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АНГЛИЙСКИЙ ЯЗЫК В ПРОФЕССИОНАЛЬНОЙ СФЕРЕ: ПРОГРАММНАЯ ИНЖЕНЕРИЯ

Учебное пособие

Пособие содержит тематические материалы, направленные на развитие навыков чтения специализированных текстов. Приведены практические упражнения, нацеленные на освоение языка в контексте программирования и проектирования систем.

Предназначено для студентов технических специальностей. Оно может использоваться как в учебных аудиториях, так и для самостоятельной подготовки.

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PREFACE

It is a focused guide designed to enhance your English communication skills specifically within the context of software development. In today's globalized tech industry, the ability to express complex ideas clearly and effectively in English is crucial. Whether you are working with international teams, writing technical documentation, or engaging in professional discussions, strong English proficiency is key to your success.

This guide book is tailored to meet the unique needs of software engineers. It covers essential technical vocabulary, improves your ability to read and comprehend domain-specific texts, and sharpens your writing skills for various contexts.

Structured with practicality in mind, each chapter combines explanations, real-world examples, and exercises to help you apply your learning immediately. Whether you are a student, a recent graduate, or an experienced professional, this book will help you navigate the specific linguistic demands of the software engineering field.

UNIT 1. THE WORLD WIDE WEB

The World Wide Web, often called the Web, is an extensive system of interlinked digital documents and multimedia that can be accessed through the Internet. Invented by Sir Tim Berners-Lee in 1989 while he was working at CERN, it has dramatically transformed how we access and share information. Unlike the Internet, which is a network of networks enabling communication between computers, the Web is an application that operates over the Internet, providing a user-friendly way to navigate and interact with a vast array of resources.

At the heart of the Web is the concept of hypertext, which allows users to move seamlessly from one document to another through hyperlinks. This system enables a non-linear form of information retrieval, unlike traditional text. Hypertext is embedded in web pages using Hypertext Markup Language (HTML), the standard language for creating web pages. HTML structures the content, while additional technologies like Cascading Style Sheets (CSS) and JavaScript are used to enhance the appearance and interactivity of web pages, respectively.

Web browsers are essential tools for accessing the Web. These software applications retrieve, present, and traverse information resources on the Web. Popular browsers include Google Chrome, Mozilla Firefox, Microsoft Edge, and Safari. Each browser has unique features, but all perform the fundamental task of rendering HTML documents and allowing users to follow hyperlinks to other documents or resources. Browsers also support other web technologies, enabling dynamic content and multimedia experiences.

Websites, consisting of multiple web pages, are hosted on web servers and identified by unique Uniform Resource Locators (URLs). A URL is a specific address used to access a particular webpage, typically starting with 'http://' or 'https://'. The 's' in 'https' indicates a secure connection. Web servers store and deliver the content to the browser upon request. The process involves a complex interaction between the browser, the server, and various protocols that ensure the correct content is delivered efficiently.

Search engines play a crucial role in navigating the vast expanse of the Web. Tools like Google, Bing, and Yahoo index millions of webpages and allow users to search for information by entering keywords. These engines use sophisticated algorithms to rank pages based on relevance, ensuring that the most pertinent results are presented first. Search engines have become indispensable, as they simplify the process of finding specific information amidst the billions of webpages available.

The Web has also facilitated the rise of social media platforms, profoundly impacting how people communicate and share information. Sites like VK and LinkedIn provide users with the ability to create and share content, connect with others, and participate in online communities. Social media has changed the landscape of personal interaction, marketing, news dissemination, and even political activism, making the Web an integral part of modern life.

In conclusion, the World Wide Web is a revolutionary tool that has reshaped the way we interact with information and each other. From its inception as a system of hyperlinked documents to the sophisticated, multimedia-rich environment we experience today, the Web continues to evolve. Its development has led to new technologies and platforms, significantly influencing communication, business, education, and entertainment. As it grows, the Web will undoubtedly remain a central component of the digital age.

Task 1. Match the words and terms from the text with their definitions.

> World Wide Web, hypertext, web browser, URL, HTML, CSS, JavaScript, web server, search engine, social media

1. A language used to structure content on the Web.
2. A system of interlinked documents and multimedia on the Internet.
3. Software application used to access and view websites.
4. Non-linear way of accessing information via links.
5. A unique address used to access a particular webpage.
6. Language used for styling web pages.
7. Online platforms where users share content and connect with others.
8. Technology that enables dynamic content on web pages.
9. A tool that indexes and retrieves information on the Web based on keywords.
10. A server that stores and delivers web content to browsers.

Task 2. Complete the sentences using words from the list below.

> Tim Berners-Lee, hypertext, web browsers, URL, HTML, CSS, JavaScript, search engines, web server, HTTPS

1. The World Wide Web was invented by _____ in 1989.
2. A _____ allows users to navigate between different documents through hyperlinks.
3. _____ are used to access and view websites.
4. A _____ is a specific address that leads to a particular webpage.
5. Websites are created using technologies like _____, _____, and _____.
6. _____ are tools that help users find information on the Web.

7. _____ enables dynamic content and multimedia experiences on web pages.
8. A _____ stores and delivers content to the browser upon request.
9. _____ is used to structure the content of web pages.
10. _____ is a secure version of HTTP.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. Веб-сайты создаются с использованием HTML, CSS и JavaScript.
2. URL используется для нахождения конкретных веб-страниц.
3. Поисковые системы помогают пользователям находить нужную информацию.
4. Социальные медиа позволяют людям делиться контентом.
5. Веб-серверы отвечают за хранение и доставку веб-контента.
6. Гипертекст является основой веба.
7. Веб-браузеры позволяют пользователям перемещаться по Интернету.
8. Тим Бернерс-Ли изобрел Всемирную паутину в 1989 году.
9. HTTPS обеспечивает защиту данных при передаче.
10. JavaScript делает веб-страницы интерактивными.

Task 4. Write an essay on one of the following topics.
1. The Future of Web Technologies and Their Impact on Society.
2. The Role of the World Wide Web in Business Innovation.
3. The Impact of Social Media on Global Communication.
4. The Importance of Web Security in the Digital Age.
5. The Development of Search Engines and Their Effect on Information Accessibility.

UNIT 2. PYTHON PROGRAMMING LANGUAGE

Python is a high-level, interpreted programming language known for its simplicity and readability. Created by Guido van Rossum and first released in 1991, Python emphasizes code readability with its notable use of significant indentation. This feature enforces a clear and visually uncluttered structure,

making it an excellent choice for beginners and experienced programmers alike. Python's syntax allows developers to express concepts in fewer lines of code compared to languages like C++ or Java.

One of Python's key strengths is its versatility. It is used in various domains such as web development, data analysis, artificial intelligence, scientific computing, and automation. Frameworks like Django and Flask make web development efficient and robust, while libraries like NumPy, pandas, and Matplotlib are essential for data science and analysis. Python's machine learning libraries, such as TensorFlow and scikit-learn, have made it a popular choice among AI researchers and practitioners.

Python supports multiple programming paradigms, including procedural, object-oriented, and functional programming. This flexibility allows developers to choose the most suitable approach for their specific project needs. Object-oriented programming (OOP) in Python provides a way to structure programs so that properties and behaviors are bundled into individual objects. This paradigm is especially useful for managing complex systems with clear modularity.

Another significant advantage of Python is its extensive standard library, which provides modules and functions for a wide range of tasks. Whether you need to handle file I/O, manipulate strings, or manage system processes, Python's standard library has you covered. This comprehensive library reduces the need for external dependencies and simplifies the development process. Additionally, Python has a vast ecosystem of third-party packages available through the Python Package Index (PyPI), further extending its functionality.

Python's community is one of its greatest assets. The language boasts a large, active community of developers who contribute to its growth and maintenance. Numerous tutorials, forums, and documentation are available, making it easier for newcomers to learn and for experienced developers to find solutions to complex problems. The Python Software Foundation (PSF) also plays a crucial role in promoting the development and adoption of Python.

In the world of software development, Python's ease of use, versatility, and strong community support make it a compelling choice for a wide range of applications. Its ability to adapt to various domains and its extensive library support ensure that Python remains a relevant and powerful tool in the programmer's toolkit. As technology continues to evolve, Python's simplicity and efficiency will likely keep it at the forefront of programming languages for years to come.

Task 1. Match the words and terms from the text with their definitions.

> Python, Guido van Rossum, Indentation, Django, NumPy,
> Object-oriented programming, Standard library, PyPI,
> Python Software Foundation, Interpreted language

1. The creator of Python.
2. A programming language known for its simplicity and readability.
3. A web framework for developing web applications in Python.
4. A library for numerical computing in Python.
5. A programming paradigm where properties and behaviors are bundled into individual objects.
6. Modules and functions provided by Python for various tasks.
7. The Python Package Index, a repository of third-party packages.
8. The organization promoting the development and adoption of Python.
9. A language where code is executed directly without prior compilation.
10. The use of spaces or tabs to structure code, making it more readable.

Task 2. Complete the sentences using words from the list below.

> Versatility, Interpreted, Object-oriented, Indentation, Ecosystem,
> Frameworks, Community, Standard library, PyPI, Syntax

1. Python's _____ allows developers to express concepts in fewer lines of code.
2. One of Python's key strengths is its _____, making it suitable for web development, data analysis, and more.
3. Python is an _____ language, meaning code is executed directly without prior compilation.
4. Python's use of significant _____ enforces a clear and visually uncluttered structure.
5. Python supports multiple programming paradigms, including procedural, _____, and functional programming.
6. Python's extensive _____ provides modules and functions for a wide range of tasks.
7. The Python Package Index, known as _____, offers a vast collection of third-party packages.

8. _____ like Django and Flask make web development efficient and robust.
9. Python's _____ is one of its greatest assets, contributing to its growth and maintenance.
10. The Python _____ consists of various libraries and tools that extend its functionality.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. Python часто используется для анализа данных и машинного обучения.
2. Сообщество разработчиков Python активно и постоянно растет.
3. Python поддерживает множество парадигм программирования, включая функциональное программирование.
4. PyPI позволяет легко устанавливать сторонние пакеты.
5. NumPy – это библиотека для численных вычислений в Пайтоне.
6. Python популярен среди исследователей искусственного интеллекта.
7. Программирование с использованием объектов помогает организовать код.
8. Стандартная библиотека Python упрощает разработку за счет встроенных функций.
9. Django используется для создания мощных веб-приложений.
10. Python известен своим простым и читаемым синтаксисом.

Task 4. Write an essay on one of the following topics.
1. The Role of Python in Data Science and Machine Learning.
2. Comparing Python with Other Programming Languages: Strengths and Weaknesses.
3. The Evolution and Future Prospects of Python.
4. The Usage of Python in Web Development.
5. The Impact of Python on Modern Software Development.

UNIT 3. DATABASES

Databases are structured collections of data that are stored and accessed electronically. They are fundamental to the functioning of modern software applications, enabling efficient storage, retrieval, and management of data.

Databases can range from small systems used by a single user to large systems accessed by thousands of users simultaneously. They are designed to handle various types of data, including text, numbers, images, and multimedia. The primary purpose of a database is to provide a way to store and organize data so that it can be easily retrieved and managed.

One of the key components of a database is the Database Management System (DBMS). A DBMS is software that interacts with the user, applications, and the database itself to capture and analyze data. The DBMS ensures that the data is consistently organized and remains easily accessible. Popular DBMSs include MySQL, PostgreSQL, Oracle Database, and Microsoft SQL Server. These systems provide tools for defining, creating, querying, updating, and administering databases. They also offer security features to protect data from unauthorized access.

Databases can be classified into several types based on their structure and usage. The most common type is the relational database, which organizes data into tables with rows and columns. Each table represents a different entity, and relationships between tables are defined through foreign keys. SQL (Structured Query Language) is the standard language used to interact with relational databases. Other types of databases include NoSQL databases, which are designed to handle unstructured data and provide high scalability. Examples of NoSQL databases are MongoDB, Cassandra, and Redis.

Data integrity and security are crucial aspects of database management. Data integrity ensures that the data in the database is accurate and consistent over its lifecycle. This is achieved through constraints, such as primary keys, foreign keys, and unique constraints, which enforce rules on the data. Security measures, such as encryption, authentication, and authorization, protect the data from unauthorized access and breaches. Regular backups and disaster recovery plans are also essential to ensure data is not lost in case of hardware failures or other disasters.

In addition to traditional databases, cloud-based databases have become increasingly popular. Cloud databases are hosted on cloud computing platforms, providing scalability, flexibility, and cost-effectiveness. Services like Amazon RDS, Google Cloud SQL, and Microsoft Azure SQL Database allow businesses to deploy and manage databases without the need for physical hardware. Cloud databases can easily scale up or down based on demand, making them suitable for applications with variable workloads.

The future of databases is evolving with advancements in technology. Emerging trends include the use of artificial intelligence and machine learning to optimize database performance and automate administrative tasks. Graph databases, which store data in nodes and edges, are gaining traction for applications involving complex relationships and networks. Moreover, the integration of blockchain technology into databases aims to enhance data security and transparency. As data continues to grow in volume and complexity, databases will remain a critical component of modern information systems, driving innovation and efficiency in various fields.

Task 1. Match the words and terms from the text with their definitions.

> Database, DBMS, SQL, relational database, NoSQL, data integrity, encryption, cloud database, graph database, backup

1. A software system that manages databases and provides an interface to interact with them.
2. Structured collections of data stored and accessed electronically.
3. A type of database that organizes data into tables with rows and columns.
4. The standard language used to interact with relational databases.
5. A type of database designed to handle unstructured data and provide high scalability.
6. The process of converting data into a code to prevent unauthorized access.
7. Ensuring that data is accurate and consistent over its lifecycle.
8. Databases hosted on cloud computing platforms.
9. A copy of data stored separately for recovery in case of loss.
10. A type of database that stores data in nodes and edges, suitable for applications involving complex relationships.

Task 2. Complete the sentences using words from the list below.

> retrieval, consistency, constraints, authentication, scalability, nodes, relationships, flexibility, querying, lifecycle

1. One of the primary purposes of a database is to provide a way to store and organize data so that it can be easily _____ and managed.
2. A DBMS ensures that the data is consistently organized and remains easily accessible.

3. Data integrity ensures that the data in the database is accurate and consistent over its _____.
4. This is achieved through _____, such as primary keys, foreign keys, and unique constraints, which enforce rules on the data.
5. Security measures, such as encryption, _____, and authorization, protect the data from unauthorized access and breaches.
6. Regular backups and disaster recovery plans are also essential to ensure data is not lost in case of hardware failures or other disasters.
7. Cloud databases can easily scale up or down based on demand, making them suitable for applications with variable workloads.
8. Graph databases store data in _____ and edges, making them suitable for applications involving complex relationships.
9. NoSQL databases provide high _____ and flexibility, making them suitable for large-scale applications.
10. SQL is used for defining, creating, _____, updating, and administering databases.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. База данных используется для хранения и управления данными.
2. СУБД обеспечивает взаимодействие пользователя и базы данных.
3. SQL применяется для создания и управления реляционными базами данных.
4. NoSQL базы данных хорошо работают с большими объемами данных.
5. Поддержание целостности данных критически важно для всех баз данных.
6. Шифрование защищает конфиденциальные данные.
7. Облачные базы данных могут масштабироваться в зависимости от потребностей.
8. Резервные копии предотвращают потерю данных в случае аварий.
9. Графовые базы данных используются для описания сложных взаимосвязей.
10. Параметры безопасности включают аутентификацию и авторизацию.

Task 4. Write an essay on one of the following topics.
1. The Role of Databases in Modern Web Applicationsb.
2. Comparing SQL and NoSQL Databases: Use Cases and Performance.
3. The Impact of Cloud Databases on Business Operations.
4. The Importance of Data Security and Integrity in Databases.
5. Does Artificial Intelligence Transform Database Management?

UNIT 4. ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is a branch of computer science that aims to create machines capable of performing tasks that typically require human intelligence. These tasks include learning, reasoning, problem-solving, perception, and language understanding. AI systems are designed to analyze data, recognize patterns, and make decisions with minimal human intervention. The field of AI has evolved significantly since its inception in the mid-20th century, driven by advancements in computer processing power, large datasets, and sophisticated algorithms.

There are various subfields within AI, each focusing on different aspects of intelligent behavior. Machine learning, a prominent subfield, involves the development of algorithms that allow computers to learn from and make predictions based on data. Deep learning, a subset of machine learning, utilizes neural networks with many layers to analyze complex patterns in large datasets. Natural language processing (NLP) enables machines to understand and respond to human language, facilitating interactions between humans and computers. Robotics integrates AI to develop machines that can perform physical tasks in the real world.

AI can be categorized into narrow AI and general AI. Narrow AI, also known as weak AI, is designed to perform a specific task, such as facial recognition or language translation, and operates under a limited set of parameters. These systems are highly efficient within their specialized domains but cannot generalize beyond them. General AI, or strong AI, refers to systems that possess the ability to understand, learn, and apply knowledge across a wide range of tasks, similar to human intelligence. While narrow AI is widely used today, general AI remains a theoretical concept, with researchers striving to achieve this level of sophistication.

The applications of AI are vast and varied, impacting numerous industries and aspects of daily life. In healthcare, AI is used to analyze medical images, predict patient outcomes, and personalize treatment plans. In finance, AI algorithms detect fraudulent transactions, automate trading, and provide personalized banking services. Autonomous vehicles, powered by AI, are transforming transportation by improving safety and efficiency. Additionally, AI-driven virtual assistants, like Siri and Alexa, have become integral to everyday life, assisting with tasks ranging from setting reminders to controlling smart home devices.

Despite its many benefits, AI also poses significant ethical and societal challenges. One major concern is the potential for job displacement as AI systems automate tasks previously performed by humans. There are also issues related to privacy and security, as AI systems often require access to large amounts of personal data. Bias in AI algorithms is another critical issue, as these systems can perpetuate and even amplify existing societal biases if not carefully designed and monitored. Ensuring the ethical development and deployment of AI is essential to maximize its benefits while minimizing its risks.

The future of AI holds immense promise, with ongoing research aimed at enhancing its capabilities and addressing its challenges. Advances in AI are expected to revolutionize fields such as medicine, education, and environmental sustainability. For instance, AI could lead to breakthroughs in disease diagnosis and treatment, personalized learning experiences, and efficient resource management to combat climate change. As AI continues to evolve, it will be crucial for policymakers, researchers, and society to collaborate in shaping an inclusive and beneficial AI-driven future.

Task 1. Match the words and terms from the text with their definitions.

> artificial intelligence (AI), machine learning, deep learning, natural language processing (NLP), neural networks, narrow AI, general AI, autonomous vehicles, ethical challenges, bias

1. The branch of computer science that aims to create machines capable of performing tasks that typically require human intelligence.
2. A subfield of AI involving algorithms that allow computers to learn from and make predictions based on data.

3. Utilizes neural networks with many layers to analyze complex patterns in large datasets.
4. Enables machines to understand and respond to human language.
5. Systems of interconnected artificial neurons used in machine learning and deep learning.
6. AI designed to perform a specific task and operates under a limited set of parameters.
7. AI that possesses the ability to understand, learn, and apply knowledge across a wide range of tasks.
8. Vehicles powered by AI that are capable of sensing their environment and moving safely with little or no human input.
9. Issues related to moral principles, such as fairness, privacy, and the impact on employment.
10. Prejudices in AI algorithms that can perpetuate and even amplify existing societal disparities.

Task 2. Complete the sentences using words from the list below.

> algorithms, data, predictions, parameters, tasks, interactions, fraudulent, privacy, efficiency, breakthroughs

1. AI systems are designed to analyze _____, recognize patterns, and make decisions with minimal human intervention.
2. Machine learning involves the development of _____ that allow computers to learn from and make predictions based on data.
3. Narrow AI operates under a limited set of _____ and is highly efficient within its specialized domains.
4. NLP enables machines to understand and respond to human language, facilitating _____ between humans and computers.
5. In finance, AI algorithms detect _____ transactions, automate trading, and provide personalized banking services.
6. Autonomous vehicles, powered by AI, are transforming transportation by improving safety and _____.
7. The applications of AI are vast and varied, impacting numerous industries and aspects of daily _____.
8. Bias in AI _____ is a critical issue, as these systems can perpetuate and even amplify existing societal biases.

9. AI could lead to _____ in disease diagnosis and treatment, personalized learning experiences, and efficient resource management.
10. Ensuring the ethical development and deployment of AI is essential to maximize its benefits while minimizing its risks to _____.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. Искусственный интеллект использует алгоритмы для анализа данных.
2. Машинное обучение помогает компьютерам делать предсказания на основе данных.
3. Глубокое обучение использует нейронные сети для анализа сложных паттернов.
4. Обработка естественного языка позволяет машинам понимать человеческую речь.
5. Автономные автомобили улучшают безопасность на дорогах.
6. Важные прорывы в медицине возможны благодаря искусственному интеллекту.
7. Узкий искусственный интеллект эффективен в специализированных задачах.
8. Обеспечение конфиденциальности данных важно при использовании искусственного интеллекта.
9. Этические проблемы связаны с вопросами справедливости и приватности.
10. Предвзятость в алгоритмах может усиливать существующие социальные неравенства.

Task 4. Write an essay on one of the following topics related to artificial intelligence.
1. The Impact of Artificial Intelligence on Employment and Job Markets.
2. Ethical Considerations in the Development and Use of AI.
3. The Future of Autonomous Vehicles and Their Potential Benefits and Risks.
4. Will AI Transform School Education?
5. The Role of Natural Language Processing in Enhancing Human-Computer Interaction.

UNIT 5. MACHINE LEARNING

Machine learning is a branch of artificial intelligence (AI) that focuses on the development of algorithms and statistical models that enable computers to perform specific tasks without explicit instructions. Instead, these systems rely on patterns and inference. At its core, machine learning involves the creation of models that can learn from and make predictions based on data. These models improve their performance over time as they are exposed to more data, which is referred to as training.

There are several types of machine learning, each suited to different kinds of tasks. Supervised learning is the most common type, where the model is trained on labeled data. This means that each training example is paired with an output label. The model makes predictions and is corrected by comparing its predictions to the actual outcomes, learning from its errors. Unsupervised learning, on the other hand, involves training a model on data that does not have labeled responses. The model tries to find patterns and structure within this data. Examples of unsupervised learning include clustering and association algorithms.

A third type, known as reinforcement learning, is inspired by behavioral psychology and involves training models through a system of rewards and penalties. The model, often referred to as an agent, learns to perform tasks by receiving feedback from its actions in a given environment. This type of learning is particularly useful in situations where the correct action is not known ahead of time but must be discovered through trial and error. Examples include game playing, robotic control, and autonomous driving.

Feature engineering is a crucial step in the machine learning process. It involves selecting and transforming the variables in the dataset to improve the performance of the model. Features are individual measurable properties or characteristics of the phenomenon being observed. Effective feature engineering can significantly enhance the predictive power of machine learning algorithms. This step often requires domain expertise and a deep understanding of the data.

Model evaluation and selection are also vital components of the machine learning pipeline. Once a model has been trained, it must be evaluated to determine its performance. Common evaluation metrics include accuracy, precision, recall, and F1 score. The model's performance is typically assessed using a separate validation dataset that the model has not seen during training.

Techniques such as cross-validation can be used to ensure that the model generalizes well to new, unseen data. Based on these evaluations, the best model is selected for deployment.

The applications of machine learning are vast and varied, spanning numerous fields. In healthcare, machine learning models assist in diagnosing diseases and personalizing treatment plans. In finance, they are used for fraud detection and algorithmic trading. Machine learning is also pivotal in the development of recommendation systems, which power services like Netflix and Amazon. Furthermore, machine learning models are integral to the functioning of self-driving cars, natural language processing, and image recognition systems. As the field continues to evolve, the potential for machine learning to transform industries and improve human life is immense.

Task 1. Match the words and terms from the text with their definitions.

machine learning, supervised learning, unsupervised learning, reinforcement learning, feature engineering, training, model, clustering, validation dataset, cross-validation

1. A type of machine learning where the model is trained on labeled data.
2. The process of selecting and transforming variables in a dataset to improve model performance.
3. Training a model through a system of rewards and penalties, inspired by behavioral psychology.
4. A subset of data used to assess the performance of a machine learning model.
5. Algorithms and statistical models that enable computers to perform tasks without explicit instructions.
6. A type of unsupervised learning that groups similar data points together.
7. A method to ensure that a model generalizes well to new, unseen data by splitting the dataset into multiple parts.
8. The process where models improve their performance over time as they are exposed to more data.
9. A type of machine learning where the model tries to find patterns and structure within unlabeled data.
10. The representation of the phenomenon being observed, which can make predictions based on data.

Task 2. Complete the sentences using words from the list below.

> predictions, labeled, patterns, agent, transforming, accuracy,
>   trial and error, clustering, recommendations, algorithms

1. In supervised learning, the model is trained on _____ data to make accurate predictions.
2. Unsupervised learning involves finding _____ and structures in the data without labeled responses.
3. Reinforcement learning relies on _____, where the model learns from rewards and penalties.
4. Feature engineering involves selecting and _____ variables to improve model performance.
5. The model, often referred to as an _____, learns to perform tasks by receiving feedback from its actions.
6. Common evaluation metrics for machine learning models include _____, precision, recall, and F1 score.
7. _____ is a type of unsupervised learning that groups similar data points together.
8. Machine learning models are used to make _____ about new, unseen data.
9. Recommendation systems, like those used by Netflix and Amazon, rely on machine learning _____.
10. Self-driving cars and image recognition systems are examples of applications that provide _____ based on data.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. Машинное обучение использует данные для улучшения моделей.
2. Обучение с учителем требует меток для обучения моделей.
3. При обучении без учителя модели ищут паттерны в данных.
4. Обучение с подкреплением включает систему наград и наказаний.
5. Инженерия признаков улучшает производительность моделей.
6. Оценка модели проводится с использованием тестового набора данных.
7. Кросс-валидация помогает убедиться, что модель хорошо обобщает данные.

8. Кластеризация – это метод группировки похожих точек данных.
9. Прогнозы моделей основаны на обучении с данными.
10. Рекомендательные системы используют алгоритмы машинного обучения.

Task 4. Write an essay on one of the following topics related to machine learning.
1. The Future of Machine Learning: Opportunities and Challenges.
2. The Ethical Implications of Machine Learning in Decision Making.
3. Does Machine Learning Transform Healthcare?
4. Comparing Supervised, Unsupervised, and Reinforcement Learning.
5. The Role of Feature Engineering in Enhancing Machine Learning Models.

UNIT 6. THE HISTORY OF NEURAL NETWORKS

The concept of neural networks dates back to the 1940s, when early researchers began exploring ways to simulate human brain processes using mathematical models. The foundation of neural networks was laid by Warren McCulloch and Walter Pitts in 1943, who developed a simplified model of a neuron and introduced the idea of a neural network to perform logical operations. Their work, which described artificial neurons and how they could be connected to solve problems, was a pioneering step in the development of neural networks and set the stage for future advancements in the field.

In the 1950s and 1960s, the first artificial neural networks were created and implemented. Frank Rosenblatt's Perceptron, introduced in 1957, was one of the earliest neural network models capable of learning from data. The Perceptron could classify linearly separable patterns and was an important milestone in demonstrating that machines could be trained to recognize patterns. However, the limitations of the Perceptron, such as its inability to solve non-linear problems, led to a decline in neural network research during the 1970s, a period often referred to as the "AI Winter."

The revival of interest in neural networks began in the 1980s, thanks to the development of new techniques and algorithms. In 1986, Geoffrey Hinton, Yann LeCun, and others introduced the backpropagation algorithm, which allowed for the effective training of multi-layer neural networks. Backpropagation improved the capability of neural networks to learn complex patterns by

systematically adjusting the weights of connections to minimize errors. This breakthrough led to the reemergence of neural networks in research and applications, setting the stage for further advancements in the field.

The 1990s and early 2000s saw significant progress in neural network research, driven by improvements in computational power and the availability of large datasets. During this period, researchers developed new neural network architectures and training methods, such as convolutional neural networks (CNNs) for image recognition and recurrent neural networks (RNNs) for sequential data processing. These innovations allowed neural networks to achieve state-of-the-art performance in various tasks and applications, including speech recognition, machine translation, and data analysis.

The 2010s marked a transformative decade for neural networks, often referred to as the "Deep Learning Revolution." Advances in hardware, particularly graphics processing units (GPUs), and the availability of massive datasets enabled the training of deep neural networks with many layers. This era saw the rise of deep learning techniques that significantly outperformed traditional machine learning methods in tasks such as image classification, natural language processing, and game playing. Breakthroughs such as AlexNet, which won the ImageNet competition in 2012, demonstrated the potential of deep neural networks and led to widespread adoption in both research and industry.

Today, neural networks continue to evolve with ongoing research and technological advancements. Innovations in network architectures, such as transformers for natural language processing and generative adversarial networks (GANs) for data synthesis, are pushing the boundaries of what neural networks can achieve. The development of more efficient algorithms and hardware is also expanding the capabilities of neural networks and their applications across diverse fields. As neural network research progresses, it is expected to drive further advancements in artificial intelligence, impacting numerous aspects of technology and daily life.

Task 1. Match the words and terms from the text with their definitions.

Perceptron, backpropagation, AI Winter, deep learning, neural networks, convolutional neural networks, recurrent neural networks, artificial neurons, Warren McCulloch, Geoffrey Hinton

1. A type of neural network architecture designed for processing grid-like data, such as images.
2. The period of reduced funding and interest in artificial intelligence research during the 1970s.
3. A mathematical model of a neuron that forms the basis for early neural networks.
4. The process of adjusting weights in a neural network to minimize prediction errors.
5. A subset of machine learning involving neural networks with many layers for complex pattern recognition.
6. Early researcher who, along with Walter Pitts, developed the initial model of a neuron.
7. A type of neural network that processes sequential data and is used in tasks like language modeling.
8. The foundational technology for artificial intelligence, consisting of layers of interconnected nodes.
9. An influential researcher who contributed to the development of the backpropagation algorithm.
10. A type of neural network designed for processing and interpreting visual information.

Task 2. Complete the sentences using words from the list below.

neural networks, perceptron, backpropagation, AI Winter, deep learning, convolutional, recurrent, patterns, Geoffrey Hinton, data

1. The _____ algorithm, introduced in the 1980s, significantly advanced the training of multi-layer neural networks.
2. During the _____ period, interest and funding for artificial intelligence research declined.
3. _____ are designed to process and learn from complex data by using layers of interconnected nodes.
4. Frank Rosenblatt's _____ was an early neural network model capable of learning from data.
5. _____ networks are used for tasks like image recognition and are particularly effective at analyzing spatial patterns.

6. _____ networks excel in processing sequential data, such as text or speech, by maintaining context over time.
7. The field of _____ involves neural networks with many layers, enabling sophisticated pattern recognition.
8. _____ was a key figure in the development of the backpropagation algorithm and other neural network innovations.
9. Training neural networks requires large amounts of _____ to effectively adjust model parameters.
10. Deep learning has enabled breakthroughs in analyzing visual _____, such as recognizing objects in images.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. В 1957 году был представлен первый перцептрон.
2. Для обучения нейронных сетей требуется большое количество данных.
3. Глубокое обучение использует многослойные нейронные сети для сложного распознавания шаблонов.
4. Период снижения интереса к искусственному интеллекту в 1970-х годах известен как «AI Winter».
5. Свёрточные нейронные сети особенно эффективны в обработке изображений.
6. Рекуррентные нейронные сети применяются в задачах обработки естественного языка.
7. Обратное распространение ошибки позволило улучшить обучение многослойных нейронных сетей.
8. Уоррен МаКаллок и Уолтер Питтс разработали раннюю модель искусственного нейрона.
9. Важные достижения в области искусственного интеллекта произошли благодаря Джеффри Хинтону.
10. Нейронные сети могут анализировать сложные данные и выявлять скрытые паттерны.

Task 4. Write an essay on one of the following topics related to neural networks.
1. The Evolution of Neural Networks: From Early Models to Modern Architectures.

2. The Impact of Convolutional Neural Networks on Computer Vision.
3. The Role of Recurrent Neural Networks in Natural Language Processing.
4. Challenges and Solutions in Training Deep Neural Networks.
5. The Future of Neural Networks: Emerging Trends and Technologies.

UNIT 7. THE HISTORY OF LOGIC PROGRAMMING

Logic programming, a paradigm in computer science, focuses on formal logic as a basis for programming and problem-solving. The roots of logic programming can be traced back to the early 20th century with the development of formal logic and mathematical foundations by pioneers like George Boole and Gottlob Frege. Their work laid the groundwork for the representation and manipulation of logical expressions, which later influenced the creation of logic programming languages. This early foundation established the theoretical basis upon which logic programming would eventually be built.

The 1960s marked the beginning of logic programming as a practical field with the development of the programming language Prolog, created by Alain Colmerauer and Philippe Roussel. Prolog, short for "Programming in Logic," was designed to facilitate natural language processing and artificial intelligence tasks. Its design was inspired by formal logic and aimed to provide a high-level abstraction for expressing knowledge and reasoning. Prolog introduced key concepts such as rules and facts, which allow programmers to describe relationships and queries in a declarative manner, rather than specifying detailed algorithms.

The 1970s saw significant advancements in the theoretical underpinnings of logic programming. During this period, researchers like Robert Kowalski developed the resolution principle, a fundamental concept in automated reasoning. The resolution principle provides a method for deriving logical conclusions from a set of premises by systematically applying inference rules. This principle became a core component of logic programming and was integrated into the design of Prolog, enhancing its capabilities for automated theorem proving and problem-solving.

In the 1980s, logic programming began to gain broader acceptance and application, particularly in artificial intelligence and knowledge representation.

The development of logic programming languages such as Datalog expanded the paradigm's utility by providing a declarative approach to database queries and logic-based programming. During this time, researchers explored extensions to Prolog and other logic programming languages to support more complex reasoning tasks, including constraint logic programming and non-monotonic reasoning.

The 1990s and early 2000s saw the continued evolution of logic programming, with advancements in optimization techniques and integration with other programming paradigms. One notable development was the incorporation of constraint logic programming, which allows for the specification of constraints in addition to logical rules, enabling more flexible and efficient problem-solving. Researchers also worked on improving the performance of logic programming systems and exploring their application in new domains such as computational biology and web services.

In recent years, logic programming has experienced a resurgence of interest, driven by its integration with other technologies and its application to modern computational problems. The rise of the semantic web and knowledge representation has revitalized interest in logic programming as a tool for modeling and querying complex datasets. Additionally, advancements in parallel and distributed computing have enhanced the performance of logic programming systems, making them more suitable for large-scale applications. As the field continues to evolve, logic programming remains a vital component of computer science, offering powerful tools for reasoning and problem-solving in diverse areas of technology and research.

Task 1. Match the words and terms from the text with their definitions.

> Prolog, resolution principle, Datalog, constraint logic programming, declarative programming, automated theorem proving, knowledge representation, Alain Colmerauer, Philippe Roussel, Gottlob Frege

1. A programming paradigm where the logic of computation is expressed in terms of relations and rules.
2. A principle used in logic programming to derive conclusions from premises by applying inference rules.

3. A logic programming language designed for database queries and logic-based programming.
4. An approach to programming where you specify what the program should accomplish rather than how to accomplish it.
5. A method of reasoning used to automatically prove or disprove logical statements.
6. A type of logic programming that incorporates constraints to enable flexible problem-solving.
7. A language created in the 1970s for natural language processing and AI tasks.
8. A formal system for representing knowledge about the world in a structured manner.
9. A researcher known for developing the Prolog programming language.
10. A logician who contributed foundational ideas to formal logic, influencing later programming paradigms.

Task 2. Complete the sentences using words from the list below.

> Prolog, resolution principle, Datalog, constraint logic programming, declarative programming, Alain Colmerauer, Philippe Roussel, knowledge representation, Automated Theorem Proving, Gottlob Frege

1. _____ was a key researcher who, along with Philippe Roussel, created the Prolog programming language.
2. The _____ allows for deriving logical conclusions by applying inference rules to a set of premises.
3. _____ extends traditional logic programming by adding constraints to solve complex problems more flexibly.
4. The _____ paradigm focuses on specifying what the program should do rather than the exact steps to achieve it.
5. _____ is a language designed for querying and managing databases using logical rules.
6. _____ contributed significantly to the development of formal logic and the theoretical foundations of programming.
7. _____ is used in fields such as natural language processing and artificial intelligence for representing knowledge.

8. In the 1970s, _____ and Philippe Roussel developed Prolog, which greatly influenced logic programming.
9. _____ involves using logic programming techniques to automatically prove or disprove statements.
10. The _____ method was crucial in advancing automated reasoning by systematically applying logical rules.

Task 3. Translate the following sentences from Russian into English using words from the text.

1. Prolog был создан для обработки естественного языка и задач искусственного интеллекта.
2. Парадигма декларативного программирования указывает, что программа должна делать.
3. Логическое программирование в ограничениях помогает решать сложные задачи с помощью дополнительных ограничений.
4. Принцип резолюций является основным методом автоматического доказательства теорем.
5. Datalog используется для выполнения запросов к базам данных с использованием логических правил.
6. Алан Колмера и Филипп Руссель разработали Prolog в 1970-х годах.
7. Представление знаний позволяет моделировать информацию о мире в структурированном виде.
8. Готлоб Фреге внес значительный вклад в развитие формальной логики.
9. Автоматическое доказательство теорем применяет логические правила для проверки утверждений.
10. Период снижения интереса к искусственному интеллекту называется AI Winter.

Task 4. Write an essay on one of the following topics related to logic programming.

1. The Development and Impact of Prolog in the Field of Artificial Intelligence.
2. The Evolution of Logic Programming Languages: From Prolog to Modern Variants.
3. How Constraint Logic Programming Enhances Problem-Solving Capabilities.

4. The Role of Logic Programming in Knowledge Representation and Semantic Web Technologies.
5. Analyzing the Contribution of Early Pioneers like Gottlob Frege and Warren McCulloch to Logic Programming.

UNIT 8. THE HISTORY
OF NATURAL LANGUAGE PROCESSING

Natural Language Processing (NLP) is a field of artificial intelligence that focuses on the interaction between computers and human languages. Its history dates back to the 1950s, a time when the concept of machine translation was first explored. One of the earliest projects was the Georgetown-IBM experiment in 1954, which successfully translated 60 Russian sentences into English. This experiment marked a significant milestone, demonstrating the potential for machines to understand and process human language, even though the translations were quite limited in scope.

The 1960s and 1970s saw significant theoretical advancements in linguistics and computer science that influenced NLP. Researchers like Noam Chomsky introduced transformational grammar, which provided a deeper understanding of the syntactic structures of languages. At the same time, the development of algorithms for parsing sentences enabled computers to analyze the grammatical structure of text. These advancements laid the groundwork for more sophisticated NLP systems by establishing foundational concepts for understanding and processing natural language.

In the 1980s, the focus of NLP shifted towards statistical methods, driven by the increased availability of digital text and computational power. Techniques such as Hidden Markov Models (HMMs) and n-grams became popular for tasks like speech recognition and part-of-speech tagging. These statistical approaches allowed NLP systems to handle ambiguity and variability in language more effectively. By leveraging large corpora of text, researchers could build models that captured the probabilistic nature of language, leading to improved accuracy in various NLP applications.

The 1990s introduced the era of machine learning in NLP, where algorithms learned from data rather than relying on manually crafted rules. The advent of more advanced algorithms, such as decision trees and support vector machines,

enabled the development of more accurate and efficient NLP systems. During this period, the creation of large annotated datasets, like the Penn Treebank, provided essential resources for training and evaluating machine learning models. These developments propelled NLP forward, allowing systems to perform tasks such as named entity recognition and sentiment analysis with higher precision.

The early 2000s witnessed the rise of deep learning, which revolutionized NLP by using neural networks to model complex language patterns. Techniques like word embeddings (e. g., Word2Vec) transformed the way NLP systems understood the semantics of words by capturing their contextual relationships. The introduction of recurrent neural networks (RNNs) and later transformers, such as the Transformer model and BERT (Bidirectional Encoder Representations from Transformers), further advanced the field. These models enabled significant improvements in tasks like machine translation, text summarization, and question answering, achieving performance levels that were previously unattainable.

In recent years, NLP has continued to evolve rapidly, with significant advancements in pre-trained language models. OpenAI's GPT-3 and Google's T5 are prime examples of models that leverage massive amounts of data and computational power to achieve remarkable language understanding and generation capabilities. These models have been applied across a wide range of applications, from chatbots and virtual assistants to automated content creation and language translation. As NLP technology continues to progress, it holds the promise of bridging the gap between human and machine communication, making interactions more natural and intuitive than ever before.

Task 1. Match the words and terms from the text with their definitions.

> machine translation, transformational grammar, Hidden Markov Models, word embeddings, named entity recognition, recurrent neural networks, Penn Treebank, GPT-3, BERT, semantic relationships

1. A type of deep learning model that captures the contextual relationships of words in a text.
2. The automatic translation of text from one language to another by a computer.

3. An annotated dataset used for training and evaluating machine learning models in NLP.
4. An AI model developed by OpenAI known for its language understanding and generation capabilities.
5. A statistical model used in NLP to predict sequences of words or speech.
6. The identification of proper names in a text, such as people, organizations, and locations.
7. A theory of syntax that provides rules for transforming sentences.
8. Deep learning models designed to handle sequences of data, often used in NLP tasks.
9. The representation of words in a continuous vector space, capturing their meanings based on context.
10. Relationships that define the meanings and connections between words.

Task 2. Complete the sentences using words from the list below.

> machine translation, transformational grammar, Hidden Markov Models, word embeddings, named entity recognition, recurrent neural networks, Penn Treebank, GPT-3, BERT, semantic relationships

1. The _____ provides a framework for understanding the syntactic structure of languages.
2. _____ are used in speech recognition to model sequences of words.
3. _____ enable the representation of words based on their contextual usage.
4. The development of _____ has greatly improved the accuracy of language translation.
5. _____ are essential for training and evaluating machine learning models in NLP.
6. Techniques like _____ help in identifying proper names within a text.
7. _____ models are particularly effective for handling sequential data in NLP tasks.
8. The release of _____ by OpenAI showcased unprecedented language generation capabilities.
9. _____ is known for its ability to understand and generate natural language.

10. Understanding _____ is crucial for capturing the meanings and connections between words.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. Разработка машинного перевода началась в 1950-х годах.
2. Теория трансформационной грамматики была предложена Ноамом Хомским.
3. В скрытых марковских моделях используются статистические методы для предсказания слов.
4. Векторные представления слов помогают моделям понимать контекст слов.
5. Распознавание именованных сущностей важно для анализа текста.
6. Рекуррентные нейронные сети эффективно работают с последовательными данными.
7. Penn Treebank является важным ресурсом для обучения моделей машинного обучения.
8. GPT-3 продемонстрировал возможности генерации естественного языка.
9. BERT используется для понимания контекста и генерации текста.
10. Понимание семантических отношений улучшает качество обработки естественного языка.

Task 4. Write an essay on one of the following topics related to NLP.
1. The Impact of Machine Translation on Global Communication.
2. The Role of Deep Learning in Advancing Natural Language Processing.
3. Comparing Traditional and Modern Approaches in Natural Language Processing.
4. The Challenges of Named Entity Recognition.
5. The Future of Conversational AI.

UNIT 9. INFORMATION SECURITY

Information security, often referred to as InfoSec, is the practice of protecting information from unauthorized access, use, disclosure, disruption, modification, or destruction. Its primary objective is to ensure

the confidentiality, integrity, and availability (CIA) of data. Confidentiality involves ensuring that information is accessible only to those authorized to access it, integrity means maintaining the accuracy and completeness of data, and availability ensures that information and systems are accessible when needed. These principles form the foundation of all information security strategies and measures.

The history of information security dates back to ancient times, with early methods including physical locks, encryption, and secret codes. However, the field has significantly evolved with the advent of the digital age. The rise of computers and the internet introduced new challenges, such as cyber threats and vulnerabilities. The development of cryptographic techniques in the mid-20th century, including the creation of the Data Encryption Standard (DES) and later the Advanced Encryption Standard (AES), marked significant milestones in the effort to secure digital information.

One of the most critical aspects of information security is the protection against cyber threats. Cyber threats can take many forms, including viruses, worms, trojans, ransomware, and phishing attacks. These threats can lead to data breaches, financial losses, and damage to an organization's reputation. To combat these threats, organizations employ various security measures, such as firewalls, antivirus software, intrusion detection systems (IDS), and security information and event management (SIEM) systems. These tools help detect and mitigate potential security incidents before they can cause significant harm.

Another vital component of information security is the implementation of robust policies and procedures. Security policies outline an organization's approach to managing and protecting its information assets. These policies include guidelines for password management, data encryption, access controls, and incident response. Regular training and awareness programs are also essential to ensure that employees understand the importance of information security and are equipped to recognize and respond to potential threats.

The legal and regulatory environment plays a significant role in shaping information security practices. Governments and regulatory bodies worldwide have enacted laws and regulations to protect sensitive information and ensure the privacy of individuals. Notable examples include the General Data Protection Regulation (GDPR) in the European Union, the Health Insurance Portability and Accountability Act (HIPAA) in the United States, and the Personal Data

Protection Act (PDPA) in Singapore. Compliance with these regulations requires organizations to implement stringent security measures and regularly audit their practices.

The future of information security is continuously evolving, driven by advancements in technology and the increasing sophistication of cyber threats. Emerging technologies such as artificial intelligence (AI) and machine learning (ML) are being integrated into security systems to enhance threat detection and response capabilities. Additionally, the growing adoption of cloud computing and the Internet of Things (IoT) presents new security challenges that require innovative solutions. As the digital landscape expands, the importance of maintaining robust information security measures will only continue to grow, making it an essential focus for organizations worldwide.

Task 1. Match the words and terms from the text with their definitions.

> confidentiality, integrity, availability, cyber threats,
> data encryption standard, advanced encryption standard, firewalls,
> intrusion detection systems, general data protection regulation,
> security information and event management

1. Measures that ensure data can be accessed when needed.
2. A European Union regulation focused on data protection and privacy.
3. The practice of keeping data accurate and unaltered.
4. Software or hardware designed to prevent unauthorized access to a network.
5. Ensuring that information is accessible only to authorized individuals.
6. Systems used to detect unauthorized access or attacks.
7. A widely used encryption algorithm developed to secure data.
8. A framework for collecting, analyzing, and reporting security data.
9. Harmful actions such as viruses and phishing aimed at compromising information security.
10. An encryption standard that replaced DES for better security.

Task 2. Complete the sentences using words from the list below.

> policies, training, compliance, cryptographic, ransomware, password,
> cloud computing, regulatory, artificial intelligence, incident response

1. Organizations must implement robust _____ to protect their information assets.
2. Regular _____ is essential to ensure employees are aware of security protocols.
3. _____ with laws like GDPR is mandatory for handling personal data.
4. The development of _____ techniques has significantly enhanced data security.
5. _____ attacks can lock users out of their data until a ransom is paid.
6. A strong _____ policy is critical for preventing unauthorized access.
7. The rise of _____ has introduced new security challenges.
8. _____ bodies worldwide have established laws to protect sensitive information.
9. _____ is being integrated into security systems to improve threat detection.
10. Effective _____ procedures are crucial for handling security breaches.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. Данные пользователя должны быть защищены от несанкционированного доступа.
2. Целостность данных важна для обеспечения точности и полноты информации.
3. Доступность систем должна быть гарантирована в любое время.
4. В современном мире под киберугрозами понимают вирусы, трояны и фишинговые атаки.
5. Стандарт шифрования данных был разработан для защиты цифровой информации.
6. Брандмауэры помогают предотвратить несанкционированный доступ к сети.
7. Системы обнаружения вторжений важны для защиты информации.
8. Регламент GDPR направлен на защиту личных данных пользователей.

9. SIEM-система собирает и анализирует данные из различных источников в ИТ-инфраструктуре предприятия и предоставляет полную картину информационной безопасности компании.
10. Развитие искусственного интеллекта улучшает возможности обнаружения угроз.

Task 4. Write an essay on one of the following topics related to information security.
1. The Role of Cryptography in Modern Information Security.
2. How to Develop an Effective Incident Response Plan.
3. The Impact of Cyber Threats on Small and Medium Enterprises (SMEs).
4. The Importance of Employee Training in Preventing Security Breaches.
5. The Future of Information Security in the Age of Cloud Computing.

UNIT 10. WINDOWS

Microsoft Windows is one of the most influential operating systems in the history of computing. Since its debut in the mid-1980s, Windows has evolved from a simple graphical extension for MS-DOS to a powerful and complex operating system that dominates the personal computer market. This chapter traces the development of Windows from its earliest versions to the modern era, highlighting key milestones and innovations.

Released on November 20, 1985, Windows 1.0 was Microsoft's first attempt to create a graphical user interface (GUI) for IBM-compatible PCs. It was not a standalone operating system but rather a graphical extension of MS-DOS. Windows 1.0 allowed users to open multiple applications simultaneously in tiled windows (not overlapping) and provided basic applications like Calculator, Notepad, and Paint. Despite its innovative approach, Windows 1.0 was not a commercial success, mainly due to its limited functionality and performance.

Windows 2.0, released in December 1987, improved upon its predecessor by allowing overlapping windows and introducing support for VGA graphics. Windows 2.0 was also the first version to support keyboard shortcuts, a feature that would become a hallmark of the Windows interface. This version gained more popularity, especially with the release of Windows/386

and Windows/286 in 1988, which were optimized for Intel's 386 and 286 processors, respectively. These releases included better memory management and improved multitasking.

The release of Windows 3.0 in 1990 marked a significant leap forward for the platform. With a more polished interface, improved graphics, and better memory management, Windows 3.0 made multitasking more practical and accessible. It introduced the Program Manager and File Manager, providing a more intuitive way for users to navigate their applications and files. This version was the first to achieve widespread commercial success, selling millions of copies and solidifying Windows as a key player in the operating system market.

Windows 95, launched in 1995, was a groundbreaking release that redefined the Windows experience. It introduced the Start menu, Taskbar, and Windows Explorer, which have become defining features of the operating system. Windows 95 also brought significant improvements under the hood, including support for 32-bit applications, which enhanced performance and multitasking capabilities. This version also marked the debut of Internet Explorer, reflecting the growing importance of the internet. The success of Windows 95 was bolstered by an unprecedented marketing campaign, making it one of the most iconic operating systems in history.

Following Windows 95, Windows 98 was released in 1998, building on the strengths of its predecessor while introducing new features. It enhanced support for emerging hardware, such as USB devices, and offered improved multimedia capabilities. Windows 98 also introduced the Windows Driver Model, aiming for better hardware compatibility. Although it was not a revolutionary update, it was well-received, particularly by home users, and became a staple in personal computing during the late 1990s.

In 2000, Microsoft released two distinct operating systems: Windows 2000 and Windows Millennium Edition (ME). Windows 2000, built on the Windows NT architecture, was aimed at business users, offering greater stability, security, and support for networking. It became a trusted platform in professional environments. In contrast, Windows ME was designed for home users but was criticized for its instability and lack of significant innovation. Despite introducing features like System Restore, Windows ME is often regarded as one of the less successful versions of Windows.

Windows XP, introduced in 2001, was a major milestone that unified the consumer and professional versions of Windows under a single platform.

Based on the stable Windows NT kernel, Windows XP offered enhanced security, reliability, and a user-friendly interface. It introduced features such as a redesigned Start menu, improved taskbar, and support for multiple user accounts. Windows XP was widely acclaimed and became one of the most successful operating systems in history, remaining popular for many years beyond its official support period.

In 2007, Microsoft released Windows Vista, an ambitious update that sought to modernize the Windows experience with a new visual style called Aero, enhanced security features like User Account Control (UAC), and improved search functionality. However, Vista faced criticism for its high system requirements, performance issues, and compatibility problems, leading many users to stick with Windows XP. Microsoft addressed these concerns with Windows 7 in 2009, which focused on refining the user experience. Windows 7 introduced a more streamlined interface, faster performance, and features like improved taskbar functionality and better touch support, earning widespread praise and becoming a favorite among users.

In 2012, Microsoft took a bold step with the release of Windows 8, which introduced a radically new interface optimized for touchscreens. The traditional Start menu was replaced with a Start screen featuring live tiles, designed to provide a more modern, tablet-friendly experience. However, the drastic changes were met with mixed reactions, as many users found the new interface confusing and less efficient on traditional desktops. Microsoft addressed these concerns with Windows 8.1 in 2013, reintroducing some familiar elements, including a partial return of the Start button.

Windows 10, released in 2015, aimed to unify the user experience across all devices, from desktops to tablets to smartphones. It reintroduced a more traditional Start menu while incorporating the live tiles from Windows 8. Windows 10 introduced new features like the Edge browser, Cortana voice assistant, and Continuum, which allowed seamless switching between desktop and tablet modes. Windows 10 was offered as a free upgrade for Windows 7 and 8 users, leading to rapid adoption. It became known for its regular updates and long-term support, with a focus on security, performance, and user experience.

In 2021, Microsoft launched Windows 11, the latest evolution of its operating system. Windows 11 introduced a modern, refreshed design with a centered Start menu, new productivity features like Snap Layouts for enhanced multitasking, and deeper integration with Microsoft Teams and cloud services.

It also brought native support for running Android apps, reflecting the blurring lines between mobile and desktop platforms. Windows 11 was designed to take advantage of modern hardware, offering improved performance, security, and gaming capabilities. As the most recent iteration, Windows 11 continues to build on the legacy of its predecessors while adapting to the changing needs of a diverse user base in an increasingly interconnected world.

Task 1. Match the words and terms from the text with their correct definitions.

> graphical user interface (GUI), taskbar, kernel, VGA graphics, multitasking, system restore, Aero, user account control, start menu, Snap Layouts

1. A security feature that prevents unauthorized changes to the operating system by requiring administrative approval.
2. A part of the operating system responsible for managing system resources and hardware.
3. A visual style introduced in Windows Vista that includes translucent window borders and enhanced graphical effects.
4. A bar at the bottom of the screen in Windows that shows open applications and provides quick access to system functions.
5. A type of interface that allows users to interact with electronic devices through graphical icons and visual indicators.
6. The ability of an operating system to run more than one application or process at the same time.
7. A basic computer graphics standard that allows for higher resolution and more colors.
8. A feature in Windows that allows users to restore their system to a previous state in case of problems.
9. A menu in Windows that provides access to programs, files, and system settings, typically found in the bottom-left corner of the screen.
10. A feature in Windows 11 that allows users to easily arrange open windows into different layouts on the screen.

Task 2. Complete the sentences using words from the list below.

> unified, iconic, optimized, compatibility, refined, adoption, tablet, ambitious, multimedia, performance

1. Windows 7 was praised for its _____ user experience and faster _____ compared to its predecessor.
2. Windows XP became one of the most _____ operating systems, widely used for many years after its release.
3. The _____ of Windows 95 was greatly helped by its massive marketing campaign.
4. Windows 8 was _____ for touchscreen devices, but it faced criticism for its confusing interface on traditional desktops.
5. The introduction of the Start menu and Taskbar in Windows 95 made it easier for users to navigate, leading to rapid _____.
6. Windows 98 focused on improving _____ capabilities and better hardware _____.
7. Windows 10 aimed to create a _____ experience across desktops, tablets, and smartphones.
8. Windows Vista was an _____ update that faced criticism for its high system requirements.
9. Windows 11 introduced new features like Snap Layouts to enhance _____ on modern hardware.
10. Microsoft _____ Windows 2000 and Windows ME for business and home users, respectively.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. В Windows 10 был представлен новый браузер под названием Edge.
2. Эта операционная система поддерживает многозадачность и работает с 32-битными приложениями.
3. Windows 8 был первым, кто предложил новый экран с живыми плитками.
4. Интерфейс в Windows 3.0 был значительно улучшен по сравнению с предыдущими версиями.
5. Обновление Windows 8.1 вернуло всем знакомую кнопку «Пуск».
6. Система Windows 2000 стала основным выбором для корпоративных пользователей благодаря своей надежности.
7. Windows Vista ввела улучшенные функции безопасности и контроль учетных записей пользователей.

8. Windows XP пользовалась популярностью благодаря своей стабильности и удобству.
9. Windows 7 значительно улучшил поддержку сенсорных экранов, эта операционная система имела упрощенный интерфейс.
10. Windows ME была известна своими проблемами с совместимостью и низкой производительностью.

Task 4. Write an essay on one of the following topics related to information security.
1. The Evolution of Windows OS: From Windows 1.0 to Windows 11.
2. The Role of Windows 95 in Shaping Modern Personal Computing.
3. Windows XP: The Operating System That Redefined User Experience.
4. The Transition from Windows 7 to Windows 10: A Study in User Interface Design.
5. Challenges and Controversies: A Critical Analysis of Windows Vista.

UNIT 11. SYSTEM ADMINISTRATION

System administration is the field of managing and maintaining computer systems, servers, and networks within an organization. A system administrator, often referred to as a sysadmin, is responsible for ensuring that these systems run smoothly, efficiently, and securely. The role requires a deep understanding of both hardware and software components, as well as the ability to troubleshoot and resolve issues quickly. System administrators play a critical role in the day-to-day operations of a business, as they ensure that the IT infrastructure supports the organization's needs.

One of the primary responsibilities of a system administrator is managing servers. This includes installing and configuring server software, managing user accounts, and ensuring that servers are properly secured against unauthorized access. Regular maintenance tasks, such as applying software updates, patching vulnerabilities, and performing backups, are essential to keep servers running reliably. System administrators must also monitor server performance and optimize configurations to handle the demands of the organization's applications and services.

In addition to server management, system administrators are tasked with network administration. This involves setting up and managing local area

networks (LANs), wide area networks (WANs), and other types of networks that connect computers within an organization. Network administration includes configuring routers, switches, firewalls, and other networking equipment to ensure secure and efficient data transmission. Sysadmins must also troubleshoot network issues, manage IP addresses, and monitor network traffic to prevent congestion and maintain optimal performance.

Security is a fundamental aspect of system administration. System administrators are responsible for implementing security measures to protect the organization's data and systems from cyber threats. This includes setting up firewalls, intrusion detection systems (IDS), and antivirus software, as well as enforcing security policies such as strong password requirements and user access controls. Regular security audits and vulnerability assessments are also necessary to identify and address potential risks. In the event of a security breach, sysadmins must respond quickly to mitigate damage and restore normal operations.

System administrators also play a key role in managing an organization's data storage solutions. They are responsible for configuring and maintaining storage systems, such as network-attached storage (NAS) or storage area networks (SAN), to ensure that data is stored securely and is easily accessible when needed. Backup and disaster recovery planning are critical tasks, as they ensure that the organization's data can be recovered in the event of hardware failure, data corruption, or other disasters. Sysadmins must regularly test backup systems to ensure they function correctly and update recovery plans to account for any changes in the IT environment.

The role of a system administrator is constantly evolving, especially as organizations adopt new technologies such as cloud computing and virtualization. Sysadmins must continuously update their skills and knowledge to stay current with the latest trends and best practices. This might involve learning how to manage virtual machines, deploying cloud-based services, or automating routine tasks using scripting languages. As IT environments become more complex, the demand for skilled system administrators who can effectively manage and secure these systems is expected to grow.

Finally, system administration is not just about technical skills; it also involves strong communication and problem-solving abilities. System administrators often work with other IT professionals, as well as end-users, to ensure that technology meets the needs of the organization. They must be able

to explain technical issues in a way that non-technical staff can understand and collaborate effectively to resolve problems. In essence, system administrators are the backbone of an organization's IT operations, ensuring that all systems are reliable, secure, and aligned with the organization's goals.

Task 1. Match the following words and terms from the text with their correct definitions.

> sysadmin, server, network administration, firewalls, virtualization, backup, disaster recovery, intrusion detection system, data storage, cloud computing

1. A system that monitors network traffic for suspicious activity and issues alerts.
2. A technology that allows the creation of virtual versions of physical hardware.
3. The process of copying data to prevent loss in case of system failure.
4. The role of managing and maintaining computer systems, servers, and networks.
5. A device or software designed to block unauthorized access to a network.
6. A service model that delivers computing services over the internet.
7. The management of local and wide area networks within an organization.
8. A computer system that provides data or services to other computers over a network.
9. The plan and processes in place to recover data and systems after a catastrophic event.
10. Systems used to store digital information securely and accessibly.

Task 2. Fill in the gaps in the sentences below using the correct words from the list provided.

> optimization, scripting, user accounts, monitoring, patch, router, IP addresses, security policies, automation, recovery

1. Regular _____ of server configurations helps ensure that applications run efficiently.
2. System administrators often use _____ languages to automate routine tasks.

3. Managing _____ is essential for controlling access to the organization's systems.
4. Continuous _____ of network performance is crucial for identifying potential issues early.
5. Applying a _____ to software can fix vulnerabilities and improve security.
6. A _____ is a device that forwards data packets between computer networks.
7. Assigning and managing _____ is a key task in network administration.
8. Enforcing _____ helps protect data from unauthorized access.
9. _____ of repetitive tasks can save time and reduce errors.
10. A well-tested _____ plan is vital to restore systems after a failure.

Task 3. Translate the following sentences from Russian into English using the words from the text.
1. Система виртуализации помогает снизить затраты на оборудование.
2. Мониторинг сети позволяет обнаружить проблемы на ранней стадии.
3. Автоматизация задач облегчает управление сервером.
4. Патчи должны применяться своевременно для обеспечения безопасности.
5. Системные администраторы должны обновлять свои знания о новых технологиях.
6. План восстановления после катастрофы должен быть проверен и актуализирован.
7. Назначение IP-адресов необходимо для организации сетевого трафика.
8. Защита данных требует строгого соблюдения политик безопасности.
9. Система обнаружения вторжений предупреждает о возможных угрозах.
10. Хранение данных должно быть организовано так, чтобы информация была легко доступна.

Task 4. Write an essay on one of the following topics related to system administration.

1. The Role of Automation in Modern System Administration.
2. The Importance of Network Security in Small and Medium Enterprises.
3. Challenges in Managing Cloud-Based IT Infrastructure.
4. Best Practices for Disaster Recovery Planning in IT.
5. The Impact of Virtualization on System Administration.

UNIT 12. MOBILE COMPUTING

Mobile computing refers to the use of portable computing devices, such as smartphones, tablets, and laptops, to access and manage information while on the move. This technology has revolutionized the way people work, communicate, and access services, enabling greater flexibility and productivity. Mobile computing relies on wireless communication networks, such as Wi-Fi, cellular networks, and Bluetooth, to connect devices to the internet and other systems. The development of mobile applications, or apps, has further expanded the capabilities of mobile devices, allowing users to perform a wide range of tasks from anywhere at any time.

One of the key components of mobile computing is the hardware used to support it. Modern mobile devices are equipped with powerful processors, high-resolution screens, and a variety of sensors, such as GPS, accelerometers, and cameras, that enhance their functionality. The portability of these devices is a significant advantage, as it allows users to carry their computing power with them, whether they are traveling, working remotely, or simply moving around within a building. Battery life is another critical aspect of mobile computing hardware, as it determines how long a device can be used without needing to be recharged.

The software aspect of mobile computing is equally important. Operating systems such as Android, iOS, and Windows Mobile provide the necessary platform for running mobile applications. These operating systems are designed to be lightweight and efficient, ensuring smooth performance on devices with limited resources compared to traditional desktop computers. Mobile applications are developed to meet the specific needs of users, ranging from productivity tools and social media platforms to gaming and entertainment. The app ecosystem has grown exponentially, with millions of apps available for download, catering to virtually every interest and need.

Wireless communication is the backbone of mobile computing, enabling devices to connect to the internet and communicate with each other. Cellular networks, particularly with the advent of 4G and 5G technology, have made it possible for users to have high-speed internet access on their mobile devices almost anywhere in the world. Wi-Fi provides another means of wireless connectivity, often used in homes, offices, and public spaces. Bluetooth is commonly used for short-range communication between devices, such as connecting a smartphone to a wireless headset or a smartwatch. The seamless integration of these technologies allows for a continuous and reliable mobile computing experience.

Security is a significant concern in mobile computing, given the sensitive nature of the data often stored and transmitted by mobile devices. Users must be vigilant in protecting their devices from unauthorized access, malware, and other cyber threats. This includes using strong passwords, enabling biometric authentication, and keeping software up to date. Organizations must also implement robust security policies to protect corporate data on employee devices, particularly in scenarios where bring-your-own-device (BYOD) policies are in place. Mobile device management (MDM) solutions are commonly used to enforce security measures and manage the devices connected to a corporate network.

The impact of mobile computing on society and business has been profound. In the business world, it has enabled remote work, real-time communication, and the automation of various processes, leading to increased efficiency and productivity. Mobile commerce, or m-commerce, has also grown, allowing consumers to shop, bank, and pay bills using their mobile devices. Socially, mobile computing has changed how people interact with each other, with social media platforms becoming a central part of daily life for many. The convenience and accessibility provided by mobile computing continue to drive innovation in various fields, making it an indispensable part of modern life.

Task 1. Match the following words and terms from the text with their correct definitions.

mobile computing, wireless communication, operating system, battery life, Bluetooth, mobile device management, biometric authentication, app ecosystem, 4G/5G Technology, m-Commerce

1. A security feature that uses unique biological traits, such as fingerprints or facial recognition, to verify a user's identity.
2. A network technology that allows for high-speed internet access on mobile devices.
3. The management and enforcement of security policies on mobile devices connected to a corporate network.
4. The use of portable devices to access and manage information while on the go.
5. A short-range wireless technology used for communication between devices.
6. The duration a mobile device can operate without recharging.
7. A platform that supports the development and distribution of mobile applications.
8. The platform software that manages hardware resources and provides services for mobile applications.
9. The exchange of data or information over a wireless network.
10. Commercial transactions conducted using mobile devices.

Task 2. Fill in the gaps in the sentences below using the correct words from the list provided.

> sensors, portability, remote work, cyber threats, high-resolution, automation, smartphones, software updates, GPS, public spaces

1. _____ is crucial for mobile devices as it allows users to carry their computing power anywhere.
2. Mobile computing has enabled _____, allowing employees to work from any location with internet access.
3. Modern smartphones are equipped with various _____, including accelerometers and cameras.
4. _____ screens enhance the visual experience on mobile devices, making them suitable for multimedia use.
5. _____ help determine the exact location of a device, which is useful for navigation apps.
6. _____ must be installed regularly to protect mobile devices from vulnerabilities.

7. Mobile devices are often used in _____, such as coffee shops and airports, where Wi-Fi is available.
8. Protecting mobile devices from _____ is a top priority for users and organizations alike.
9. _____ has become a significant part of business operations, reducing manual workload and improving efficiency.
10. Devices like _____ have become essential tools for communication, entertainment, and productivity.

Task 3. Translate the following sentences from Russian into English using the words from the text.
1. Важность резервного копирования данных на мобильных устройствах нельзя переоценить.
2. Современные операционные системы разработаны для обеспечения высокой производительности на мобильных устройствах.
3. Bluetooth позволяет подключать наушники к смартфону без проводов.
4. Виртуальные частные сети (VPN) обеспечивают дополнительный уровень безопасности для мобильных устройств.
5. Мобильные приложения стали неотъемлемой частью повседневной жизни.
6. Портативность ноутбуков делает их удобными для работы в дороге.
7. Система управления мобильными устройствами помогает контролировать доступ к корпоративным данным.
8. Влияние мобильных технологий на социальное взаимодействие значительно возросло.
9. Защита от киберугроз включает в себя регулярное обновление программного обеспечения.
10. Мобильные устройства позволяют пользователям оставаться на связи практически в любом месте.

Task 4. Write an essay on one of the following topics related to mobile computing.
1. The Evolution of Mobile Operating Systems.
2. The Role of Mobile Devices in Modern Business.
3. The Future of 5G and Its Impact on Mobile Computing.

4. Security Challenges in Mobile Computing and How to Address Them.
5. The Influence of Mobile Apps on Everyday Life.

UNIT 13. SOFTWARE ENGINEERING

Software engineering is a disciplined and systematic approach to designing, developing, testing, and maintaining software. It encompasses a wide range of activities, from understanding user requirements and designing software architecture to coding, testing, and deploying software applications. The goal of software engineering is to produce high-quality software that meets the needs of users while being reliable, maintainable, and scalable. This field is crucial in today's digital world, where software plays a central role in virtually every aspect of life, from business operations to personal communication.

The history of software engineering dates back to the 1960s when the term was first coined to address the "software crisis" of the time. This crisis was characterized by the increasing complexity of software systems, which often led to projects being delivered late, over budget, or failing to meet user requirements. To address these challenges, the field of software engineering emerged, borrowing principles from traditional engineering disciplines, such as civil and mechanical engineering. This shift marked the beginning of a more structured approach to software development, emphasizing planning, design, and testing.

One of the core concepts in software engineering is the software development life cycle (SDLC). The SDLC is a process that outlines the steps involved in creating software, from initial planning and requirement gathering to deployment and maintenance. The SDLC typically includes stages such as requirement analysis, design, implementation, testing, deployment, and maintenance. Each stage is crucial for ensuring that the final product meets the needs of users and is free from defects. Different methodologies, such as Waterfall, Agile, and DevOps, provide various approaches to managing the SDLC, each with its own set of practices and tools.

Software engineering also places a strong emphasis on the importance of quality assurance (QA) and testing. QA is the process of ensuring that the software meets specified requirements and is free of defects. Testing is a critical part of QA and involves running the software through various scenarios to

identify and fix bugs before the software is released to users. There are several types of testing, including unit testing, integration testing, system testing, and user acceptance testing. Automated testing tools have become increasingly popular in recent years, helping to improve the efficiency and effectiveness of the testing process.

In addition to technical skills, software engineering requires strong communication and collaboration abilities. Software projects often involve large teams of developers, designers, testers, and other stakeholders who must work together to achieve a common goal. Effective communication is essential for ensuring that everyone is on the same page, from understanding user requirements to resolving issues that arise during development. Collaboration tools, such as version control systems and project management software, are widely used in software engineering to facilitate teamwork and ensure that projects stay on track.

The field of software engineering is constantly evolving, driven by advancements in technology and changing user needs. Emerging trends such as artificial intelligence (AI), machine learning, and cloud computing are reshaping the way software is developed and deployed. These technologies are enabling the creation of more intelligent, adaptive, and scalable software systems. As software continues to play an increasingly important role in society, the demand for skilled software engineers is expected to grow, making it a dynamic and rewarding field for those interested in technology and problem-solving.

Task 1. Match the following words and terms from the text with their correct definitions.

software engineering, software crisis, software development life cycle, quality assurance, unit testing, agile, version control, artificial intelligence, cloud computing, requirement analysis

1. The process of defining user needs and the functionalities that a software system must perform.
2. The practice of using remote servers hosted on the internet to store, manage, and process data.
3. A method of project management and software development that emphasizes iterative progress and flexibility.

4. The systematic application of engineering principles to the development and maintenance of software.
5. A period in the 1960s when software projects often failed due to increasing complexity and lack of structured development approaches.
6. The first stage of testing where individual components of a software system are tested separately.
7. The use of technology to create systems capable of performing tasks that would normally require human intelligence.
8. A process that includes planning, designing, building, testing, and maintaining software systems.
9. The activity of maintaining a history of changes made to a software project, usually using tools like Git.
10. A systematic process to ensure that software meets specified requirements and is free of defects.

Task 2. Fill in the gaps in the sentences below using the correct words from the list provided.

> implementation, testing, deployment, maintenance, collaboration, automated, integration testing, communication, stakeholders, DevOps

1. After the design phase, the next step in the SDLC is _____, where the actual coding takes place.
2. _____ tools are used to streamline the testing process, ensuring that software is free from bugs.
3. _____ is an approach that emphasizes the collaboration between development and operations teams.
4. Once the software is developed, it undergoes _____ to verify that all components work together correctly.
5. Effective _____ within a team is crucial for the success of a software engineering project.
6. The final stage of the SDLC is _____, where the software is released to users and begins to operate in a live environment.
7. Regular _____ of software is essential to fix bugs, add new features, and improve performance.
8. Good _____ with all involved parties ensures that the software meets the expectations and needs of the users.

9. The _____ phase involves evaluating the software in real-world conditions to ensure it works as expected.
10. In a software engineering project, _____ is essential to ensure that all team members are aligned and working toward the same goals.

Task 3. Translate the following sentences from Russian into English using the words from the text.
1. Как бы тщательно ни проводился анализ требований, проблемы могут возникнуть на этапе реализации.
2. Если бы команда провела контроль качества лучше, дефекты не обнаружились бы на финальном этапе.
3. Когда разработчики завершат этап тестирования, они смогут перейти к развёртыванию системы.
4. Где бы ни использовалась система управления версиями, всегда можно будет отслеживать изменения в коде.
5. Если бы проект был реализован с использованием облачных вычислений, затраты на инфраструктуру могли бы быть снижены.
6. Какие бы изменения ни вносились в программный код, они должны быть зафиксированы в системе управления версиями.
7. Когда проект будет завершен, потребуется регулярное обслуживание для поддержания его стабильности.
8. Как бы эффективно ни было проведено автоматизированное тестирование, все ошибки обнаружить невозможно.
9. Если бы гибкая методология разработки была внедрена, проект мог бы быстрее адаптироваться к изменениям.
10. Что бы ни происходило во время этапа развертывания, команда должна быть готова к устранению любых проблем.

Task 4. Write an essay on one of the following topics related to software engineering.
1. The Impact of Agile Methodologies on Modern Software Development.
2. The Role of Automated Testing in Enhancing Software Quality.
3. The Evolution of Software Development Life Cycle Models.
4. The Challenges of Implementing Artificial Intelligence in Software Projects.
5. The Future of Cloud Computing in Software Engineering.

UNIT 14. CRYPTOGRAPHY

Cryptography is the science of securing communication and data through the use of codes and ciphers, ensuring that only intended recipients can read or understand the information. The word "cryptography" comes from the Greek words "kryptos," meaning "hidden", and "graphein," meaning "to write". Historically, cryptography was primarily concerned with the process of converting plain text into unreadable formats (encryption) and then back into readable formats (decryption). In today's digital age, cryptography has evolved significantly and plays a critical role in protecting sensitive information, such as financial transactions, personal data, and government communications.

The history of cryptography dates back thousands of years, with early examples found in ancient Egypt and Rome. One of the earliest and simplest forms of cryptography is the Caesar cipher, used by Julius Caesar to protect military messages. This cipher involves shifting each letter in a message by a fixed number of positions in the alphabet. Although the Caesar cipher was relatively easy to crack, it laid the groundwork for more complex encryption techniques. During World War II, cryptography took a giant leap forward with the development of the Enigma machine by Nazi Germany, and its subsequent decryption by Allied cryptanalysts, which played a crucial role in the outcome of the war.

Modern cryptography is heavily based on mathematical theory and computer science. It involves the use of algorithms to transform data into formats that are virtually impossible to decipher without the correct decryption key. There are two primary types of encryption: symmetric and asymmetric. Symmetric encryption uses the same key for both encryption and decryption, making it faster but requiring a secure method for sharing the key between parties. Asymmetric encryption, on the other hand, uses a pair of keys — one public and one private — making it more secure for tasks like sending sensitive information over the internet, where secure key exchange is difficult.

Public Key Infrastructure (PKI) is a framework used to manage digital keys and certificates, ensuring that communications are secure. In PKI, a trusted third party, known as a Certificate Authority (CA), issues digital certificates that authenticate the identity of entities like websites or individuals. This infrastructure is fundamental to secure communications on the internet, enabling technologies such as SSL/TLS, which are used to protect data

transmitted between web browsers and servers. PKI also underpins the operation of digital signatures, which provide a way to verify the authenticity and integrity of digital documents.

Cryptography is not without challenges. One of the most significant threats is the advent of quantum computing, which has the potential to break many of the cryptographic algorithms currently in use. Quantum computers operate on principles entirely different from traditional computers, allowing them to solve certain problems, like factoring large numbers, exponentially faster. This capability threatens the security of widely-used cryptographic techniques, particularly RSA and ECC, which rely on the difficulty of these problems. Researchers are actively working on developing quantum-resistant cryptographic algorithms to mitigate this future threat.

In addition to its role in security, cryptography has a wide range of applications across various industries. It is used in blockchain technology to secure transactions and maintain the integrity of data on decentralized networks. Cryptography also enables the creation of cryptocurrencies like Bitcoin, which use cryptographic techniques to control the creation of new units and secure transactions. Moreover, cryptography is essential in protecting the confidentiality of communications in fields such as healthcare, where patient information must be kept secure, and in finance, where it safeguards online banking and payment systems.

Cryptography is a dynamic and critical field in the modern digital landscape. Its evolution from simple ciphers to complex algorithms reflects the growing need to protect information in an increasingly interconnected world. As technology continues to advance, the importance of cryptography will only increase, making it an essential area of study for anyone interested in cybersecurity and information technology.

Task 1. Match the following words and terms from the text with their correct definitions.

cryptography, encryption, decryption, symmetric encryption, asymmetric encryption, public key infrastructure, certificate authority, quantum computing, digital signature, blockchain

1. The process of converting encrypted data back into its original form.
2. A system that manages digital keys and certificates, ensuring secure communications.

3. The science of securing communication through the use of codes and ciphers.
4. A framework used to manage digital keys and certificates, involving a trusted third party.
5. The use of a pair of keys, one public and one private, for encryption and decryption.
6. A form of encryption that uses the same key for both encryption and decryption.
7. A trusted third party that issues digital certificates to authenticate entities.
8. A technology that uses the principles of quantum mechanics to process information in ways that traditional computers cannot.
9. A cryptographic method that provides a way to verify the authenticity and integrity of digital documents.
10. A decentralized digital ledger used to record transactions across multiple computers in a secure manner.

Task 2. Fill in the blanks with the appropriate words from the list provided.

> algorithms, integrity, confidentiality, RSA, SSL/TLS, decentralized, interconnected, ciphers, threats, healthcare

1. Cryptographic _____ are essential for transforming data into unreadable formats.
2. _____ of information is a primary concern in fields like finance and _____.
3. The _____ of digital signatures ensures that documents have not been altered.
4. The _____ nature of blockchain technology makes it secure and transparent.
5. _____ algorithms are widely used in securing online communications.
6. Quantum computing poses significant _____ to existing cryptographic systems like _____.
7. SSL/TLS protocols are used to protect data transmitted between _____ systems.
8. Cryptography's evolution reflects the need to protect information in an increasingly _____ world.

9. The use of _____ is crucial for securing communications during World War II.
10. Cryptography helps maintain the _____ of patient information in the _____ sector.

Task 3. Translate the following complex or compound Russian sentences into English using words from the text.

1. Даже если бы криптография не существовала, защита данных всё равно была бы необходима.
2. Важно понимать, что, где бы ни использовалась шифровка, она всегда требует ключа для расшифровки.
3. Если бы квантовые компьютеры были разработаны раньше, многие современные алгоритмы уже были бы взломаны.
4. Как бы сложно ни было защитить информацию, криптография остаётся эффективным методом.
5. Независимо от того, какую методологию вы используете, публичные и приватные ключи всегда необходимы.
6. Где бы ни использовались цифровые подписи, они обеспечивают подлинность и целостность документов.
7. Чтобы защитить конфиденциальные данные, нужно использовать асимметричное шифрование.
8. Если бы не существовало инфраструктуры открытого ключа, безопасные интернет-коммуникации были бы невозможны.
9. Как только цифровой сертификат был выдан, его можно использовать для подтверждения личности.
10. Хотя квантовые компьютеры угрожают криптографии, разработка квантово-устойчивых алгоритмов продолжается.

Task 4. Choose one of the following topics and write a detailed essay.

1. The Role of Cryptography in Modern Digital Security.
2. How Could Quantum Computing Revolutionize Cryptography?
3. The Evolution of Cryptographic Techniques from Ancient Times to the Digital Age.
4. Public Key Infrastructure: Ensuring Secure Communications in the Digital World.
5. Cryptography and Blockchain: How They Work Together to Secure Decentralized Systems.

UNIT 15. DOCUMENTATION WRITER

A documentation writer, also known as a technical writer, plays a crucial role in the software development process. They are responsible for creating clear, concise, and comprehensive documentation that helps users understand and utilize software products effectively. This documentation can range from user manuals and installation guides to API documentation and troubleshooting guides. The role requires a deep understanding of the software, as well as the ability to communicate complex information in a way that is accessible to users of varying technical expertise.

Documentation writers work closely with software developers, product managers, and other stakeholders to gather the necessary information for their documents. They often participate in meetings, review technical specifications, and even test the software themselves to gain firsthand experience. This collaborative process ensures that the documentation is accurate and reflects the latest features and functionalities of the software. Without effective documentation, users may struggle to fully utilize a product, leading to frustration and potentially reducing the product's overall success.

A key skill for a documentation writer is the ability to translate technical jargon into plain language. Many users may not have a deep technical background, so it is essential that the documentation is written in a way that is easy to understand. This often involves breaking down complex concepts into smaller, more digestible parts and using visual aids like diagrams or screenshots to enhance comprehension. Additionally, documentation writers must be able to organize information logically, ensuring that users can quickly find the answers they need.

In addition to writing user-facing documents, documentation writers may also be responsible for creating internal documentation for development teams. This can include project documentation, process documentation, and even code comments. Internal documentation is critical for maintaining consistency and continuity within a development team, especially when new members join or when projects are handed over to different teams. Good internal documentation can save time and reduce errors, making it an essential part of the software development lifecycle.

Documentation writers must also stay up-to-date with industry standards and tools. The field of technical writing is constantly evolving, with new

software tools and methodologies emerging regularly. For example, many documentation writers use content management systems (CMS) or version control systems like Git to manage their documents. Familiarity with these tools, as well as a strong understanding of user experience (UX) principles, can greatly enhance the quality of the documentation produced.

Finally, the role of a documentation writer is increasingly recognized as critical to the overall success of a software product. As software becomes more complex and user bases become more diverse, the demand for high-quality documentation continues to grow. Companies are beginning to invest more in their documentation teams, recognizing that good documentation can lead to higher user satisfaction, fewer support calls, and a stronger reputation for the product. In this way, documentation writers contribute significantly to the user experience and the overall success of the software industry.

Task 1. Match the words and terms from the list with their correct definitions.

> documentation writer, technical jargon, API documentation, user manual, content management system, version control system, internal documentation, user experience, stakeholders, troubleshooting guide

1. A system used to manage the creation, editing, and publishing of content.
2. Documentation aimed at assisting developers and users in understanding and using an API.
3. The practice of organizing, storing, and tracking changes to code and documentation over time.
4. A person responsible for creating clear and comprehensive documentation for software products.
5. A document designed to help users resolve common issues with a software product.
6. Technical language used by professionals in a particular field, often difficult for outsiders to understand.
7. The overall experience of a person using a product, especially regarding how easy or pleasant it is to use.
8. A manual provided to users to help them understand how to operate a software product.

9. People or groups who have an interest in the success or outcome of a project.
10. Documentation created for use within a development team, not intended for external users.

Task 2. Fill in the gaps in the sentences below using the correct words from the list.

> guidelines, clarity, feedback, standards, collaboration, structure, audience, consistent, accuracy, maintenance

1. A documentation writer must always consider the target _____ when creating manuals and guides.
2. The _____ of the information provided is crucial to ensure users can rely on the documentation.
3. Effective _____ between developers and writers leads to more precise documentation.
4. Adhering to _____ helps ensure that all documentation is uniform and easy to follow.
5. Regular _____ is necessary to keep documentation up to date with the latest software updates.
6. The _____ of the document should be logical to help users easily navigate through the content.
7. Providing _____ in the writing is essential for helping users understand complex concepts.
8. Documentation must be _____ in style and format across different sections and products.
9. Writers often rely on _____ from users to improve the quality and usability of their documentation.
10. Following best practice _____ ensures that documentation is both comprehensive and accessible.

Task 3. Translating Sentences from Russian into English Using Words from the text.
1. Когда разработчики работают над новым проектом, они должны учитывать мнение всех заинтересованных сторон.
2. Если бы документация была доступна пользователям, количество звонков в поддержку было бы значительно меньше.

3. Как бы сложно это ни было, важно перевести технический жаргон на понятный язык.
4. Важно, чтобы документация была обновлена для поддержания актуальности информации.
5. Где бы ни находились члены команды, они должны сотрудничать для создания точной документации.
6. Если бы разработчики использовали систему управления версиями, они могли бы легко отслеживать изменения в коде.
7. Независимо от сложности продукта, пользовательский опыт всегда должен быть в приоритете.
8. Чтобы улучшить документацию, важно использовать современные инструменты и методологии.
9. Каким бы ни был продукт, хорошая репутация зависит от качества его документации.
10. Если бы технические писатели могли лучше коммуницировать с пользователями, они могли бы создать более доступные руководства.

Task 4. Choose one of the following topics and write an essay of 300−500 words.
1. The Role of Documentation Writers in Agile Development Teams.
2. The Impact of Clear Documentation on User Experience.
3. The Challenges of Translating Technical Jargon into Plain Language.
4. How Have Content Management Systems Changed Technical Writing?
5. The Importance of Maintaining Up-to-Date Documentation in Software Development.

UNIT 16. CREATING A WEB APPLICATION

Creating a web application is a multifaceted process that involves several stages, each critical to the final product's success. The journey begins with requirements gathering, where stakeholders, including clients, users, and developers, collaborate to outline the purpose and functionality of the application. This phase often includes meetings and discussions to identify user needs, desired features, and specific use cases. Tools such as user stories and wireframes can be utilized to visualize how users will interact with the

application, providing a clearer understanding of the project scope. A well-defined set of requirements serves as the foundation for subsequent stages, ensuring all parties have a shared vision.

Once the requirements are established, the next step is designing the application architecture. This involves selecting the right technology stack, which includes programming languages, frameworks, and databases. For instance, a developer may choose JavaScript for front-end development, using frameworks like React or Angular, while opting for Node.js or Python with Django for back-end development. Database choices, such as MySQL or MongoDB, must also be made based on the data requirements of the application. During this phase, developers often create architecture diagrams and data flow diagrams to represent how different components will interact, ensuring a robust and scalable application structure.

With the design in place, the actual development phase begins. This phase is characterized by writing code according to the specifications outlined in the previous stages. Front-end and back-end developers typically work simultaneously, implementing the user interface and server-side logic respectively. Version control systems, such as Git, are essential during development to track changes and manage collaboration among team members. Developers often use Integrated Development Environments (IDEs) that streamline coding, debugging, and testing processes. Regular code reviews and pair programming can further enhance code quality, ensuring that the application is built efficiently and effectively.

After the development is complete, thorough testing is conducted to identify and fix any bugs or issues before deployment. Testing can be divided into various categories, including unit testing, integration testing, and user acceptance testing (UAT). Unit testing focuses on individual components to ensure they function correctly, while integration testing evaluates how different parts of the application work together. UAT involves real users testing the application to validate its functionality and user experience. This stage is crucial, as it helps to catch issues that may have been overlooked during development and ensures that the application meets user expectations.

Once testing is finalized and all issues have been addressed, the application is ready for deployment. This phase involves moving the application from a local or staging environment to a production server, making it accessible to users. Deployment can be done using cloud platforms like AWS, Azure, or

Heroku, which provide scalable hosting solutions. Additionally, it's essential to implement a continuous integration/continuous deployment (CI/CD) pipeline to automate the deployment process, enabling regular updates and improvements without significant downtime. After deployment, monitoring tools are put in place to track the application's performance and user interactions, allowing for timely responses to any emerging issues.

The final phase of creating a web application is maintenance and updates. This is an ongoing process that ensures the application remains functional and relevant over time. Regular updates are necessary to introduce new features, improve performance, and enhance security. User feedback collected through analytics and direct interactions can guide these updates, helping developers prioritize what changes will provide the most value to users. Additionally, maintaining documentation throughout the development process assists new team members and supports future enhancements. Overall, effective maintenance is vital for the longevity and success of a web application, allowing it to adapt to changing user needs and technological advancements.

Creating a web application is an intricate process that requires careful planning, design, development, testing, deployment, and ongoing maintenance. Each stage is interconnected, and success hinges on clear communication among all stakeholders. By following a structured approach, developers can build web applications that not only meet user expectations but also provide a seamless and engaging user experience. As technology continues to evolve, staying updated with the latest trends and tools in web development is essential for creating innovative and effective applications.

Task 1. Match the words and terms from the text with their correct definitions.

> requirements gathering, architecture design, version control system, front-end development, unit testing, user acceptance testing, deployment, continuous integration/continuous deployment, integrated development environment, maintenance

1. A method used by developers to track and manage changes in code during the development process.
2. The initial phase of creating a web application, where the needs and features are outlined.

3. The process of organizing and structuring the various components of a web application, including technology stack choices.
4. The aspect of development focused on the user interface and experience.
5. Testing done by end-users to validate the application's functionality and usability.
6. A process that involves writing code for individual components to ensure they perform as expected.
7. The process of moving an application from a development or testing environment to a live production environment.
8. The practice of automating the integration and deployment of code changes to ensure smooth and regular updates.
9. A software application that provides tools for coding, debugging, and testing during development.
10. The ongoing process of updating and improving a web application after it has been deployed.

Task 2. Fill in the gaps with the correct word from the list provided.

scalable, wireframes, collaboration, cloud platforms, analytics, debugging, stakeholders, user feedback, production server, documentation

1. During the requirements gathering phase, it's essential to engage with all relevant _____ to ensure their needs are met.
2. _____ are visual guides that represent the skeletal framework of a web application, helping to clarify the design.
3. Effective _____ among team members is crucial for the success of any web application project.
4. To host the application, developers can use _____ like AWS or Azure, which offer reliable and scalable solutions.
5. After deployment, it's important to monitor the application using _____ tools to track user behavior and performance.
6. The process of identifying and fixing errors in the code is known as _____.
7. The final deployment involves transferring the application to a _____ where it becomes accessible to users.
8. _____ is key for improving and updating the application based on how it is used in the real world.

9. A _____ application can handle increasing amounts of work or users without compromising performance.
10. Proper _____ ensures that the development process is well-documented and easy to follow for future updates.

Task 3. Translate the following sentences into English, using words and phrases from the text.

1. Когда требования собраны, разработчики начинают проектировать архитектуру приложения.
2. Если бы команда не использовала систему контроля версий, они бы потеряли многие изменения в коде.
3. Независимо от сложности интерфейса, фронтенд-разработка должна быть понятной пользователю.
4. Где бы ни происходило тестирование, оно должно включать как юнит-тесты, так и тестирование пользователем.
5. Поскольку приложение уже развернуто на боевом сервере, его необходимо регулярно обновлять.
6. Чтобы автоматизировать интеграцию и развертывание, компания внедрила CI/CD.
7. Документация должна быть достаточно подробной, чтобы любой новый участник команды мог разобраться в проекте.
8. Кто бы ни проводил отладку, он должен учитывать все возможные ошибки в коде.
9. Если разработчики учтут обратную связь пользователей, приложение станет более удобным.
10. Даже если приложение изначально не было масштабируемым, его можно адаптировать под большие нагрузки.

Task 4. Choose one of the following topics and write a detailed essay.

1. The Importance of User Feedback in the Web Application Development Process.
2. Challenges and Solutions in Front-end Development.
3. The Role of CI/CD in Modern Web Application Deployment.
4. How to Design a Scalable Web Application Architecture.
5. The Impact of Cloud Platforms on Web Application Development.

UNIT 17. SEMANTIC NETWORKS

Semantic networks are a form of knowledge representation that organizes information in a structured way, connecting concepts through relationships. They are widely used in fields such as artificial intelligence, linguistics, and cognitive psychology to model how information is stored and processed in the human mind. The basic components of a semantic network are nodes and edges, where nodes represent concepts or entities, and edges represent the relationships between them. This structure allows for the visualization of complex relationships and the exploration of how different concepts are interconnected.

The origins of semantic networks can be traced back to the early days of artificial intelligence research in the 1960s. Researchers sought to develop ways to represent knowledge that mimicked human cognitive processes. One of the earliest and most influential semantic networks was the "semantic memory" model proposed by Allan M. Collins and M. Ross Quillian in 1969. Their work demonstrated how information could be stored in a hierarchical network, with more general concepts at higher levels and specific instances or attributes at lower levels. This hierarchical structure allowed for efficient retrieval of information by traversing the network.

Semantic networks have several key features that make them a powerful tool for knowledge representation. One of these is their ability to handle inheritance, where more specific concepts inherit properties from more general ones. For example, in a semantic network, the concept "bird" might have the property "can fly," and this property would automatically be inherited by specific instances like "sparrow" or "eagle." This ability to infer properties based on hierarchical relationships is one of the strengths of semantic networks, enabling them to model real-world knowledge efficiently.

Another important aspect of semantic networks is their flexibility in representing different types of relationships between concepts. Unlike other forms of knowledge representation, which may be limited to simple "is-a" or "has-a" relationships, semantic networks can represent a wide variety of relationships, such as cause-and-effect, part-whole, or temporal sequences. This versatility makes them suitable for a broad range of applications, from natural language processing to expert systems. By capturing the nuances of how concepts are related, semantic networks can provide a more accurate and comprehensive representation of knowledge.

Despite their strengths, semantic networks also have some limitations. One challenge is the potential for complexity as the network grows larger. As more nodes and edges are added, the network can become difficult to manage and navigate, leading to issues with scalability. Additionally, semantic networks may struggle to represent ambiguous or contradictory information, as the structure assumes clear and well-defined relationships between concepts. To address these challenges, researchers have developed extensions and variations of semantic networks, such as fuzzy semantic networks and probabilistic semantic networks, which aim to handle uncertainty and complexity more effectively.

In modern applications, semantic networks continue to play a crucial role in areas such as knowledge management, information retrieval, and the semantic web. They are used to create ontologies, which are formal representations of a set of concepts within a domain and the relationships between those concepts. Ontologies help to standardize knowledge representation and facilitate interoperability between different systems and datasets. As technology advances, the role of semantic networks in organizing and making sense of vast amounts of data will likely become even more significant, enabling smarter and more intuitive systems.

Task 1. Match each word or term from the text with its correct definition.

semantic network, nodes, edges, knowledge representation, inheritance, hierarchical network, ontology, expert systems, scalability, semantic web

1. A visual structure where more general concepts are placed at higher levels and specific instances are at lower levels.
2. A web of data that enables machines to understand and interpret information.
3. The process of organizing and structuring information to mimic human cognitive processes.
4. The capacity of a system to handle increasing amounts of work or its potential to be enlarged to accommodate growth.
5. The elements in a semantic network that represent concepts or entities.
6. The ability of specific concepts to automatically acquire properties from more general concepts.
7. Formal representations of a set of concepts within a domain and the relationships between them.

8. Relationships between nodes in a semantic network.
9. Computer systems that emulate the decision-making abilities of a human expert.
10. A structure used in artificial intelligence to organize concepts and their relationships.

Task 2. Fill in the gaps in the following sentences using the correct word from the list provided.

> artificial intelligence, representation, cognitive, attributes, ambiguous, applications, sequence, contradictory, nuances, complexity

1. Semantic networks are crucial in the field of _____, especially in modeling how information is stored and processed.
2. One challenge with semantic networks is managing their _____ as they grow larger.
3. The ability to capture the _____ of relationships makes semantic networks a powerful tool.
4. Semantic networks can struggle to represent _____ or _____ information.
5. The hierarchical structure allows for efficient _____ of information by following the network's _____.
6. Semantic networks can also represent a wide variety of _____, such as cause-and-effect or part-whole.
7. As technology advances, the role of semantic networks in various _____ will likely become even more significant.
8. The basic elements of semantic networks include nodes, edges, and _____.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. Когда сеть становится слишком сложной, она может быть трудноуправляемой и масштабируемой.
2. Если бы информация была организована в иерархической сети, её было бы легче извлекать.
3. Чтобы система могла обрабатывать нечеткие данные, необходимо использовать расширенные семантические сети.

4. Где бы ни использовались семантические сети, они всегда помогают моделировать сложные отношения.
5. Когда концепты наследуют свойства, сеть становится более эффективной.
6. Что бы ни случилось, семантические сети продолжают играть важную роль в управлении знаниями.
7. Если бы не существовало семантической паутины, машины не могли бы интерпретировать данные столь эффективно.
8. Как только были введены онтологии, совместимость между различными системами значительно улучшилась.
9. Чтобы отразить всю полноту знаний, необходимо учитывать нюансы отношений между концептами.
10. Где бы ни требовалось организовать данные, онтологии на основе семантических сетей являются незаменимыми инструментами.

Task 4. Choose one of the following topics and write a detailed essay, discussing the concept and its implications within the context of semantic networks.
1. The Role of Semantic Networks in Artificial Intelligence.
2. The Evolution of Knowledge Representation: From Early Models to Semantic Networks.
3. Challenges and Solutions in Managing Large-Scale Semantic Networks.
4. Applications of Semantic Networks in Natural Language Processing.
5. The Future of the Semantic Web: Opportunities and Challenges.

UNIT 18. CLUSTERING

Clustering is a fundamental concept in data science and machine learning, used to group a set of objects in such a way that objects in the same group, or cluster, are more similar to each other than to those in other groups. This technique is particularly useful in situations where you want to explore the natural structure of your data without predefined categories. Clustering is an unsupervised learning method, meaning it does not rely on labeled data, making it invaluable in discovering hidden patterns or groupings within large datasets.

There are several types of clustering methods, each with its own strengths and weaknesses. The most commonly used methods include partitioning

clustering, hierarchical clustering, density-based clustering, and model-based clustering. Partitioning clustering, such as the k-means algorithm, divides the data into a predetermined number of clusters. Hierarchical clustering, on the other hand, creates a tree-like structure of nested clusters, which can be either agglomerative (merging clusters) or divisive (splitting clusters). Density-based clustering identifies clusters as dense regions of data points, useful for identifying clusters of arbitrary shapes, while model-based clustering assumes that data is generated by a mixture of underlying probability distributions.

Clustering has a wide range of applications across various fields. In marketing, it is used to segment customers based on purchasing behavior, allowing companies to tailor their products and services to specific groups. In biology, clustering helps in classifying species based on genetic information. In the field of image processing, it can be used to identify and segment different regions of an image. Additionally, clustering plays a critical role in anomaly detection, where it helps in identifying data points that do not fit well into any cluster, potentially indicating fraudulent activity or errors.

While clustering is a powerful tool, it also presents several challenges. One of the main challenges is determining the optimal number of clusters. In methods like k-means, the number of clusters must be specified beforehand, which is not always intuitive. Another challenge is dealing with high-dimensional data, where the concept of distance (which many clustering algorithms rely on) becomes less meaningful. Additionally, different clustering algorithms may produce different results on the same dataset, leading to ambiguity in interpreting the results. The presence of noise and outliers can also significantly affect the quality of the clusters formed.

Evaluating the quality of the clusters is another critical aspect of clustering. Unlike supervised learning, where accuracy can be directly measured against known labels, clustering requires different evaluation metrics. Internal evaluation methods, such as silhouette score, Dunn index, and Davies-Bouldin index, measure the compactness and separation of the clusters. External evaluation methods, when true labels are available, involve comparing the clustering results to the known labels using metrics like purity, adjusted Rand index, or mutual information. Visual methods, such as plotting the clusters in two or three dimensions, can also provide insights into the clustering performance, although these are limited by the dimensionality of the data.

The field of clustering continues to evolve with advances in machine learning and data science. Future directions include developing algorithms that can automatically determine the optimal number of clusters, improving scalability for large datasets, and enhancing robustness against noise and outliers. Another promising area is ensemble clustering, which combines multiple clustering algorithms to produce a more robust and accurate result. Additionally, the integration of clustering with other machine learning techniques, such as deep learning, is an exciting avenue that could lead to more powerful and flexible clustering methods. As data continues to grow in complexity and volume, the importance of clustering as a tool for extracting meaningful patterns and insights will only increase.

Task 1. Match the following words and terms from the text with their correct definitions.

> clustering, unsupervised learning, k-means, anomaly detection, density-based clustering, silhouette score, partitioning clustering, hierarchical clustering, ensemble clustering, model-based clustering

1. A method of clustering that assumes data is generated by a mixture of underlying probability distributions.
2. A statistical measure used to evaluate the quality of clusters by measuring how similar an object is to its own cluster compared to other clusters.
3. A type of clustering that identifies clusters based on dense regions of data points.
4. A technique that groups data points based on their similarities without using predefined categories.
5. A method of clustering where data is divided into a predetermined number of clusters.
6. A type of learning where the algorithm is not provided with labeled data.
7. The process of identifying data points that do not fit well into any cluster, often used to detect outliers or fraudulent activities.
8. A popular clustering algorithm that partitions data into k clusters.
9. A clustering method that creates a tree-like structure of nested clusters.
10. A clustering technique that combines multiple clustering algorithms to produce a more accurate result.

Task 2. Fill in the gaps in the sentences below using the appropriate words from the list provided.

> segmentation, evaluation, compactness, visualization, optimal,
> robustness, insights, scalability, dimensionality, anomalies

1. In marketing, clustering is used for customer _____ based on purchasing behavior.
2. The _____ of the clusters can be measured using the silhouette score.
3. The challenge of determining the _____ number of clusters often arises in clustering tasks.
4. High _____ data can complicate the process of clustering.
5. _____ is crucial for clustering algorithms to handle large datasets effectively.
6. Visual methods, such as plotting clusters, help in the _____ of clustering performance.
7. _____ against noise and outliers is important for maintaining cluster quality.
8. Model-based clustering assumes that data is generated by a mixture of underlying probability distributions, which can provide valuable _____ into the data structure.
9. Density-based clustering is particularly useful in identifying _____ in data, which may indicate errors or fraudulent activities.
10. Ensemble clustering enhances the _____ of clustering results by combining multiple algorithms.

Task 3. Translate the following sentences from Russian into English using words from the text.

1. Когда данные имеют высокую размерность, некоторые алгоритмы кластеризации становятся менее эффективными.
2. Если бы алгоритм мог автоматически определять оптимальное количество кластеров, анализ данных был бы гораздо проще.
3. Чтобы понять структуру данных, необходимо проводить оценку качества кластеров с помощью различных метрик.
4. Где бы ни использовалась кластеризация, важно учитывать наличие шума и выбросов в данных.

5. Когда визуализация кластеров затруднена, возможно использование других методов оценки.
6. Какие бы алгоритмы кластеризации вы ни использовали, всегда следует проверять их результаты на наличие аномалий.
7. Когда необходимо обработать большие наборы данных, важна масштабируемость алгоритмов кластеризации.
8. Если бы сегментация клиентов была проведена правильно, маркетинговые стратегии были бы более успешными.
9. Независимо от того, какой метод кластеризации вы выбираете, его устойчивость к шуму играет ключевую роль.
10. Какими бы ни были исходные данные, правильная оценка кластеров приведет к лучшим результатам.

Task 4. Choose one of the following topics and write a detailed essay discussing your thoughts and findings.
1. The Role of Clustering in Big Data Analytics.
2. Comparing Different Clustering Algorithms: Strengths and Weaknesses.
3. Applications of Clustering in Healthcare and Medicine.
4. The Impact of High-Dimensional Data on Clustering Performance.
5. Future Trends in Clustering Techniques and Their Applications.

UNIT 19. CLASSIFICATION

Classification is a fundamental concept in data science and machine learning that involves categorizing data into predefined classes or groups. It is a type of supervised learning, where the algorithm is trained on a labeled dataset, meaning the outcome (or class) for each data point is already known. The goal of a classification model is to learn from this labeled data and predict the class of new, unseen data points accurately. Common applications of classification include spam detection in emails, disease diagnosis based on medical records, and image recognition, such as identifying objects in photographs.

One of the most basic forms of classification is binary classification, where the data is divided into two distinct classes. For example, a spam filter classifies emails as either "spam" or "not spam." However, classification can also be multi-class, where there are more than two categories. An example of

multi-class classification is classifying handwritten digits, where the possible outcomes range from 0 to 9. In this case, the model must distinguish between ten different classes.

Several algorithms are commonly used for classification tasks, each with its strengths and weaknesses. Some popular classification algorithms include decision trees, support vector machines (SVMs), k-nearest neighbors (KNN), and neural networks. Decision trees are easy to interpret and visualize but can be prone to overfitting, especially with complex datasets. SVMs are powerful for high-dimensional spaces but may require extensive computation. KNN is simple and effective for small datasets but becomes inefficient as the dataset size grows. Neural networks, particularly deep learning models, are highly effective for complex tasks like image and speech recognition but require large amounts of data and computational resources.

The performance of a classification model is typically evaluated using metrics such as accuracy, precision, recall, and the F1 score. Accuracy measures the proportion of correct predictions out of all predictions made by the model. However, in cases where the classes are imbalanced, meaning some classes are much more frequent than others, accuracy alone may not be a sufficient indicator of performance. In such cases, precision (the proportion of true positive predictions among all positive predictions) and recall (the proportion of true positive predictions among all actual positives) provide more insight. The F1 score, which is the harmonic mean of precision and recall, is also commonly used to balance these two metrics.

Overfitting is a common challenge in classification tasks, where a model becomes too complex and captures noise in the training data rather than the underlying pattern. This leads to poor performance on new, unseen data. Techniques such as cross-validation, regularization, and pruning (in the case of decision trees) are used to mitigate overfitting. Cross-validation involves dividing the dataset into several parts and training the model on different subsets, while regularization adds a penalty to the model complexity. Pruning simplifies the decision tree by removing branches that have little importance.

In recent years, ensemble methods like Random Forests and Gradient Boosting have gained popularity in classification tasks. These methods combine the predictions of multiple models to improve accuracy and robustness. For instance, a Random Forest is an ensemble of decision trees, where each tree

is trained on a random subset of the data. The final prediction is made by averaging the predictions of all trees, which helps to reduce the variance and improve generalization.

Classification is an essential tool in data science, with applications across various domains. From medical diagnosis to customer segmentation in marketing, classification models help organizations make informed decisions based on data. Understanding the principles and challenges of classification, as well as the strengths and limitations of different algorithms, is crucial for building effective models that perform well in real-world scenarios.

Task 1. Match the following words and terms from the text with their correct definitions.

> supervised learning, binary classification, multi-class classification, decision trees, overfitting, cross-validation, regularization, ensemble methods, precision, recall

1. A machine learning approach where the model is trained on labeled data.
2. The process of reducing a model's complexity to prevent it from fitting noise in the data.
3. A classification task involving only two possible outcomes.
4. An algorithm that splits data into branches to make a decision based on input features.
5. A technique that combines multiple models to improve prediction accuracy.
6. A classification task where the model predicts one out of several possible categories.
7. The process of dividing data into parts to validate the model on different subsets.
8. The proportion of correctly predicted positive observations to all observations in the class.
9. The proportion of actual positives that are correctly identified by the model.
10. When a model is too complex and learns from the noise in the data instead of the actual pattern.

Task 2. Fill in the blanks with the correct words from the list provided.

accuracy, variance, datasets, algorithms, patterns, harmonic, training, generalization, labeled, outcome

1. Classification models aim to identify underlying _____ in the data.
2. Supervised learning involves using _____ data to train the model.
3. _____ is a key metric that measures the proportion of correct predictions.
4. Overfitting can occur when the model captures noise instead of the true _____.
5. Cross-validation helps to improve the model's _____ by testing it on different data subsets.
6. Regularization techniques add penalties to reduce the model's _____.
7. Multi-class classification involves predicting one _____ out of several possibilities.
8. The _____ mean of precision and recall gives the F1 score.
9. Decision trees can be prone to overfitting, especially with complex _____.
10. Ensemble methods like Random Forests combine multiple _____ to enhance prediction accuracy.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. Важно, чтобы модель классификации могла правильно пред-сказать класс новых данных.
2. Что бы ни произошло, регуляризация помогает улучшить обоб-щающую способность модели.
3. Когда данные разделены на тренировочные и тестовые, важно учитывать баланс классов.
4. Где бы ни использовались деревья решений, они должны быть правильно настроены, чтобы избежать переобучения.
5. Модели должны быть протестированы с использованием пере-крестной проверки, чтобы оценить их точность.

6. Если бы не было ансамблевых методов, сложные задачи классификации были бы менее точными.
7. Классификация текстов применяется для разделения веб страниц и сайтов по тематическим каталогам.
8. Байесовская классификация является одним из самых простых методов в классификации текстов.
9. Для классифицируемого объекта вычисляются функции правдоподобия каждого из классов.
10. Метод ансамблей базируется на алгоритмах машинного обучения, генерирующих множество классификаторов и разделяющих все объекты из вновь поступающих данных на основе их усреднения или итогов голосования.

Task 4. Write an essay on one of the following topics.
1. The Role of Classification in Medical Diagnosis and Patient Care.
2. Challenges of Multi-Class Classification in Real-World Applications.
3. The Impact of Overfitting on Machine Learning Models and How to Prevent It.
4. A Comparative Analysis of Popular Classification Algorithms in Data Science.
5. The Importance of Cross-Validation and Regularization in Model Evaluation.

UNIT 20. COMPUTER GRAPHICS

Computer graphics is a field of computer science that focuses on creating and manipulating visual content using computational techniques. It encompasses a wide range of technologies and methods, from the simple display of images on a screen to the complex rendering of 3D environments in real-time. The field is fundamental to many modern applications, including video games, movies, simulations, and virtual reality. By understanding computer graphics, one can gain insight into how visual content is produced, manipulated, and displayed across various digital platforms.

The history of computer graphics dates back to the 1950s, when early computers were first used to generate simple images and shapes. One of the

first significant milestones was the development of the Sketchpad system by Ivan Sutherland in 1963, which allowed users to interact with a computer using a graphical interface. This was a groundbreaking achievement that laid the foundation for modern interactive graphics. Over the decades, the field has evolved rapidly, with advancements in hardware and software leading to increasingly sophisticated graphical capabilities.

One of the core concepts in computer graphics is the distinction between raster and vector graphics. Raster graphics are composed of pixels, which are tiny dots that collectively form an image. Each pixel has a specific color value, and the image resolution is determined by the number of pixels. In contrast, vector graphics are made up of paths defined by mathematical equations. These paths can be scaled infinitely without losing quality, making vector graphics ideal for logos and other designs that need to be resized frequently. Both raster and vector graphics have their own strengths and are used in different applications depending on the requirements.

Rendering is another essential aspect of computer graphics. It refers to the process of generating an image from a model, which can be 2D or 3D. Rendering involves several steps, including modeling, texturing, lighting, and shading. There are two main types of rendering: real-time and offline. Real-time rendering is used in applications like video games, where images must be generated quickly to keep up with user interaction. Offline rendering, on the other hand, is typically used in movie production and allows for more complex computations, resulting in highly detailed images. The choice of rendering method depends largely on the intended use of the graphics.

In addition to rendering, animation plays a crucial role in computer graphics. Animation involves creating the illusion of movement by displaying a series of images, or frames, in quick succession. This technique is used in various forms, from traditional 2D animation to advanced 3D animations seen in movies and video games. The process of animation often involves keyframing, where the animator specifies the start and end points of a movement, and the software interpolates the frames in between. Another technique is motion capture, which records the movements of real actors and applies them to digital characters, creating realistic animations.

Finally, the applications of computer graphics are vast and varied. In entertainment, computer graphics are used to create everything from animated films to photorealistic video games. In design and engineering, they enable the

visualization of products and structures before they are built. Medical imaging relies on computer graphics to visualize complex data, such as MRI scans. Virtual reality (VR) and augmented reality (AR) are also heavily dependent on computer graphics to create immersive environments. As technology continues to advance, the field of computer graphics will likely play an even more significant role in shaping our digital experiences.

Task 1. Match the following words and terms from the text with their correct.

> definitions. rendering, raster graphics, vector graphics, animation, resolution, real-time rendering, offline rendering, modeling, keyframing, virtual reality

1. The process of generating an image from a model using techniques like lighting, texturing, and shading.
2. The creation of movement illusion by displaying a series of images in quick succession.
3. Images composed of pixels, where each pixel has a specific color value.
4. The level of detail in an image, typically measured by the number of pixels in a raster image.
5. Graphics made up of paths defined by mathematical equations, allowing for infinite scaling without loss of quality.
6. Rendering that must occur quickly to keep up with user interaction, often used in video games.
7. The process of creating a digital representation of a 2D or 3D object.
8. A technique in animation where the start and end points of a movement are specified, and intermediate frames are automatically generated.
9. The method of rendering used in movie production, which allows for more complex computations and highly detailed images.
10. A simulated environment created using computer graphics, often experienced with VR headsets.

Task 2. Fill in the gaps in the sentences below using the appropriate word from the list provided.

> photorealistic, interactive, interpolates, mathematical, visualization, immersive, digital, path, computational, movement

1. The software automatically _____ the frames between the keyframes to create a smooth animation.
2. _____ models are often used to simulate real-world objects in a virtual environment.
3. Engineers rely on computer graphics for the _____ of products before they are physically built.
4. The _____ techniques in offline rendering allow for highly detailed images in movie production.
5. _____ environments, such as those in VR, provide users with a realistic experience.
6. The _____ equations used in vector graphics allow for infinite scaling without loss of quality.
7. Video games often require _____ rendering to ensure the graphics keep up with player actions.
8. A _____ is a sequence of points that define a line or shape in vector graphics.
9. _____ rendering can create visuals that look extremely realistic, as seen in many modern films.
10. The illusion of _____ in animation is created by displaying a series of images rapidly.

Task 3. Translate the following sentences from Russian into English using words from the text.
1. Чтобы создать фотореалистичное изображение, необходимо использовать сложные вычислительные методы.
2. Где бы вы ни находились, вы можете использовать виртуальную реальность для погружения в другой мир.
3. Если бы у нас была возможность использовать рендеринг в реальном времени, игра выглядела бы намного лучше.
4. Когда создается анимация, важно учитывать интерполяцию между ключевыми кадрами.
5. Как только модель будет завершена, её можно использовать для визуализации продукта.
6. Какими бы ни были требования проекта, математические пути векторной графики обеспечат высокое качество изображения.

7. Если бы в фильме не использовался оффлайн рендеринг, он не выглядел бы так детализированно.
8. Независимо от сложности объекта, его можно смоделировать с помощью компьютерной графики.
9. *Используя компьютерную графику, вы можете создать такие изображения, которые было бы невозможно нарисовать вручную.*
10. *Было бы лучше, если бы разработчики использовали рендеринг для создания более интерактивного опыта.*

Task 4. Choose one of the following topics and write an essay.
1. The Evolution of Computer Graphics in Video Games.
2. The Role of Rendering in Modern Film Production.
3. Vector and Raster Graphics Differences.
4. The Impact of Virtual Reality on Education and Training.
5. The Future of Real-Time Rendering in Interactive Media.

TEXTS FOR RENDERING

Text 1. Computer Science

Computing is part of everything we do. Computing drives innovation in engineering, business, entertainment, education, and the sciences − and it provides solutions to complex, challenging problems of all kinds.

Computer science is the study of computers and computational systems. It is a broad field which includes everything from the algorithms that make up software to how software interacts with hardware to how well software is developed and designed. Computer scientists use various mathematical algorithms, coding procedures, and their expert programming skills to study computer processes and develop new software and systems.

Computer science focuses on the development and testing of software and software systems. It involves working with mathematical models, data analysis and security, algorithms, and computational theory. Computer scientists define the computational principles that are the basis of all software.

Information technology (IT) focuses on the development, implementation, support, and management of computers and information systems. IT involves working both with hardware (CPUs, RAM, hard disks) and software (operating

systems, web browsers, mobile applications). IT professionals make sure that computers, networks, and systems work well for all users.

Computing jobs are among the highest paid today, and computer science professionals report high job satisfaction. Most computer scientists hold at least a bachelor's degree in computer science or a related field.

Principal areas of study and careers within computer science include artificial intelligence, computer systems and networks, security, database systems, human-computer interaction, vision and graphics, numerical analysis, programming languages, software engineering, bioinformatics, and theory of computing.

Learning how to program and code is only one element of the field. Computer scientists design, develop, and analyze the software and hardware used to solve problems in all kinds of business, industry, scientific, and social contexts. And because computers solve problems to serve and enrich people, there is a significant human component to computer science. Due to the range and complexity of the projects they take on, computer scientists depend on both technical knowledge and essential skills like communication, problem solving, critical thinking, and creativity. Not all computer science professionals will need every skill listed – because of the broad nature of the field, they have the opportunity to focus on the skills pertinent to their unique interests and chosen focus area (which may change over time).

What does the future of computer science look like? There's no end in sight! Computing has permeated our lives and its influence just keeps growing – from the apps on our phones to any device with a computer processor, computing is here to stay.

Future opportunities in computing are without boundaries. Across virtually every industry, computer science professionals are engaged in programming, systems analysis, database administration, network architecture, software development, research, and more.

Text 2. Chomsky Hierarchy in Theory of Computation

The Chomsky Hierarchy in Theory of Computation (TOC), named after the renowned linguist and cognitive scientist Noam Chomsky, is a fundamental concept in the field of theoretical computer science. It classifies formal grammars and languages into four distinct levels, each with increasing expressive power. This hierarchy provides valuable insights into the capabilities and limitations of computational models, shedding light on the nature of computation itself.

Formal grammars serve as a foundation for describing the structure of languages in a precise and systematic manner. They consist of a set of rules that define how strings of symbols can be generated. In this context, language refers to a set of strings composed from a given alphabet, which is a finite set of symbols. The Chomsky Hierarchy in TOC is composed of four levels, organized in increasing order of complexity and generative power.

At the lowest level of the hierarchy, we have regular languages. These languages can be described using regular expressions or recognized by finite automata. Regular languages have simple rules for pattern recognition and are suited for tasks like lexical analysis in programming languages.

Context-free languages are one level higher in the hierarchy. They can be described using context-free grammars. These grammars consist of rules that define how non-terminal symbols can be replaced by sequences of terminal and non-terminal symbols. Context-free languages are commonly used to define the syntax of programming languages and are recognized by pushdown automata.

Context-sensitive languages extend the expressive power of context-free languages by allowing rules that take into account the context in which symbols appear. This level of the hierarchy is recognized by linear-bounded automata, which have limited tape space for computation. Context-sensitive languages capture certain linguistic constructs that context-free grammars cannot.

At the highest level of the Chomsky Hierarchy in TOC, we have recursively enumerable languages. These languages can be generated by unrestricted grammars or recognized by Turing machines. Recursively enumerable languages encompass all possible languages that can be computed, making them the most powerful class in the hierarchy. However, this power comes at the cost of undecidability and uncomputability for many problems.

The Chomsky Hierarchy in TOC has profound implications for the theory of computation and linguistics. First of all, as we move up the hierarchy, the complexity of recognizing languages increases. Regular languages can be recognized in linear time, context-free languages in polynomial time, and context-sensitive languages in non-deterministic polynomial time. Recursively enumerable languages can take an infinite amount of time for recognition, depending on the specific Turing machine configuration.

The hierarchy allows us to classify languages based on their generative power. This classification is not only relevant for computer science but also

for linguistics. Natural languages, such as English or Spanish, are generally more expressive than the formal languages described by regular or context-free grammars.

The Chomsky Hierarchy in TOC establishes the limits of what can be computed within different computational models. For example, certain problems are inherently beyond the scope of context-free grammars or even Turing machines. This understanding has direct applications in algorithm design, complexity analysis, and the study of undecidability.

The Chomsky Hierarchy in TOC stands as a fundamental framework for understanding the capabilities and limitations of computational models. Its division of formal grammars and languages into four distinct levels provides a structured perspective on the complexity of language recognition and generation. From regular expressions used in text search to the complexity of programming language syntax, the Chomsky Hierarchy in TOC's influence is pervasive and enlightening, shaping our understanding of computation's boundaries and potentials.

Text 3. Visual Programming

Visual programming is an approach to software development where, instead of writing code in a text-based language, you use a graphical interface to create and connect visual representations of concepts and functions. These visual elements can include icons, symbols, and diagrams that logically represent the flow of data and the control structure of the program.

This form of programming is especially beneficial for visual learners or educational purposes where the understanding of programming concepts is still being developed. It can also accelerate development by providing a more intuitive way for programmers to express their ideas and logic without the syntactical overhead of traditional coding.

During the 1960s to 1970s decade, people were already tinkering with graphical representations of logic through flowchart-based systems like Graphic Input Language (GraIL) and Pygmalion. These early visual programming languages were used to help people visualize their code and simplify the programming process by allowing users to create programs without having to deal with text-based code.

The concept continued until the 1990s when visual programming began to take off. It was the era when computers had upgraded into decent graphical

interfaces. Apple released a visual abstraction tool called Hypercard in 1987, and Microsoft released Visual Basic in 1991. Since then, visual programming has become more popular, with visual programming languages like Scratch and Flowgorithm being used in schools to teach children the basics of programming and coding.

Visual programming has carved out a valuable niche in the software industry, appealing to a diverse range of users – from beginners and educators to experienced engineers looking to streamline complex systems. In commercial settings, visual programming environments enable rapid prototyping, allowing developers to quickly create, test, and iterate on new ideas or features without needing extensive code. Tools such as visual IDEs and node-based editors are increasingly used for developing games, interactive content, and applications where user experience design is crucial.

The impact of visual programming is not limited to development speed; it also opens the door to collaboration between professionals who may not be proficient in traditional coding languages yet have a deep understanding of the logic and processes that govern software development. This democratizes software creation, empowering project managers, designers, and subject matter experts to contribute directly to product development. As technology continues to evolve, the role of visual programming in simplifying and expediting the software development life cycle remains an exciting prospect.

Visual programming eliminates many barriers that once made computer programming seem inaccessible and formidable, especially for new learners and non-technical individuals. However, it's important to note that it also has its limitations. With that said, here are some advantages and disadvantages of visual programming.

First of all, visual programming is easier to learn than traditional coding because it utilizes graphical symbols and visual elements, making it more accessible to beginners. Debugging visual programs is simpler compared to text-based programming, which can save time and effort during the development process. Its efficiency and speed make it a favorable choice for many developers, allowing for quicker project completion. The use of visual elements aids in easier retention of instructions, enhancing the learning process for users. Additionally, its visual nature enables the creation of complex visual output, such as graphs and visualizations, adding versatility to its capabilities.

As for disadvantages, accessing and modifying the code of visual programming languages can be challenging due to the graphical nature of the interface, making it less intuitive for direct code manipulation. While visual programming languages offer simplicity, they may lack the flexibility and robustness of traditional programming languages, limiting the range of potential applications. Debugging visual programs can pose challenges, as the visual representation may obscure the underlying logic, making it difficult to trace errors and identify issues. Adoption of visual programming languages often necessitates purchasing specialized software, which may not align with the needs or preferences of all users, potentially limiting accessibility and adoption.

In the modern digital landscape, visual programming is a formidable asset, catering to seasoned developers and newcomers alike. By introducing an intuitive, visually-driven approach to programming, it tears down barriers to entry and democratizes the art of software development.

Whether the goal is to educate the youth on the principles of logic and computation, streamline data management in professional settings, or experiment with personal projects, visual programming is a versatile tool that adapts to diverse needs and aspirations. As the field continues to evolve, it promises to enhance creativity and efficiency, reaffirming the potential of visual programming to revolutionize how we interact with technology and each other in the connected world.

Text 4. Android Operating System

The Android operating system is a mobile operating system that was developed by Google (GOOGL) to be primarily used for touchscreen devices, cell phones, and tablets. Its design lets users manipulate the mobile devices intuitively, with finger movements that mirror common motions, such as pinching, swiping, and tapping. Google also employs Android software in televisions, cars, and wristwatches – each of which is fitted with a unique user interface.

The Android operating system was first developed by Android Inc., a software company located in Silicon Valley before Google acquired it in 2005. Investors and electronics industry analysts have questioned Google's true intentions for entering the mobile market space since that acquisition. But in any case, soon thereafter, Google announced the impending rollout of its first commercially available Android-powered device in 2007, although that product actually hit the marketplace in 2008.

Since then, software and application developers have been able to use Android technology to develop mobile apps, which are sold through app stores, such as Google Play. And because it is developed as a Google product, Android users are given the opportunity to link their mobile devices to other Google products, such as cloud storage, email platforms, and video services.

The Android source code is released in an open-source format to help advance open standards across mobile devices. However, despite being released as "open," Android is still packaged with proprietary software when sold on handset devices.

The emergence of Android created a new rivalry between smartphone manufacturers, with Apple (AAPL) serving as Google's chief competitor. To some, this competitive dynamic mirrors that of the "cola wars" between Coca-Cola (KO) and Pepsi (PEP) over the past 40 years, where no clear winner or loser has emerged. Android was the most popular operating system on mobile devices as of Q1 2022, with 23.7 % of the global market share while Apple's iOS was in second place with 18 %, according to International Data Corporation.

The increased popularity of the system has also led to a number of patent-related lawsuits, including a lawsuit brought forth by Oracle (ORCL). In 2010, the company alleged that Google unlawfully used Java APIs to develop its Android software. In April 2021, the case was decided with the Supreme Court ruling 6–2 in Google's favor.

While Android offers users a viable alternative to other mobile operating systems, several limitations still remain. On the developer side, coding complex user experiences and interfaces is a difficult task that demands a greater reliance on Java than Objective-C. For users, the apps on the Android Market tend to have lower standards than comparable app stores.

In other words, the apps have lower security profiles and make users more susceptible to data breaches. Meanwhile, Android's lack of a voice-controlled assistant and its heavy dependence on advertising can repel some users.

Text 5. Linus Torvalds

Linus Torvalds (born December 28, 1969, Helsinki, Finland) is a Finnish computer scientist who was the principal force behind the development of the Linux operating system.

At age 10 Torvalds began to dabble in computer programming on his grandfather's Commodore VIC-20. In 1991 while a computer science student at

the University of Helsinki (M.S., 1996), he purchased his first personal computer (PC). He was not satisfied, however, with the computer's operating system (OS). His PC used MS-DOS (the disk operating system from Microsoft), but Torvalds preferred the UNIX operating system he had used on the university's computers. Consequently, he decided to create his own PC-based version of UNIX.

Months of determined programming work yielded the beginnings of an operating system known as Linux. In 1991 Torvalds posted a message on the Internet to alert other PC users to his new system, made the software available as a free download, and, as was a common practice among software developers at the time, released the source code, which meant that anyone with knowledge of computer programming could modify Linux to suit their own purposes. Because of their access to the source code, many programmers helped Torvalds retool and refine the software, and by 1994 Linux kernel (original code) version 1.0 had been released.

Although Torvalds purposely made Linux open source, he would send abusive emails to those who made changes he disagreed with. Megan Squire, a computer science professor at Elon University, stated in a 2018 interview in The New Yorker that the emails may have contributed to the male-dominated Linux development community, as women may have found receiving the insulting messages to be more isolating than men may have found them. In 2018 Torvalds announced in a post to a Linux mailing list that he would step down as lead developer at Linux "to get help on how to behave differently." He admitted that he had never been a "people person."

Operating Linux required a certain amount of technical acumen; it was not as easy to use as more popular operating systems, such as Windows, Apple's Mac OS, or IBM OS/2. However, Linux evolved into a remarkably reliable, efficient system that rarely crashed. Linux became popular in the late 1990s when competitors of Microsoft began taking the upstart OS seriously. Netscape Communications, Corel, Oracle, Intel, and other companies announced plans to support Linux as an inexpensive alternative to Windows. In addition to Linux being free, its source code can be viewed and freely modified by anyone, unlike in a proprietary OS. This means that different language versions can be developed and deployed in markets that would be too small for the traditional companies. Also, many organizations and governments have expressed security reservations about using any kind of computer software containing code that cannot be viewed.

Combined with Apache, an open-source Web server, Linux accounts for most of the servers used on the Internet. Because it is open source, and thus modifiable for different uses, Linux is popular for systems as diverse as cell phones and supercomputers. Android, Google's operating system for mobile devices, has at its core a modified Linux kernel, and Chrome OS, Google's operating system, which uses the Chrome browser, is also Linux-based. The addition of user-friendly desktop environments, office suites, browsers, and even games helped to increase Linux's popularity and make it more suitable for home and office desktops.

In 1997 Torvalds took a position with Transmeta, a microprocessor manufacturer, and relocated to California. Six years later he left the company to work as a project coordinator under the auspices of the Open Source Development Labs (OSDL), a consortium created by such high-tech companies as IBM, Intel, and Siemens to promote Linux development. In 2007 OSDL merged with the Free Standards Group to form the Linux Foundation. In 2012 Torvalds was awarded the Millennium Technology Prize by the foundation Technology Academy Finland.

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CONTENTS