Lecture 6

New Emerging Technologies of E-Commerce

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Group presentation

All the presentations should be submitted before week 17 (27 Dec.) via email: qlgao@szu.edu.cn

Format: E-commerce group presentation_group ID.

- **Choose a real case of E-commerce for analysis**
- **Design a case of E-commerce**

Quiz

Which of the following IPv4 addresses is incorrect?

1. 196.118.1.0
2. 217.320.109.6
3. 255.255.255.0
4. 176.16.254.1

At which TCP/IP layer does the IP protocol reside?

1. Application layer
2. Transport layer
3. Internet layer
4. Link layer

Which of the following protocols is used for web browsing?

1. SMTP
2. HTML
3. HTTP(S)
4. TCP

Which of the following technologies is/are used on the server side?

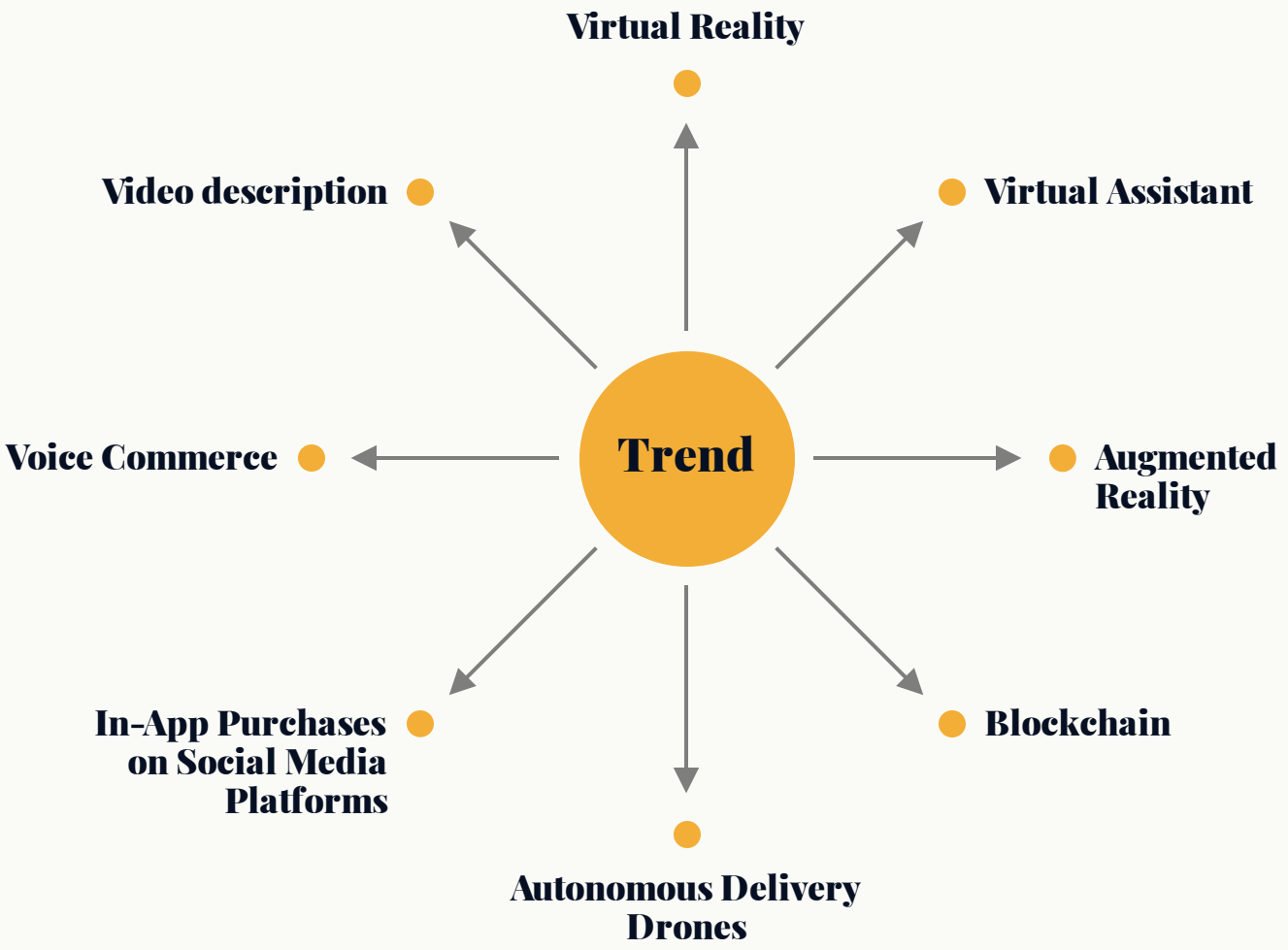
1. JSP
2. CSS
3. XML
4. PHP

The Future of E-Commerce

Q+A

What technologies are mentioned in the video?

Emerging technologies



Learning objects

Define the new technologies including Internet of Things (IOT), cloud computing, big data, etc.

Describe how cloud computing is becoming a new profit source of Amazon.

Explain how Netflix leverages big data in its operation.

Section 1

Internet of Things

物联网

Internet of Things (物联网)

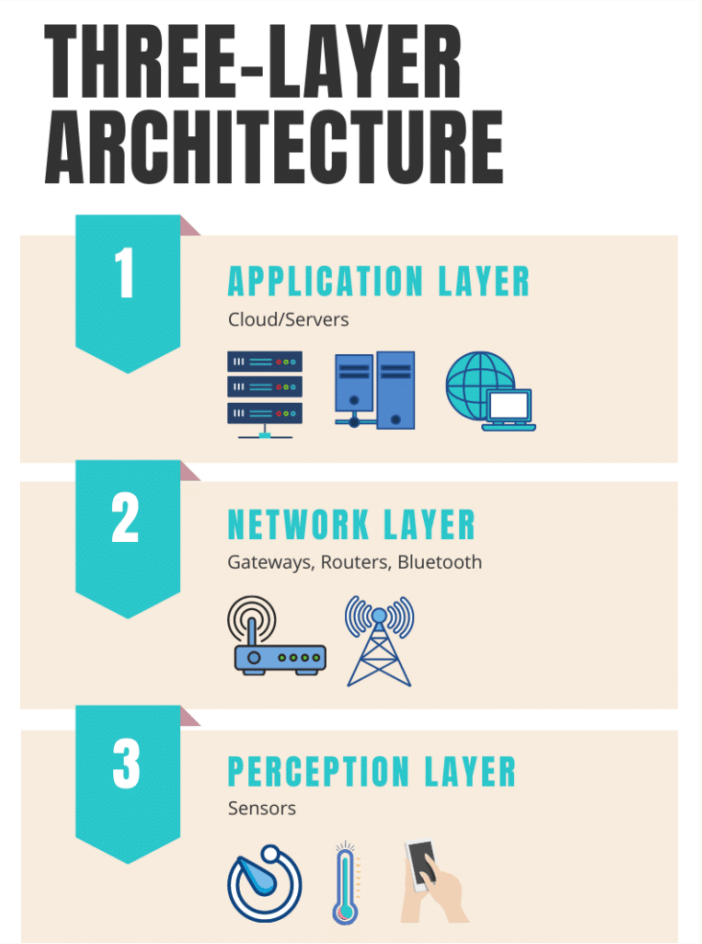
Internet of Things (IoT)

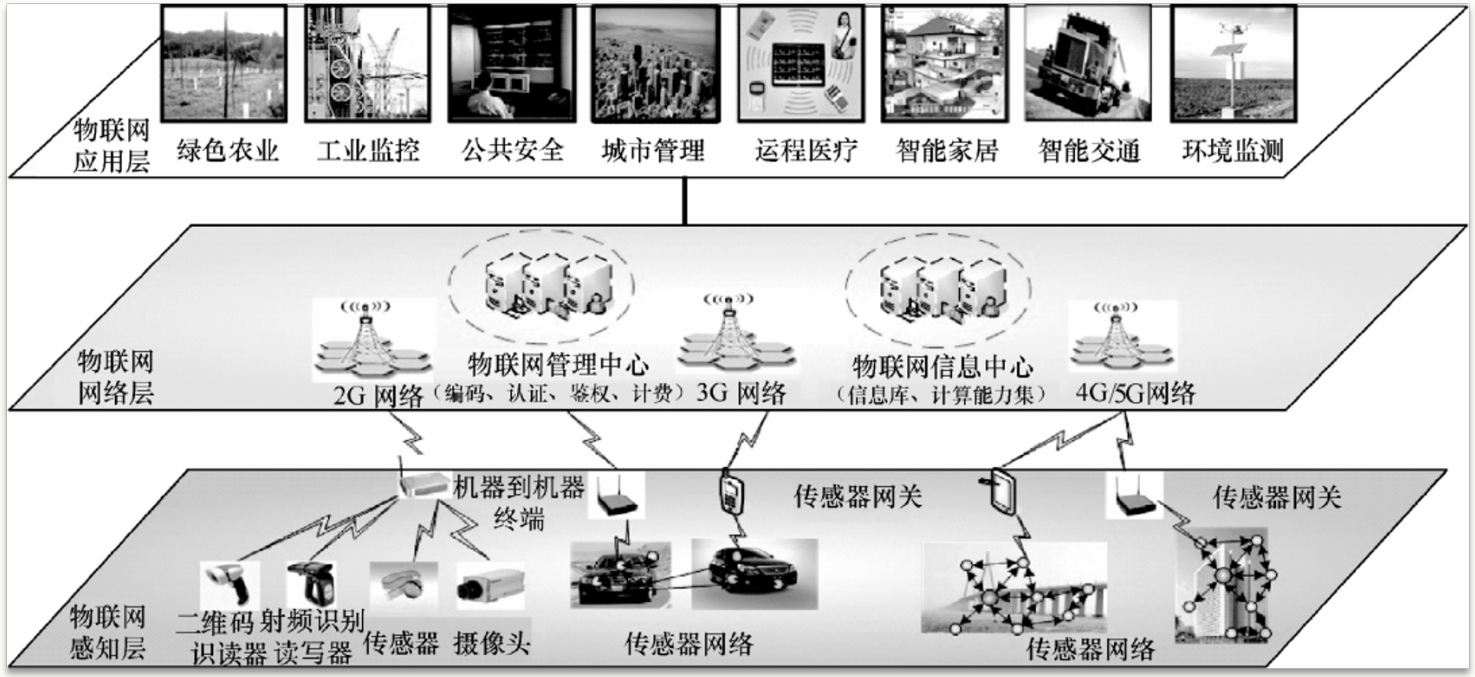
IoT refers to a network of interconnected physical devices, vehicles, appliances, and other objects that can collect and exchange data. It enables the integration of the digital and physical worlds, allowing for smart and automated systems.

IoT has applications in areas like smart homes, industrial automation, agriculture, and healthcare.

Could you give examples of IoT in everyday Life?

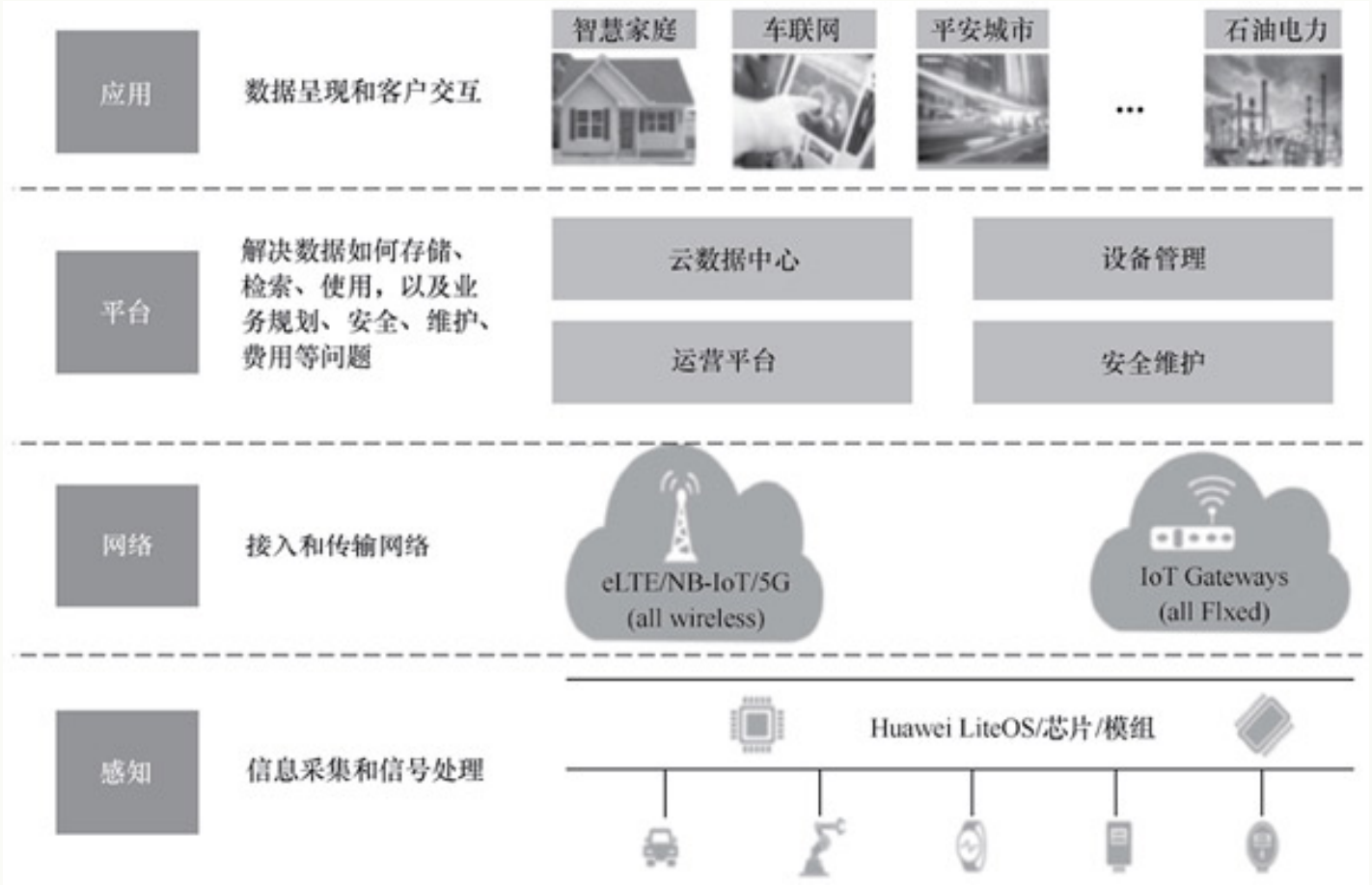
IOT Architecture





IOT Architecture

管理层



IOT Architecture

服务	提供服务	入库、存储、拣选、分拣、运输、配送
分析	对“物”采集的数据进行分析和处理、优化设备、准备服务	仓网规划和库存布局、分拣布局、点网布局等
管理平台	设备的部署、激活、注销、计费及通信管理	智能排产、智能分单、智能派单
物与物连接	通信基础设施和通信设备	基于无线网络的通信平台
物	物联网设备、嵌入式系统	货品、叉车、运输车、无人机等

物联网生态

京东物流物联网的分层机构

Internet of Things (物联网)

The characteristics of IOT

1. **Networking (网络化)**: IoT is based on the concept of interconnected devices and systems that communicate with each other over a network. This network can be a local network or the internet, enabling seamless connectivity and data exchanges
2. **Things Connectivity (物联化):** IoT involves connecting various physical objects, devices, sensors, and machines to the internet or a network. These objects can range from everyday devices like smartphones and wearables to industrial equipment, appliances, vehicles, and infrastructure.
3. **Interoperability (互联化)**: IoT promotes the interoperability of different devices and systems, allowing them to work together and exchange information efficiently. Standardized protocols and interfaces enable seamless integration and communication between diverse IoT devices and platforms.
4. **Automation (自动化):** IoT enables automation by integrating sensors, actuators, and intelligent algorithms. It enables devices and systems to automatically collect data, analyze it, and respond or take action based on predefined rules or machine learning algorithms.
5. **Sensing (感知化):** IoT devices are equipped with sensors that capture and monitor real-world data such as temperature, humidity, motion, light, and more. These sensors enable the collection of real-time information about the physical environment and enable context-aware applications and services.
6. **Intelligence (智能化):** IoT leverages advanced technologies such as artificial intelligence (AI), machine learning (ML), and data analytics to extract meaningful insights from the vast amount of collected data. This intelligence enables devices and systems to make informed decisions, optimize operations, and provide personalized experiences.

Key technologies of IOT

Key technologies

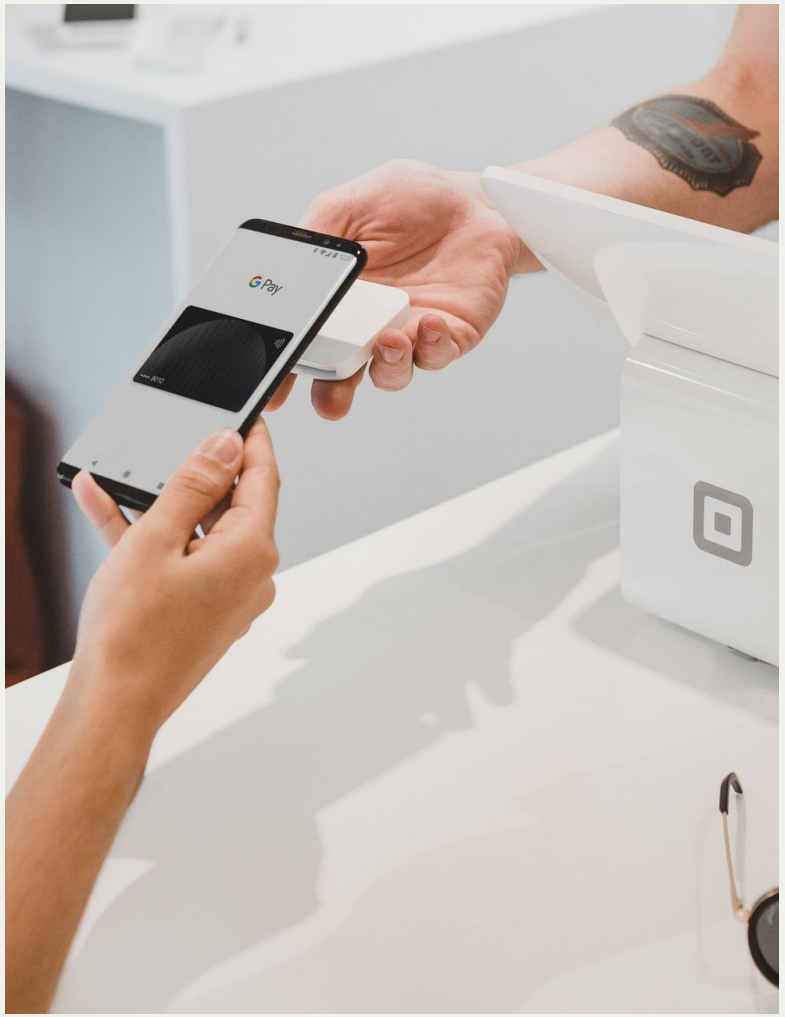
1. **RFID (Radio-Frequency Identification，射频识别技术)** is a technology that uses radio waves to wirelessly identify and track objects or individuals. It involves the use of RFID tags or transponders and RFID readers or scanners.

2. **Sensor (传感器):** Sensor technology refers to the field of developing and utilizing devices that can detect and measure physical or environmental phenomena and convert them into electrical signals. These electrical signals can then be processed, analyzed, and utilized for various purposes.

3. **Network communication technology (网络通讯技术):** refers to the various methods and protocols used to enable communication and data exchange between devices over a network. Sensors can utilize various network communication technologies to transmit data and enable connectivity in the context of IoT and networked systems.

4. **Location-based technology (定位技术):** refers to a range of technologies and methods that utilize location information to provide services, gather data, or enable specific functionalities based on the geographical position of a user or device Global Positioning System (GPS), Wi-Fi Positioning, Cellular Network Positioning, Bluetooth Positioning.

RFID (射频识别技术)



The application of IOT

Smart home

IoT enables the automation and control of various home devices and systems, such as lighting, thermostats, security cameras, appliances, and entertainment systems. Smart home solutions provide convenience, energy efficiency, and improved security.

Industrial automation

IoT is revolutionizing industrial sectors by connecting machines, sensors, and devices to improve efficiency, productivity, and safety. It enables real-time monitoring, predictive maintenance, supply chain optimization, and remote control of industrial processes.

Healthcare

IoT is transforming healthcare with applications such as remote patient monitoring, wearable devices, smart medical devices, and telemedicine. It enables continuous health monitoring, remote consultations, and personalized healthcare services.

Agriculture

IoT is used in precision agriculture to monitor soil conditions, crop growth, and livestock health. It enables smart irrigation, automated pest control, optimized resource management, and remote farm monitoring, leading to increased crop yields and reduced costs.

Environmental Monitoring

IoT sensors are deployed to monitor air quality, water quality, weather conditions, and natural resources. This data helps in environmental conservation, early warning systems for natural disasters, and sustainable management of resources.

Retail and supply Chain

IoT is employed in inventory management, supply chain optimization, and asset tracking in the retail industry. It enables real-time tracking of products, smart shelves, customer behavior analysis, and personalized shopping experiences.

Cloud computing

Cloud computing refers to the delivery of computing resources and services, including servers, storage, databases, networking, software, and analytics, over the Internet. Instead of owning and maintaining physical infrastructure, businesses and individuals can access and utilize these resources on demand from a cloud service provider.

The impact of cloud computing on E-commerce

- Cloud computing enables e-commerce enterprises to rent rather than purchase hardware and software, which helps them to decrease the cost of system building. Particularly, the charging mode of "pay-as-service" is very flexible, which helps an e-commerce company to pay for the resources based on the demand.

The impact of cloud computing on E-commerce

- Cloud computing solves the problem of resources utilization efficiency. For an e-commerce company, it is necessary to invest in the software and hardware to maintain the operation. With the company's growth, the investment will be increased. However, the utilization efficiency of the invested infrastructure is low. The statistics shows that the average utilization efficiency of IT is no more than 10%. Cloud computing enables the busineses to integrate IT resourses (e.g., server) on the far end platform. This mode on the one hand reduces the operation cost of an e-commerce company and prioritizes resources allocation on the other hand.

The impact of cloud computing on E-commerce

- Cloud computing enables the new backend service model for c-commete enterprises, All the IT resources such as hardware, software, data and infrastructure are offered to e-commerce enterprises as service by virtue of the cloud platform. As e-commerce company is allowed to get access to the IT resources just like the voisy services (e.g. electricity) on the cloud platform and pay for them. It does not require the high expenses on devices purchase and each firm is able to choose the appropriate Ir resources through renting. In another word, the emergence of cloud computing brings the new service philosophy and model which enables the lower cost and changes the traditions IT licensing mode. Cloud computing sets the e-commerce enterprises free from the complicated technical architecture planning, designing and maintaining and enables them is focus on the core businesses.

The impact of cloud computing on E-commerce

- Cloud computing is influencing e-commerce business strategies. Since the emergence of cloud computing, some e-commerce firms like Amazon, Google have expanded their business to cloud computing and involved cloud computing in their long-term strategies.

The impact of cloud computing on E-commerce

- Cloud computing is influencing the structure of the e-commerce industrial chain. Traditionally, the e-commerce industry chain is composed of the hardware supplier, software developer, Internet service provider, system integrating provider, service supplier, e-commerce enterprise, and customer. Each member of the industry chain fulfills its own responsibilities. When cloud computing is migrated into the e-commerce industry, cloud service providers can supply almost all the necessary products and services to an e-commerce website. As a result, the structure of the e-commerce industry chain will be changed.

Cloud computing

Deployment models

Public cloud (公有云): A public cloud provides services to all users and is typically accessible via the internet. Examples of public cloud providers include Alibaba Cloud, Tencent Cloud, Kingsoft Cloud, and Baidu Cloud. It allows users to access and share fundamental computing infrastructure, including hardware, storage, and bandwidth resources.

Private cloud (私有云): A private cloud is constructed for the exclusive use of a specific user or organization, allowing effective control over data, security, and service quality. Private clouds can be deployed either within an enterprise's data center behind a firewall or within a secure hosted environment. Private clouds ensure the security of user data, and some businesses have already begun building their own private clouds.

Hybrid/Multi-cloud (混合云): Hybrid cloud is a combination of both public and private cloud models. Enterprises, while opting for public cloud services, also place some of their corporate information on private clouds due to security and control considerations. As a result, most businesses utilize a hybrid cloud model.

Cloud computing

Application

Cloud education (云教育): Cloud education, also known as cloud-based education or online education, refers to the use of cloud computing technologies and internet-based platforms to deliver educational content and services. It involves the use of the internet to provide access to educational resources, courses, and tools, allowing students to learn remotely from anywhere with an internet connection. Cloud education has become increasingly popular in recent years due to its flexibility, accessibility, and scalability. It has gained prominence, especially with the growth of Massive Open Online Courses (MOOCs) and the increasing demand for remote and online learning options.

Cloud healthcare (云医疗)：Cloud healthcare, also known as cloud-based healthcare or healthcare cloud computing, refers to the use of cloud computing technologies and services in the healthcare industry to store, manage, analyze, and share health-related data and applications. This approach leverages cloud infrastructure to improve the efficiency, accessibility, and scalability of healthcare services while maintaining the security and privacy of sensitive patient information.

Cloud e-Government (云政务)： Government Cloud refers to the use of cloud computing technology to coordinate the utilization of existing facilities, computing, storage, network, security, application support, information resources, etc. It leverages the characteristics of cloud computing, including virtualization, high reliability, high versatility, and high scalability, as well as rapid, on-demand, and elastic services, to provide the government sector with a comprehensive service platform for infrastructure, support software, application systems, information resources, operational support, and information security.

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Ali Government Cloud

Big data

Large and complex data sets that cannot be easily managed, processed, or analyzed using traditional data processing tools. It is characterized by the "4Vs": Volume, Velocity, Variety, and Veracity.

Volume

This refers to the sheer size of the data. Big data involves massive volumes of data that can range from terabytes to exabytes or even more. Traditional databases and data processing tools struggle to handle such vast amounts of information.

Velocity

Velocity represents the speed at which data is generated, collected, and processed. In the age of the internet, social media, IoT (Internet of Things), and other technologies, data can be generated and updated in real-time or near real-time. Big data solutions need to be able to process data streams at high speeds.

Variety

Variety refers to the diversity of data types and sources. Big data encompasses structured data (like relational databases), semi-structured data (like JSON or XML files), and unstructured data (like text, images, videos, and social media posts). Managing and analyzing data in various formats is a significant challenge in big data.

Veracity

Veracity relates to the quality and trustworthiness of the data. Big data often contains noisy, incomplete, or inaccurate information. Ensuring data quality and reliability is crucial for making informed decisions based on big data.

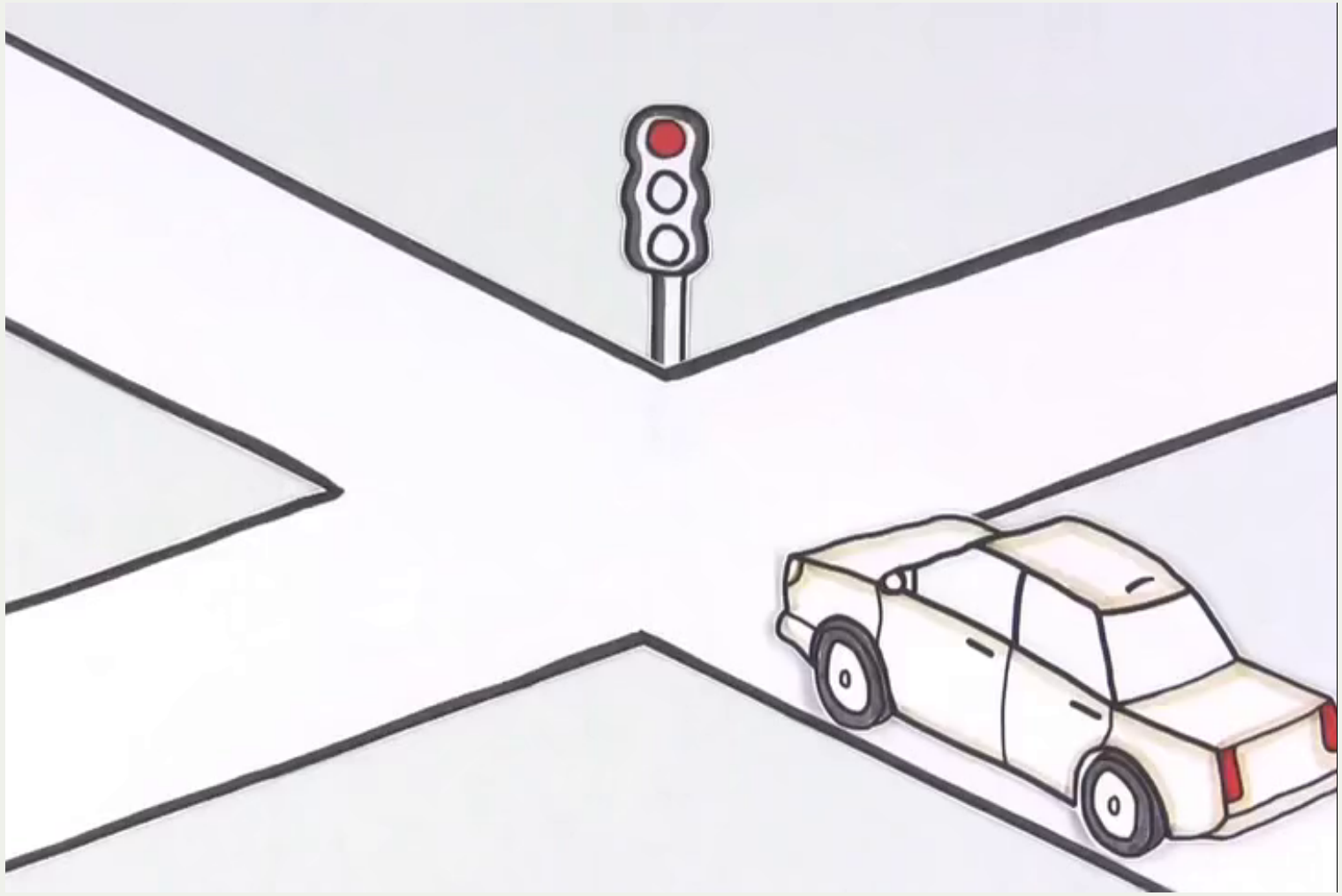
Big data-5V

Value

Value refers to the ultimate goal of big data analysis – extracting actionable insights and value from the data. The value can be in the form of improved decision-making, better understanding of customer behavior, cost savings, or other business benefits.

Understanding these 4Vs (or 5Vs) helps organizations develop strategies for collecting, storing, processing, and analyzing big data effectively. It also highlights the need for specialized tools and technologies, such as distributed computing frameworks (e.g., Hadoop), NoSQL databases, and machine learning algorithms, to tackle the challenges posed by big data.

Big data



Big data

Data storage and management

Big data requires specialized storage and management systems designed to handle the volume, velocity, and variety of data. Technologies such as distributed file systems (e.g., Hadoop HDFS) and NoSQL databases (e.g., MongoDB, Cassandra) are commonly used for big data storage.

Data processing and analytics

Big data analytics involves processing and analyzing large datasets to uncover patterns, trends, and insights. Technologies like Apache Spark, Apache Hadoop, and machine learning algorithms are used for distributed processing and advanced analytics on big data.

Data visualization

Big data visualization tools help in presenting complex data in a visually appealing and understandable format. These tools enable users to explore and interpret data patterns, trends, and relationships.

Data-driven decision making

Big data analytics enables organizations to make data-driven decisions by uncovering hidden patterns and insights. It helps in identifying market trends, customer preferences, operational inefficiencies, and other actionable insights for strategic planning and optimization.

Application of Big data

Business and marketing analytics

Healthcare and precious medicine

Financial services

Transportation and logistics

Manufacturing and supply chain management

Smart cities

E-commerce enterprises can improve their business with big data in the following areas

- ## Optimized product portfolio

  The analysis of large amounts of structured customer data allows detailed target group analysis. Based on the results, the portfolio of an online shop can be adapted user-specific. Particularly, large online vendors can scale their offerings with big data better and meet specific customer needs, enabling a future optimization of the product portfolio. So with big data, it is possible to optimize the stock costs.

- ## Optimized prices

  Thanks to big data, data mining and real-time analyzes are possible. An online retailer can dynamically adjust the price of a product. Due to the high transparency of the internet, it is necessary to have competitors always under observation and adjust its own price in order to remain competitive. Big data offers comprehensive market analysis for a dynamic pricing policy.

E-commerce enterprises can improve their business with big data in the following areas

- ## Optimized online store

  Due to the use of big data and fast webserver technologies, it is possible to provide dynamic websites. So different start pages or landing pages can be displayed depending on the region or target group. Furthermore, different preferences regarding the product range for men and women can be displayed.

- ## Optimized online advertising

  Due to big data, online retailers' advertisements can be targeted at their customers precisely. With look-a-like modeling, it is possible to reach new customers. Real-time advertising is cheaper and more effective than advertising in the past. Therefore with big data online retailers can reduce advertising costs and increase their media reach.

E-commerce enterprises can improve their business with big data in the following areas

- **Optimized customer service**

  If a customer is dissatisfied with a product and complained by phone or e-mail. It will be a big advantage if a service employee can use the complete customer history enriched by some social media information about the customer during the telephone call. This scenario is possible with big data. The variety of valuable background information offers a customer support team possibilities to improve a customer relation significantly.

AI

Section 4


VIEWS
ARTIFICIALLY
INTELLIGENT
WHAT IS
ARTIFICIAL
INTELLIGENCE?

Artificial Intelligence

AI, or Artificial Intelligence, refers to the development of intelligent machines and systems that can perform tasks that typically require human intelligence. AI involves the creation of algorithms and models that enable computers and machines to mimic human cognitive functions, such as learning, reasoning, problem-solving, perception, and decision-making.

Narrow AI: Narrow AI, also known as Weak AI, refers to AI systems that are designed to perform specific tasks or solve specific problems. Examples of narrow AI include virtual personal assistants (e.g., Siri, Alexa), recommendation systems (e.g., Netflix recommendations), fraud detection algorithms, and autonomous vehicles. Narrow AI excels in specific domains but lacks human-level intelligence outside of those domains.

General AI: General AI, also known as Strong AI or Artificial General Intelligence (AGI), represents AI systems that possess human-like intelligence and can perform any intellectual task that a human being can do. General AI is capable of understanding, learning, and applying knowledge across multiple domains. However, achieving true General AI that matches or surpasses human intelligence is still a subject of ongoing research and development.

Artificial Intelligence technologies

1. Machine Learning: Machine learning involves training algorithms to learn from data and make predictions or decisions. It encompasses techniques such as supervised learning, unsupervised learning, and reinforcement learning.

2. Deep Learning: Deep learning is a subset of machine learning that uses artificial neural networks with multiple layers to analyze and learn from complex patterns in large datasets. It has been successful in various applications, including image and speech recognition.

3. Natural Language Processing (NLP): NLP focuses on enabling computers to understand, interpret, and generate human language. It encompasses tasks such as language translation, sentiment analysis, text summarization, and chatbots.

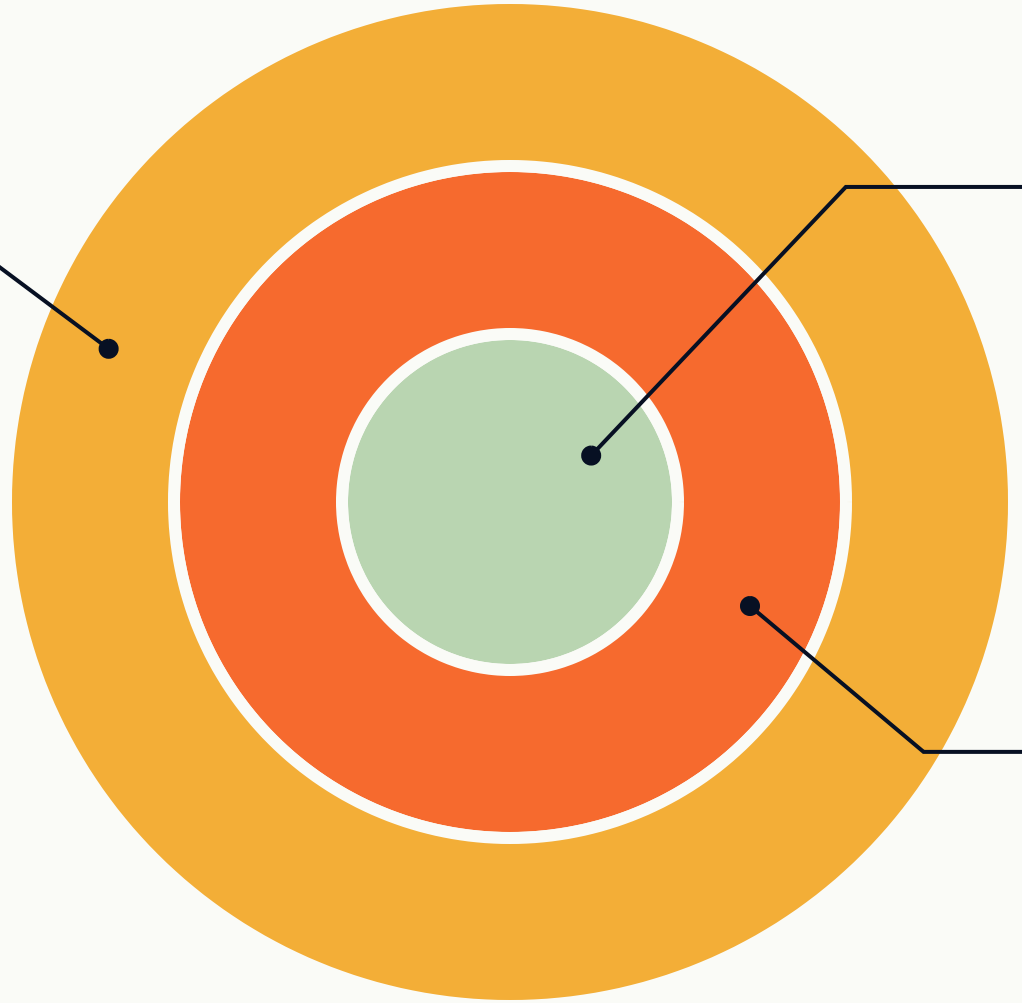
4. Computer Vision: Computer vision involves enabling computers to interpret and understand visual information from images or videos. It has applications in object recognition, image classification, facial recognition, and autonomous vehicles.

5. Robotics: AI is applied in robotics to develop intelligent machines capable of perceiving their environment, making decisions, and performing physical tasks. Robotics combines AI with sensors, actuators, and control systems to create autonomous or semi-autonomous robots.

AI, Machine learning, Deep learning

Artificial Intelligence

Ability of a machine to imitate intelligent human behaviour.



Deep learning

Application of Machine Learning that uses complex algorithms and deep neural nets to train a model.

Machine learning

Application of AI that allows a system to automatically learn and improve from experience

Artificial Intelligence in E-Commerce

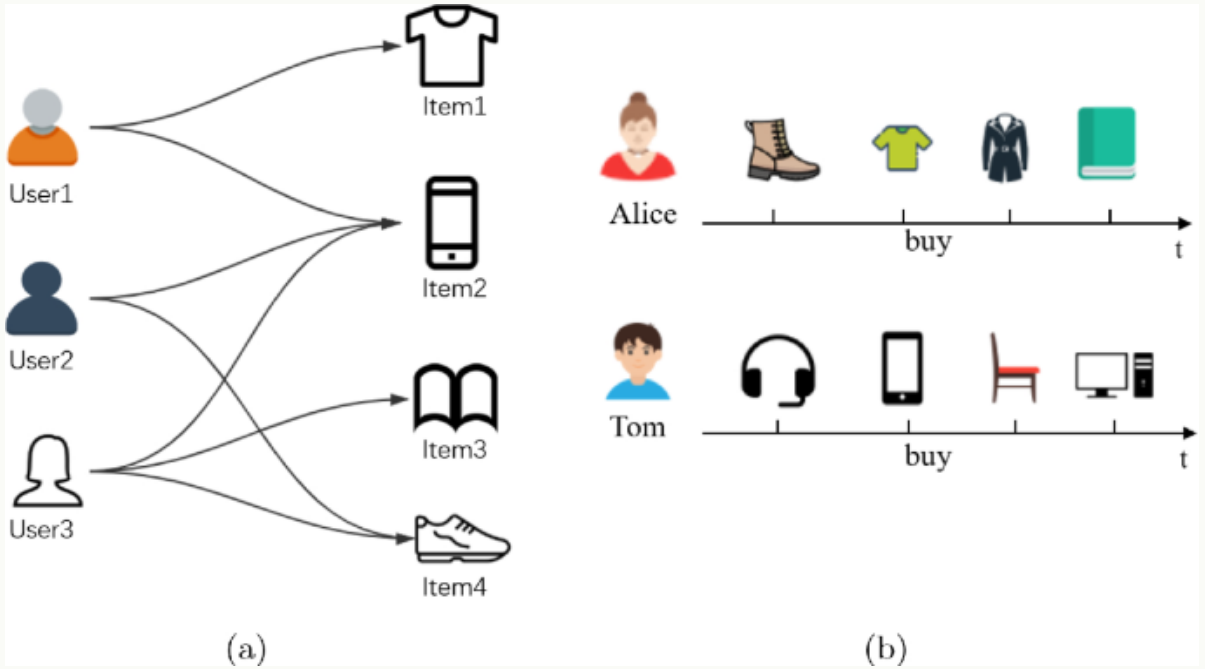
The research goal of recommendation systems is to match users with items based on users' interaction history, predicting new transaction records that match the users' interests.

Items: Items are the objects recommended in a recommendation system. In the context of e-commerce, this specifically refers to the products on an e-commerce website. The characterization of a product depends on its attributes, such as category, name, image, and so on. The way different items are characterized can have varying impacts in different contexts. A successful recommendation algorithm needs to be able to accurately and effectively describe its items.

Users： Users are the focus of recommendation systems, and the fundamental task of a recommendation system is to provide customized items for different users. Real-world users may have diverse and ever-changing emotions and preferences, and the differences in preferences among different users can be significant. In recommendation systems, the characterization of users can be based on their past behavior, such as representing a user by all the items they have purchased. Additionally, it can also be based on attributes, such as using demographic information to provide a user's age, gender, occupation, education, and more.

Artificial Intelligence in E-Commerce

Interaction records: The data that can be observed and utilized in recommendation tasks are interaction records, which encompass various types of actions occurring between users and items. Generally, these actions can be categorized as "explicit feedback" and "implicit feedback." "Explicit feedback" typically refers to the explicit attitudes expressed by users toward items, such as when a user makes a purchase, provides reviews, or gives ratings to products. On the other hand, "implicit feedback" usually doesn't directly reflect user preferences and can include actions like clicking, browsing, bookmarking, or the duration of item viewing. In comparison to "explicit feedback," "implicit feedback" is often closer to real-world evaluation metrics, such as whether a user buys a particular item or not.



Yin, C., Wang, S., Du, J., Zhang, M. (2020). Recursive RNN Based Shift Representation Learning for Dynamic User-Item Interaction Prediction. In: Yang, X., Wang, CD., Islam, M.S., Zhang, Z. (eds) Advanced Data Mining and Applications. ADMA 2020. Lecture Notes in Computer Science, vol 12447. Springer, Cham. https://doi.org/10.1007/978-3-030-65390-3_30

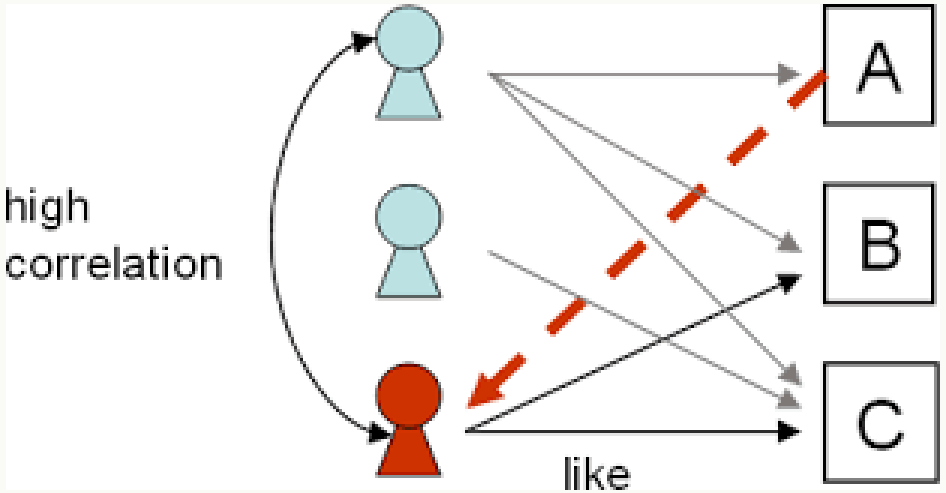
Artificial Intelligence in E-Commerce

User-Based Collaborative Filtering

"User-Based Collaborative Filtering" is a recommendation system algorithm that generates personalized recommendations by leveraging the similarity between users. This approach is based on the following principles:

- Identify groups of users with similar interests or behavior patterns.
- For a target user, find items that are liked by these similar users.
- Recommend these items to the target user, assuming that they will also like these items.

User-Based Collaborative Filtering typically requires a user-item interaction matrix, which records the historical interactions between users and items, such as purchases, ratings, or clicks. By calculating the similarity between users (often using methods like cosine similarity or Pearson correlation), the algorithm can find other users who are similar to the target user and generate recommendations based on the actions of these similar users.The advantage of this approach is that it can provide personalized recommendations. However, it also faces challenges such as data sparsity and the cold start problem (how to generate recommendations for new users or items). Therefore, in practical applications, it is often combined with other recommendation algorithms to improve the performance and robustness of the recommendation system.



Picture source: Kalz, M., Drachsler, H., Van Bruggen, J., Hummel, H., & Koper, R. (2008). Wayfinding services for open educational practices. International Journal of Emerging Technologies in Learning (iJET), 3(2), 24-28.

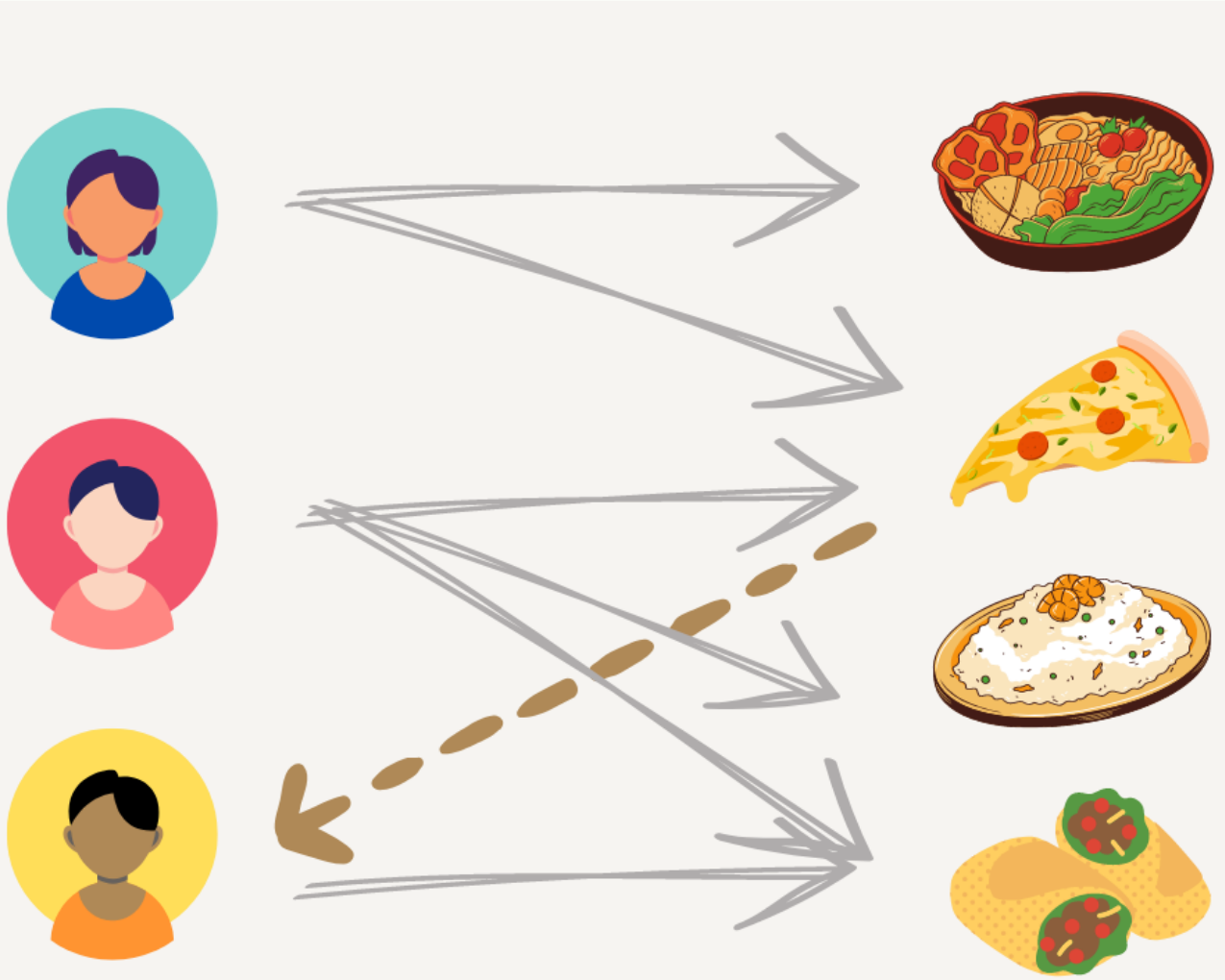
Artificial Intelligence in E-Commerce

Item-Based Collaborative Filtering

"Item-Based Collaborative Filtering" is a recommendation system algorithm that generates personalized recommendations based on the similarity between items. Here's how this method works:

- Calculate the similarity between items, typically using methods like cosine similarity or Pearson correlation.
- For items that the target user has already interacted with, find other items that are similar to these interacted items.
- Recommend these similar items to the target user, assuming that the target user will likely be interested in items similar to those they have interacted with.

Item-Based Collaborative Filtering differs from User-Based Collaborative Filtering in that it focuses on item-item similarity rather than user-user similarity. Typically, a user-item interaction matrix is required to record the interaction history between users and items in order to calculate item similarities. The advantage of this approach is that it performs relatively well in handling cold start problems (new users or new items) and often provides high-quality recommendations. However, Item-Based Collaborative Filtering also has some challenges, such as the need to compute item similarity matrices, which can be computationally intensive when dealing with a large number of items. Therefore, in practical applications, a combination of user-based, item-based, or hybrid methods is often used to achieve better recommendation performance depending on the specific use case.



Picture source: https://darshankanade.medium.com/build-a-collaborative-filtering-and-graph-based-movie-recommendation-system-using-streamlit-bda70a457789

Artificial Intelligence

Application

1. Healthcare
2. Finance
3. Transportation
4. Customer service
5. Retail
6. Manufacturing
7. Education
8. ……

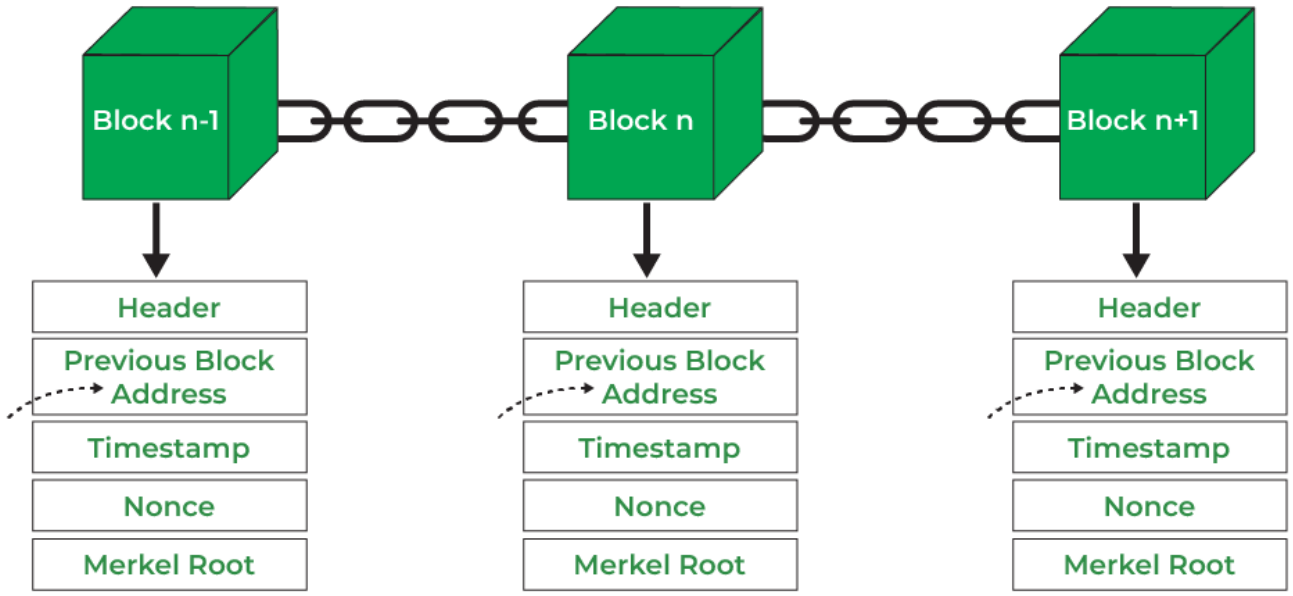
Section 5

Blockchain

区块链

Blockchain

Blockchain is a decentralized and distributed digital ledger technology that records transactions across multiple computers in a way that ensures the security, transparency, and immutability of the data. It was originally designed to support cryptocurrencies like Bitcoin but has since found applications in various industries beyond finance.



Blockchain

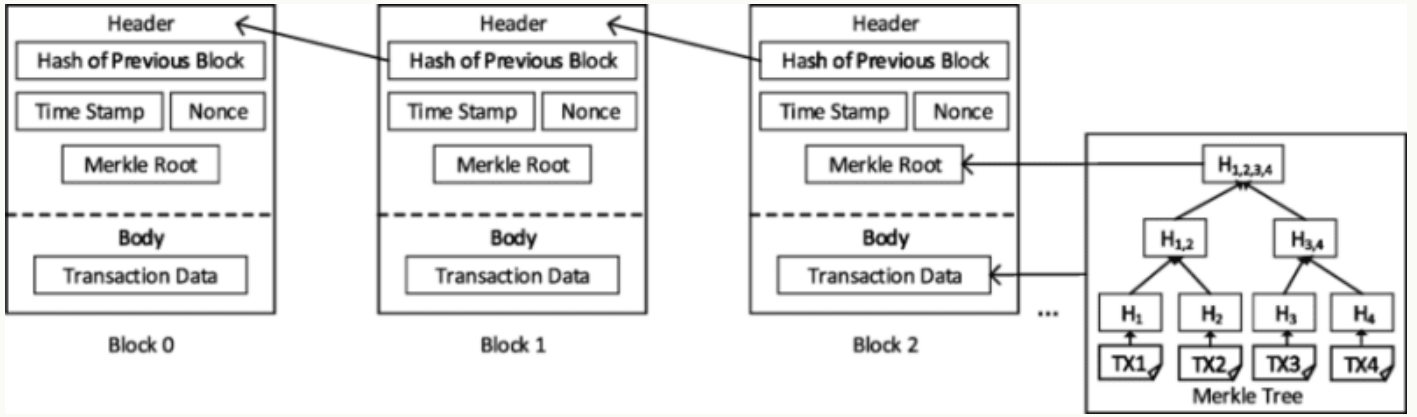
Header: It is used to identify the particular block in the entire blockchain. It handles all blocks in the blockchain. A block header is hashed periodically by miners by changing the nonce value as part of normal mining activity, also three sets of block metadata are contained in the block header.

Previous Block Address/ Hash: It is used to connect the $i+1^{th}$ block to the i^{th} block using the hash. In short, it is a reference to the hash of the previous (parent) block in the chain.

Timestamp: It is a system verify the data into the block and assigns a time or date of creation for digital documents. The timestamp is a string of characters that uniquely identifies the document or event and indicates when it was created.

Nonce: A nonce number which uses only once. It is a central part of the proof of work in the block. It is compared to the live target if it is smaller or equal to the current target. People who mine, test, and eliminate many Nonce per second until they find that Valuable Nonce is valid.

Merkel Root: It is a type of data structure frame of different blocks of data. A Merkle Tree stores all the transactions in a block by producing a digital fingerprint of the entire transaction. It allows the users to verify whether a transaction can be included in a block or not.



Key characteristics and concepts associated with blockchain

- **Decentralization**

  Unlike traditional centralized systems where a single authority (like a bank or government) controls the ledger, blockchain operates on a network of computers (nodes) that work together to validate and record transactions. This decentralization makes it resistant to censorship and tampering.

- **Distributed Ledger**

  Blockchain maintains a distributed ledger, meaning that copies of the entire transaction history are stored on multiple nodes in the network. This redundancy enhances security and ensures data availability.

- **Immutable**

  Once data is recorded on the blockchain, it is extremely difficult to alter or delete. Each block in the chain contains a cryptographic reference to the previous block (a hash), creating a continuous and unbroken chain of blocks. Changing data in one block would require changing it in all subsequent blocks, which is computationally infeasible.

- **Transparency**

  Transactions on a public blockchain are typically visible to all participants in the network. This transparency can help build trust among users.

Application of Blockchain

Cryptocurrencies

Blockchain's original application was Bitcoin, a digital currency that enables peer-to-peer transactions without the need for intermediaries like banks. Many other cryptocurrencies have since been built on blockchain technology.

Supply Chain Management

Blockchain can be used to track and verify the origin and journey of products in the supply chain. This is particularly useful for ensuring the authenticity of products, reducing fraud, and improving traceability. Companies like IBM and Walmart have adopted blockchain for supply chain management.

Smart Contracts

Smart contracts are self-executing contracts with predefined rules and conditions. They automate and enforce agreements between parties, eliminating the need for intermediaries. They have applications in legal, financial, and insurance industries, among others.

Identity Verification

Blockchain can provide a secure and tamper-resistant way to manage digital identities. This can be used for everything from verifying online identities to securing personal data.

Intellectual Property and Copyright

Artists, writers, and creators can use blockchain to timestamp and protect their intellectual property and ensure they are compensated for their work.

Food Safety

In the food industry, blockchain can be used to trace the origin of food products, ensuring food safety and quality by tracking the production, processing, and distribution of goods.

Section 6

AWS-New profit Engine of Amazon

Background

Before launching Amazon Web Services (AWS) , Amazon developed unique software and services based on more than a decade of infrastructure work for the evolution of the Amazon e-commerce Platform. This was dedicated software and operation procedures that drove excellent performance, reliability, operational quality, and security all at a very large scale.

At the same time, Amazon realized that offering programmatic access to the Amazon Catalog and other e-commerce services was driving tremendous unexpected innovation by a very large developer ecosystem. The thinking then developed that offering Amazon's expertise in ultra-scalable system software as primitive infrastructure building blocks delivered through a services interface could trigger a whole new world of innovation as developers no longer needed to focus on buying, building, and maintaining infrastructure.

The previous experience showed that the cost of maintaining a reliable, scalable infrastructure in a traditional multi-datacenter model could be as high as 70%, both in time and effort and require significant investment of intellectual capital to sustain over a longer period of time.

Background

The initial thinking was to deliver services that could reduce that cost to 30% or less. Amazon also found that compute utilization in most cases, enterprise as well as startups, was extremely low (less than 20% and often even lower than 10%) and was often subject to significant periodicity. Providing these services in an on-demand fashion using a utility pricing model had the potential to radically change this. In 2006, Amazon officially launched AWS, which provides online services for other web sites or client-side applications. Most of these services are not exposed directly to end users, but instead offer functionality that other developers can use in their applications. All services are billed based on usage, but how usage is measured for billing varies from service to service. They include Amazon Elastic Compute Cloud (EC2) and Amazon Simple Storage Service (S3).

AWS Pricing Model

AWS offers you a pay-as-you-go approach for pricing for the vast majority of our cloud services. With AWS you pay only for the individual services you need, for as long as you use them, and without requiring long-term contracts or complex licensing. AWS pricing is similar to how you pay for utilities like water and electricity. You only pay for the services you consume, and once you stop using them, there are no additional costs or termination fees.

Pay-as-you-go

Pay-as-you-go allows you to easily adapt to changing business needs without overcommitting budgets and improving your responsiveness to changes. With a pay-as-you-go model, you can adapt your business depending on need and not on forecasts, reducing the risk of overprovisioning or missing capacity.

Save when you commit

For AWS Compute and AWS Machine Learning, Savings Plans offer savings over On-Demand in exchange for a commitment to use a specific amount (measured in $/hour) of an AWS service or a category of services, for a one- or three-year period.

Pay less by using more

With AWS, you can get volume based discounts and realize important savings as your usage increases. For services such as S3, pricing is tiered, meaning the more you use, the less you pay per GB. AWS also gives you options to acquire services that help you address your business needs.

Benefits of AWS

Easy to use

AWS is designed to allow application providers, ISVs, and vendors to quickly and securely host your applications – whether an existing application or a new SaaS-based application. You can use the AWS Management Console or well-documented web services APIs to access AWS's application hosting platform.

Cost-Effective

You pay only for the compute power, storage, and other resources you use, with no long-term contracts or up-front commitments. For more information on comparing the costs of other hosting alternatives with AWS, see the AWS Economics Center.

Flexible

AWS enables you to select the operating system, programming language, web application platform, database, and other services you need. With AWS, you receive a virtual environment that lets you load the software and services your application requires. This eases the migration process for existing applications while preserving options for building new solutions.

Scalable and high-performance

Using AWS tools, Auto Scaling, and Elastic Load Balancing, your application can scale up or down based on demand. Backed by Amazon's massive infrastructure, you have access to compute and storage resources when you need them.

Secure

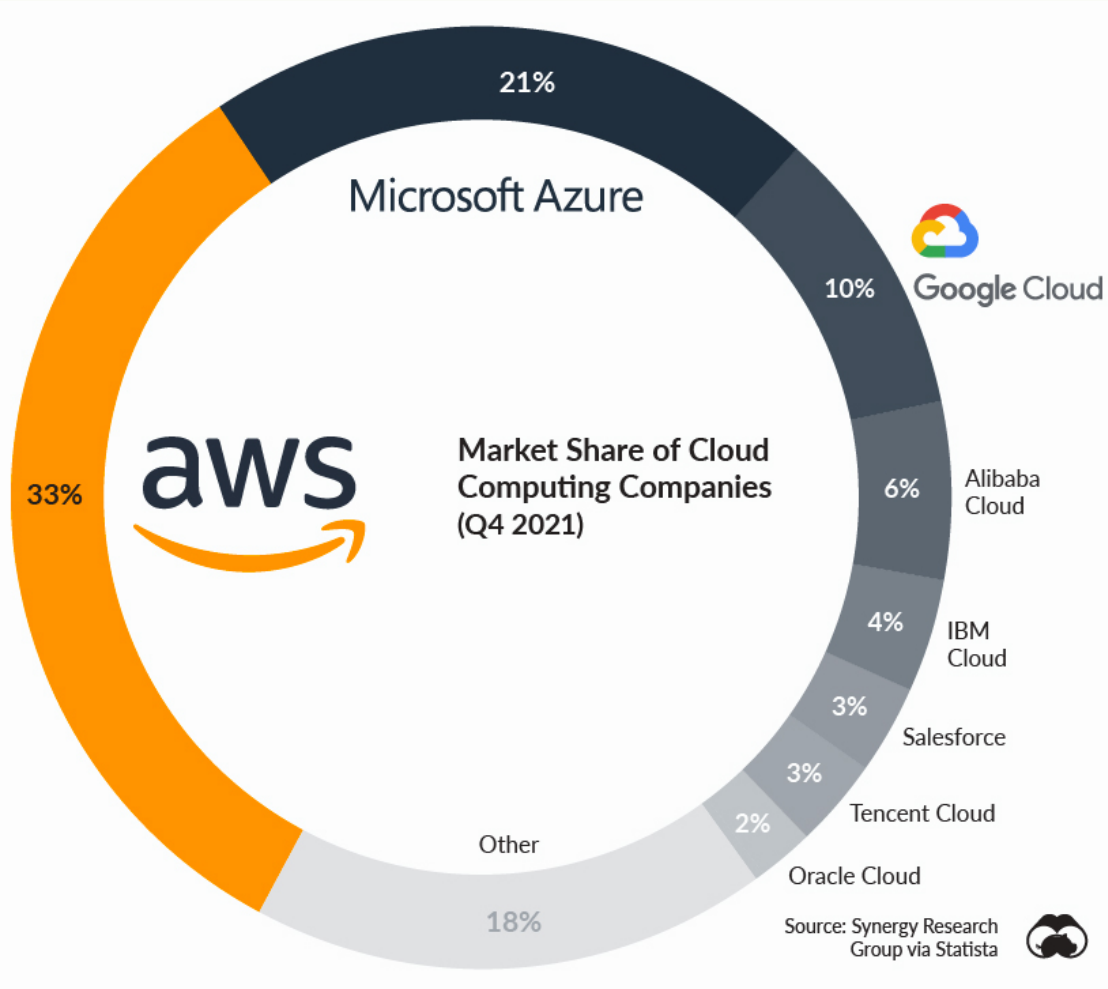
AWS utilizes an end-to-end approach to secure and harden our infrastructure, including physical, operational, and software measures. For more information, see the AWS Security Center.

Reliable

With AWS, you take advantage of a scalable, reliable, and secure global computing infrastructure, the virtual backbone of Amazon.com's multi-billion dollar online business that has been honed for over a decade.

AMS is becoming a new profiting source of Amazon

https://www.visualcapitalist.com/aws-powering-the-internet-and-amazons-profits/



Section 7

Big Data-Power Source of Netflix

The Netflix

Netflix is a streaming service that offers a wide variety of award-winning TV shows, movies, anime, documentaries, and more on thousands of internet-connected devices. Netflix was launched on January 16, 2007, nearly a decade after Netflix, Inc. began its DVD-by-mail service. With 238.39 million paid memberships in more than 190 countries, it is the most-subscribed video on demand streaming service. By 2022, original productions accounted for half of Netflix's library in the United States, and the company had ventured into other categories, such as video game publishing via the Netflix service (Wikipedia).

- **Launch as a mail-based rental business (1997–2006)**
- **Transition to streaming services (2007–2012)**
- **Development of original programming (2013–2017)**
- **Expansion into international productions (2017–2020)**
- **Expansion into gaming, *Squid Game*, end of DVDs (2021–present)**

The Success of "House of Cards" (纸牌屋)

House of Cards is an American political thriller streaming television series created by Beau Willimon. It is based on the 1989 novel of the same name by Michael Dobbs and an adaptation of the 1990 BBC series of the same name by Andrew Davies, also from the novel. The first 13-episode season was released on February 1, 2013, on the streaming service Netflix. *House of Cards* is the first TV series to have been produced by a studio for Netflix.

Before green-lighting House of Cards, by virtue of data analysis, Netflix knew that a lot of users watched the British version of "House of Cards" well. Those who watched the British version "House of Cards" also wathced ** films and/or films directed by David Fincher. Netflix combined the three factors to make the $100 million investment in creating a US version of "House of Cards".

House of Cards received highly positive reviews and numerous award nominations, including 33 Primetime Emmy Award nominations. It is the first original online-only streaming television series to receive major Emmy nominations. The show also earned eight Golden Globe Award nominations.

How Does Netflix Take Advantage of Big Data in Programming?

Analytics at Netflix

Netflix is able to see the "completion rate" of users on a large scale.

Netflix tracks you activities on it site like: when you pause, rewind, or fast forward; what day you watch content; where you watch; what device you use to watch; your searches, browsing and scrolling behaviour.

The recommendation algorithm

As part of the on-boarding process, Netflix asks new users to rate their interest in movie genres and rate any movies they've already seen. Based on the rating, Netflix offers movie recommendations soon after credits credits start. Netflix's recommendation depends on the self-developed personalization algorithms that aim to accurately predict what users will watch next. For Netflix, helping users to discover new movies and TV shows they'll enjoy is integral to its success.

Possible problems with Netflix's Big Data Application

Conflicts between big data and creativeness

For years Netflix has been analyzing what customers watched last night to suggest movies or TV shows that we might like to watch tomorrow. Now it is using the same formula to prefabricate its own programming to fit what it thinks we will like. These innovative productions might be troubling because they pave the way for more calibrated and uniform content, denying the disruptive novelty of digital TV. But if our future TV programming coincides perfectly with our tastes and habits, how TV can surprise us anymore? The same funnel will narrow the curiosity of viewers as well as their desperate need The success of this new kind of production for leaming and exploring new horizons remains in the capacity of entertainment players to take risks and use big data as a launching pad to cutting-edge creations. It is the role of content producers to pay consumers out of their comfort zone and use big data as an incentive to expand their field of vision.

Users' privacy

There are concerns that the thing that makes Netflix so valuable -it knows everything about us could create problems if it is not careful with our data and our privacy though many people think the trade is worth it.

The end!