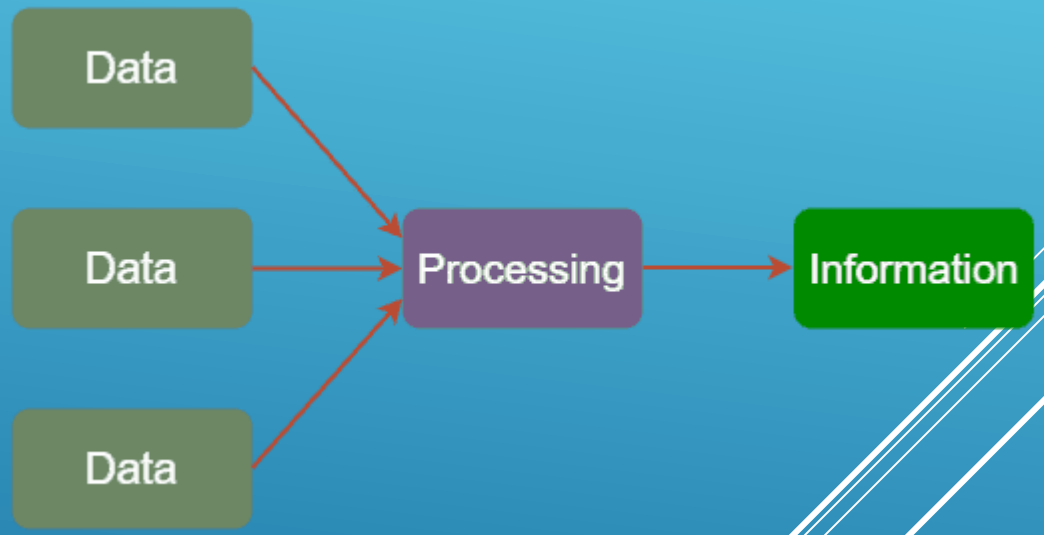
INFORMATION RETRIEVAL

WHAT IS INFORMATION?

- **Information**:

Definition: Information refers to data that has been processed, organized, and given meaning. It is the result of transforming raw data into something useful and relevant.



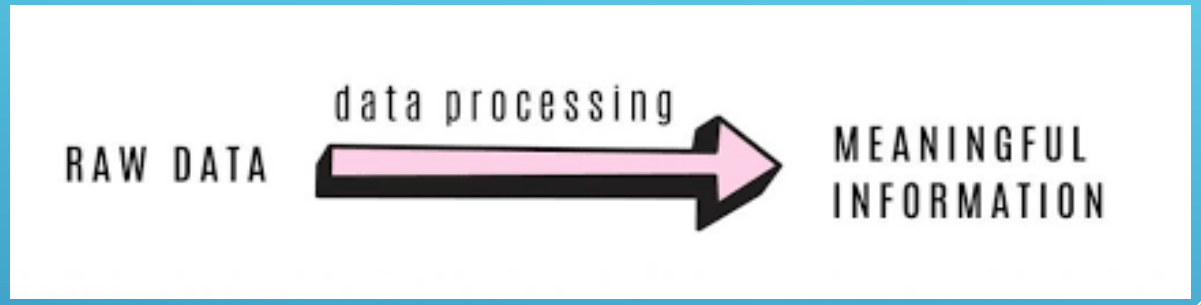
INFORMATION CHARACTERISTICS

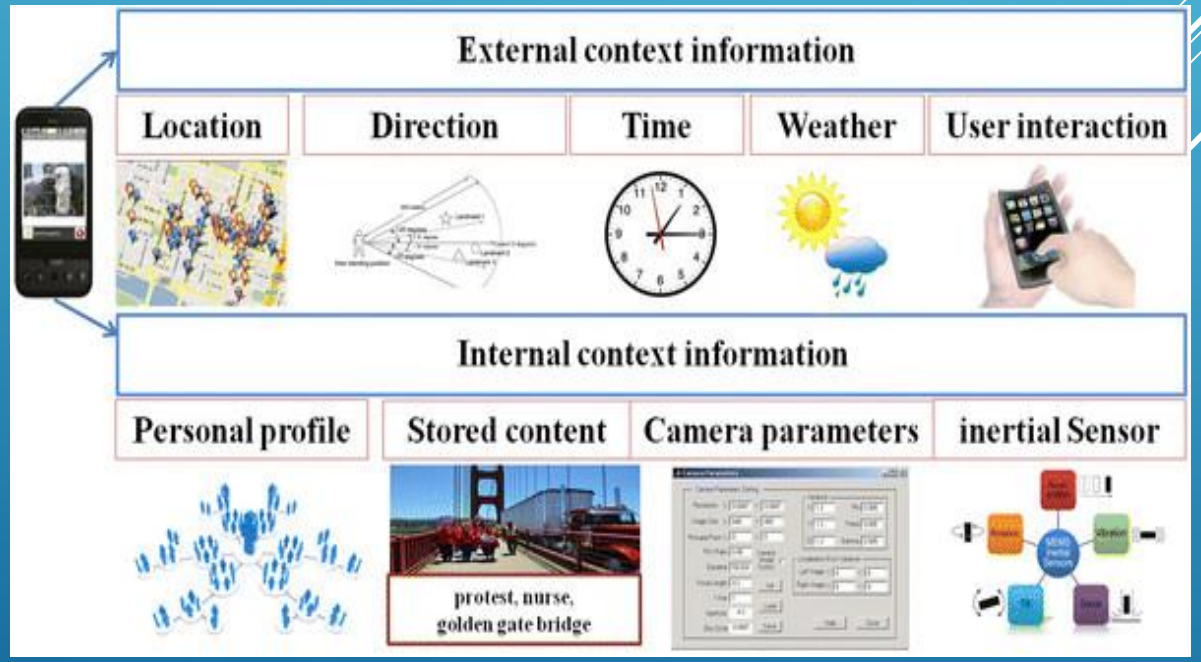
- **Characteristics:**
  - **Meaningful:**
  - Information provides insights, knowledge, or understanding.

  - **Contextual**:

  It gains significance within a specific context.

  - Contextual information on mobile phone.





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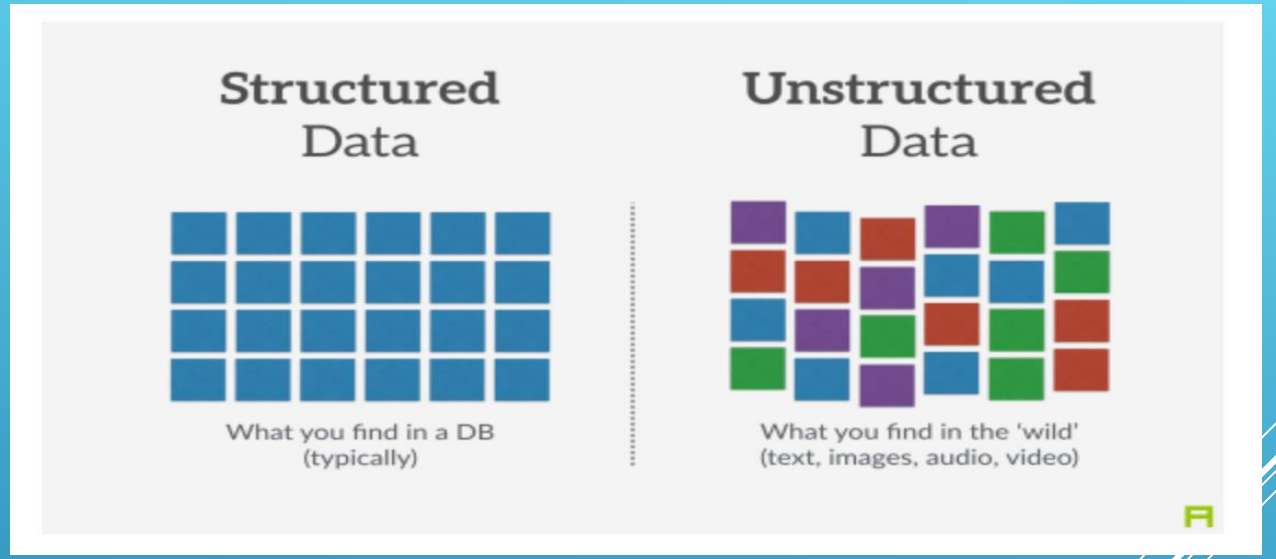
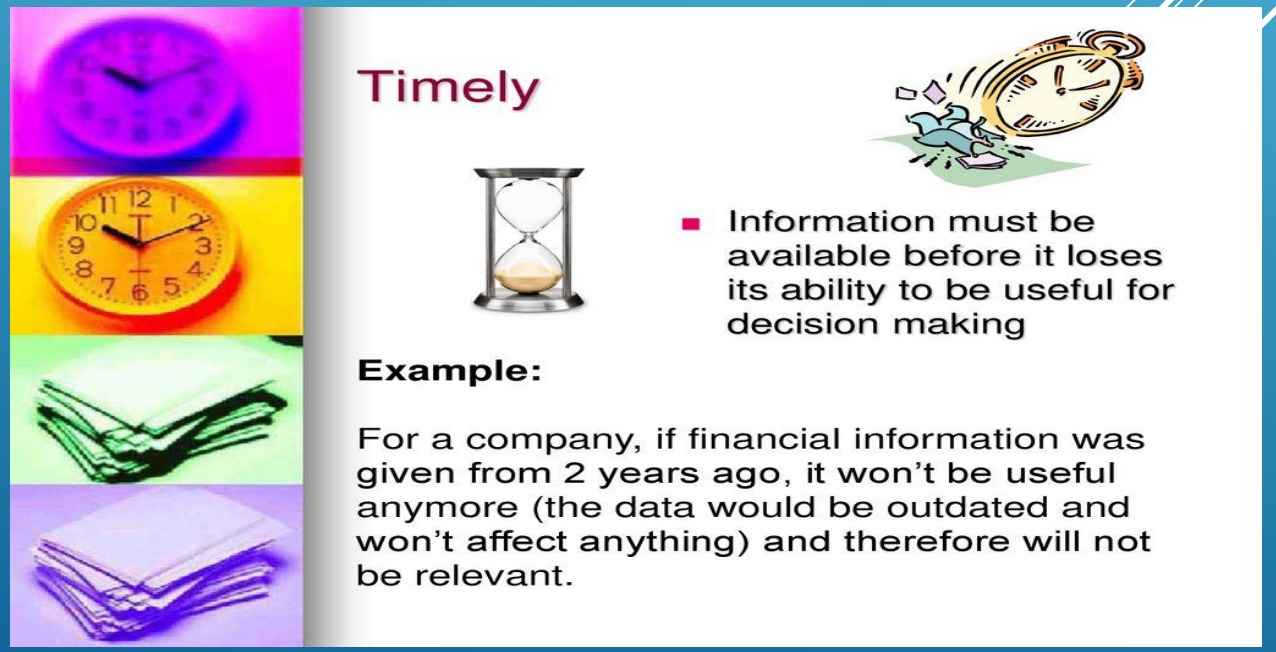
- **Structured or Unstructured:** Information can be in the form of text, images, audio, or video.



- **Timely:** Relevant information is available when needed.

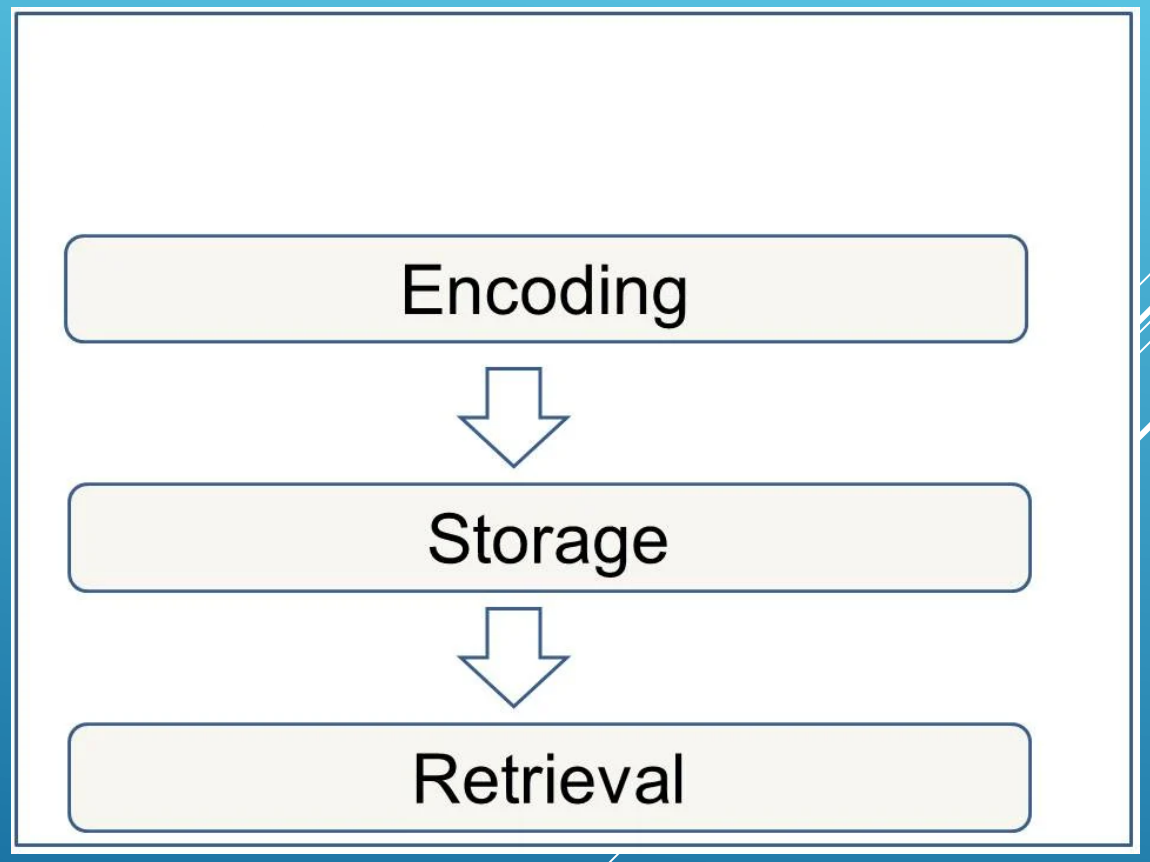


WHAT IS RETRIEVAL?

- **Retrieval:**

Retrieval refers to the process of finding and bringing back something that was previously stored or lost.

- Here are a few contexts in which the term ”retrieval” is commonly used.



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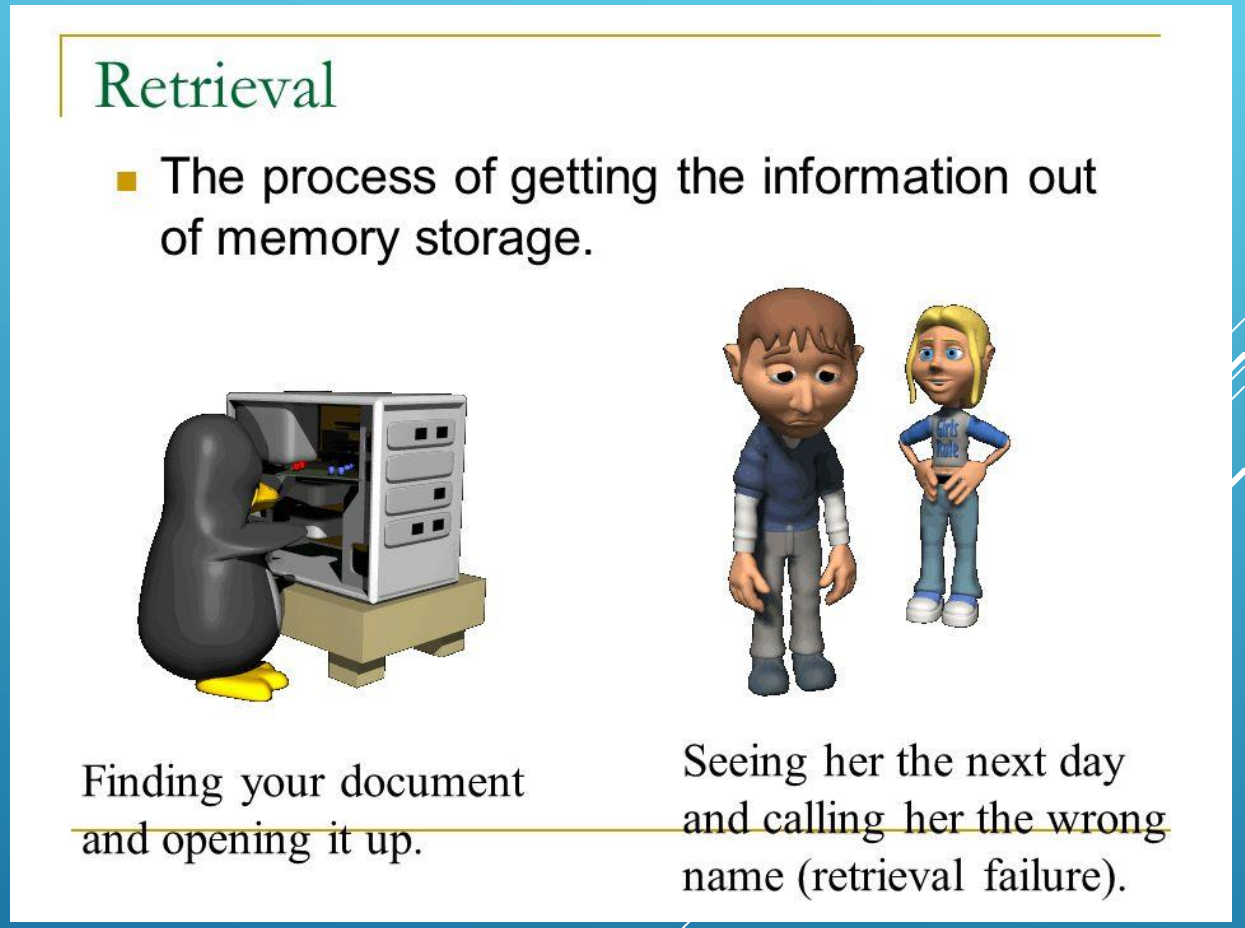
- **Computers:**

In the context of computers, retrieval involves getting stored information from a computer system.

For instance:

- Retrieving data from a database.
- Accessing files or records stored on a computer.
- Searching for specific information online.
- An example sentence: “The data management system facilitates easy retrieval of evidence.”



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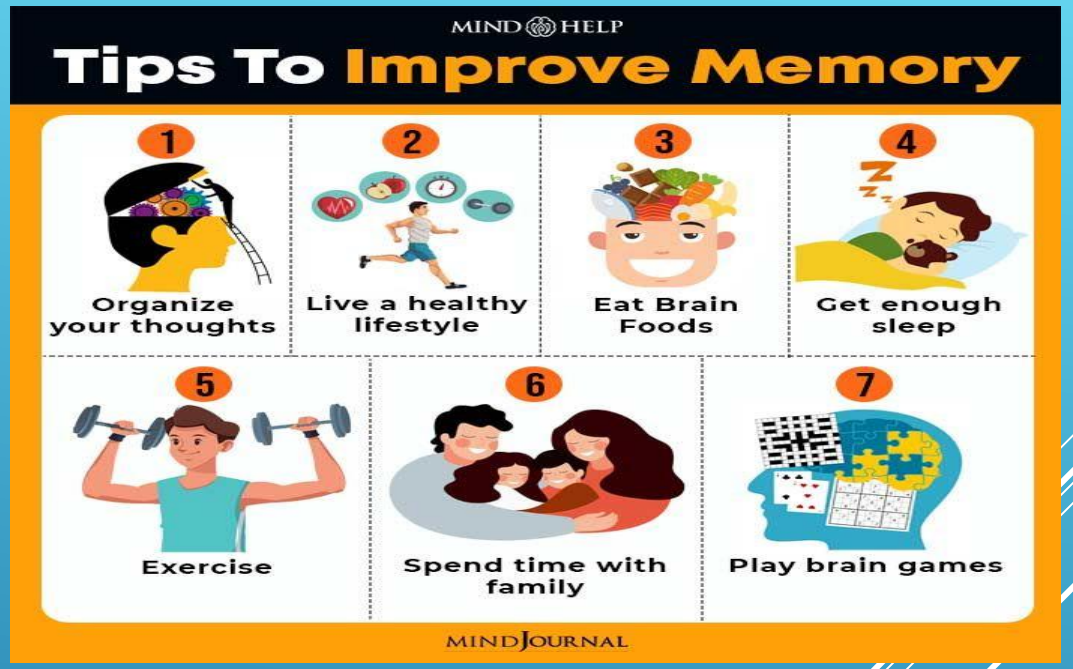
- **Physical Retrieval:**
- In everyday scenarios, retrieval can refer to physically obtaining something.
- **Medication retrieval:** Opening a box mechanically to retrieve medications.



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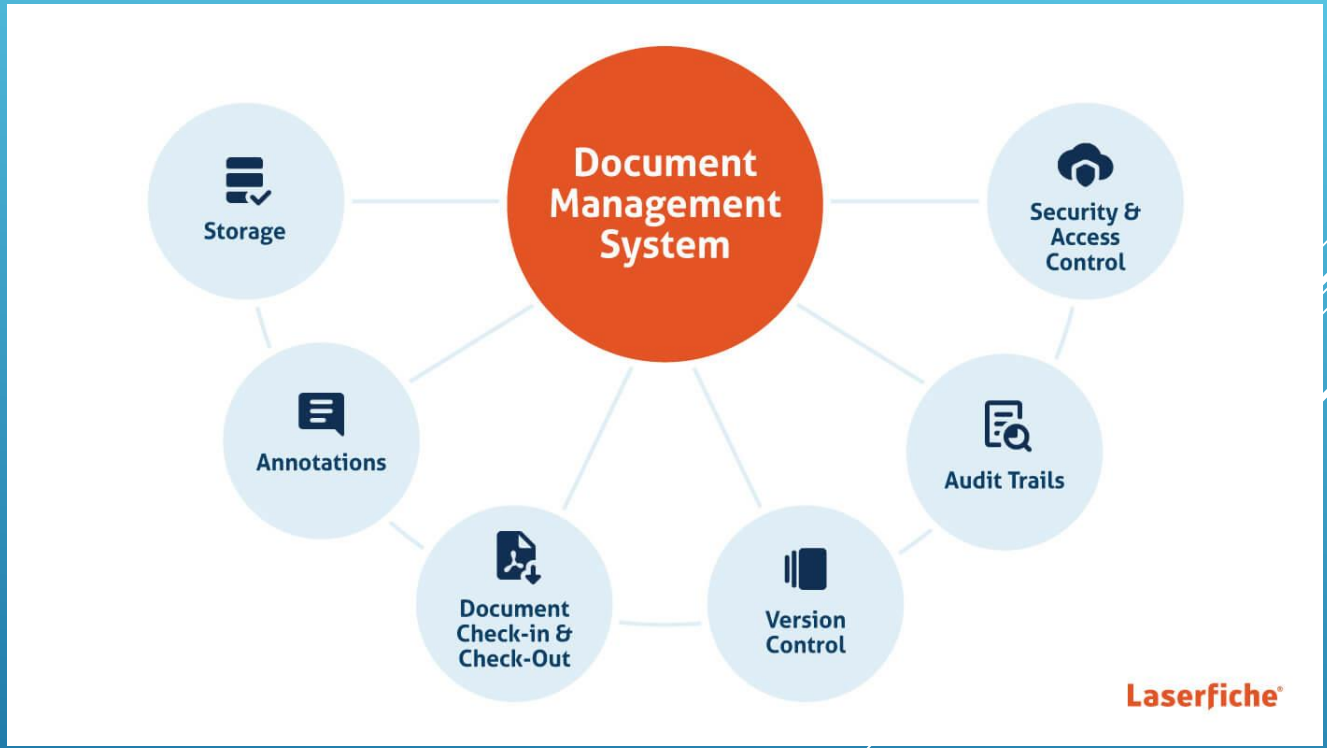
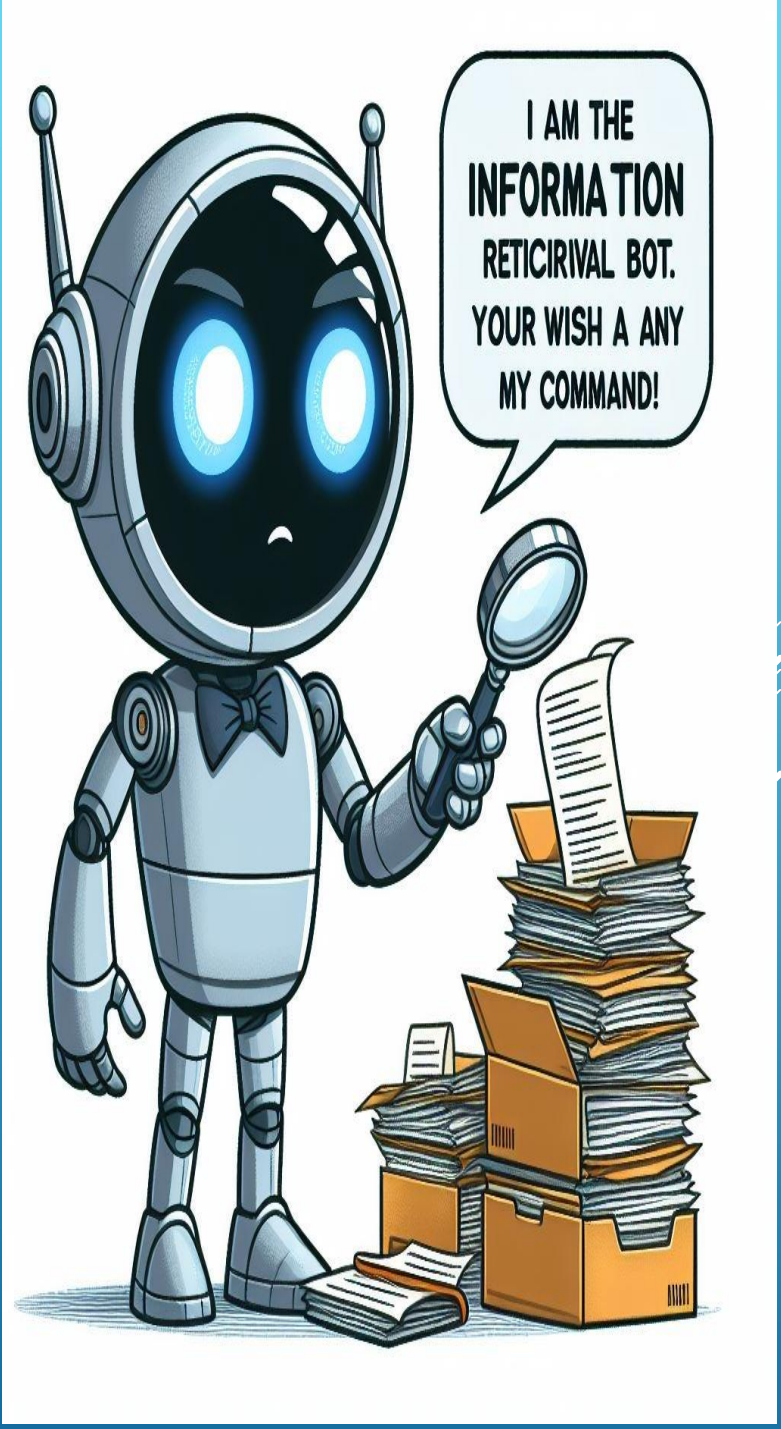
- **Filing and retrieval system:** A system that allows you to find specific notes or documents when needed.



What Is **Information Retrieval?**

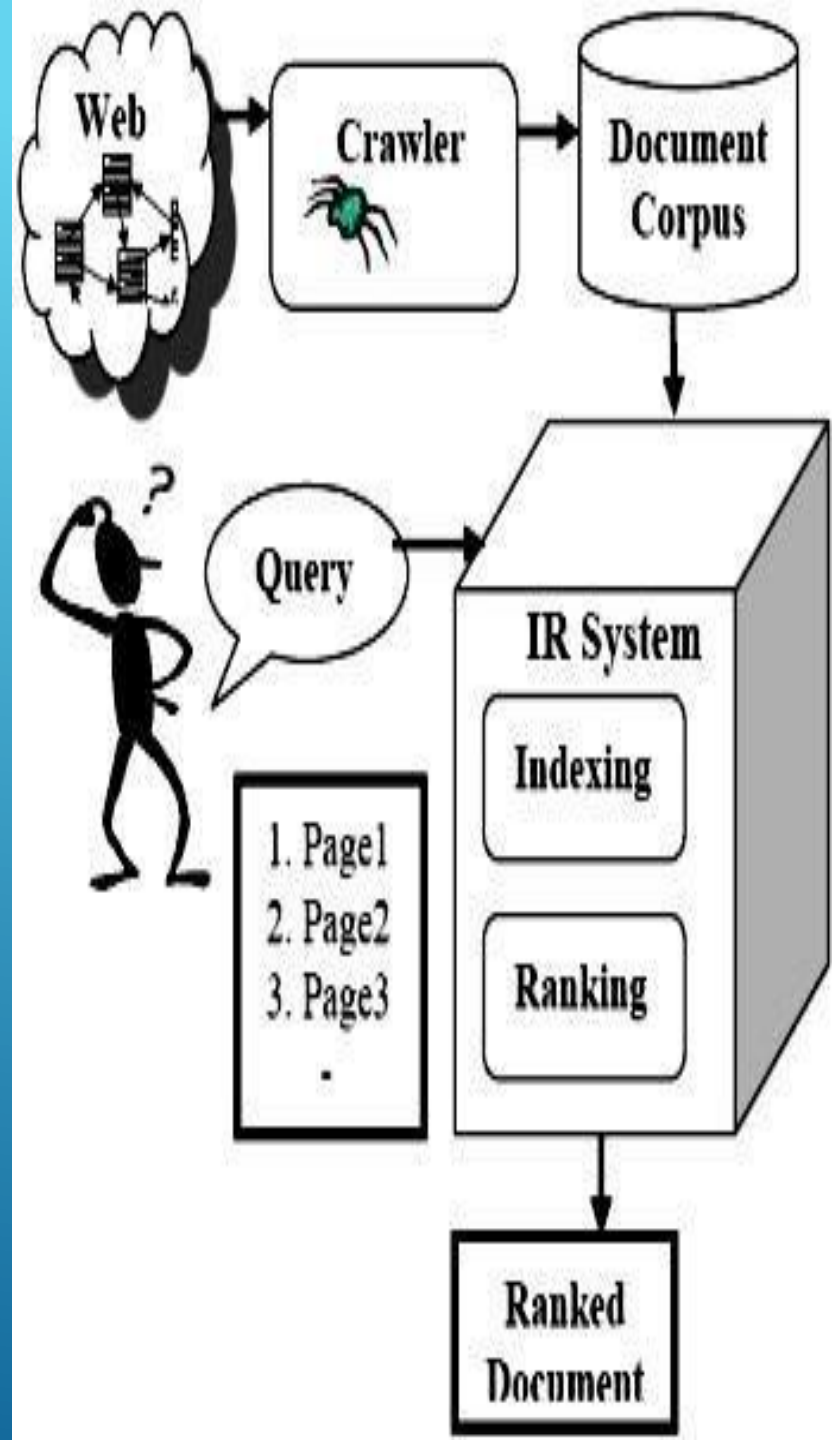
WHAT IS INFORMATION RETRIEVAL

- Information retrieval (IR) is the process of obtaining information from a large repository or database, typically in the context of digital systems. The goal of information retrieval is to retrieve relevant information that matches a user's information need from a collection of documents or data. This process is commonly associated with search engines, databases, and other information systems.



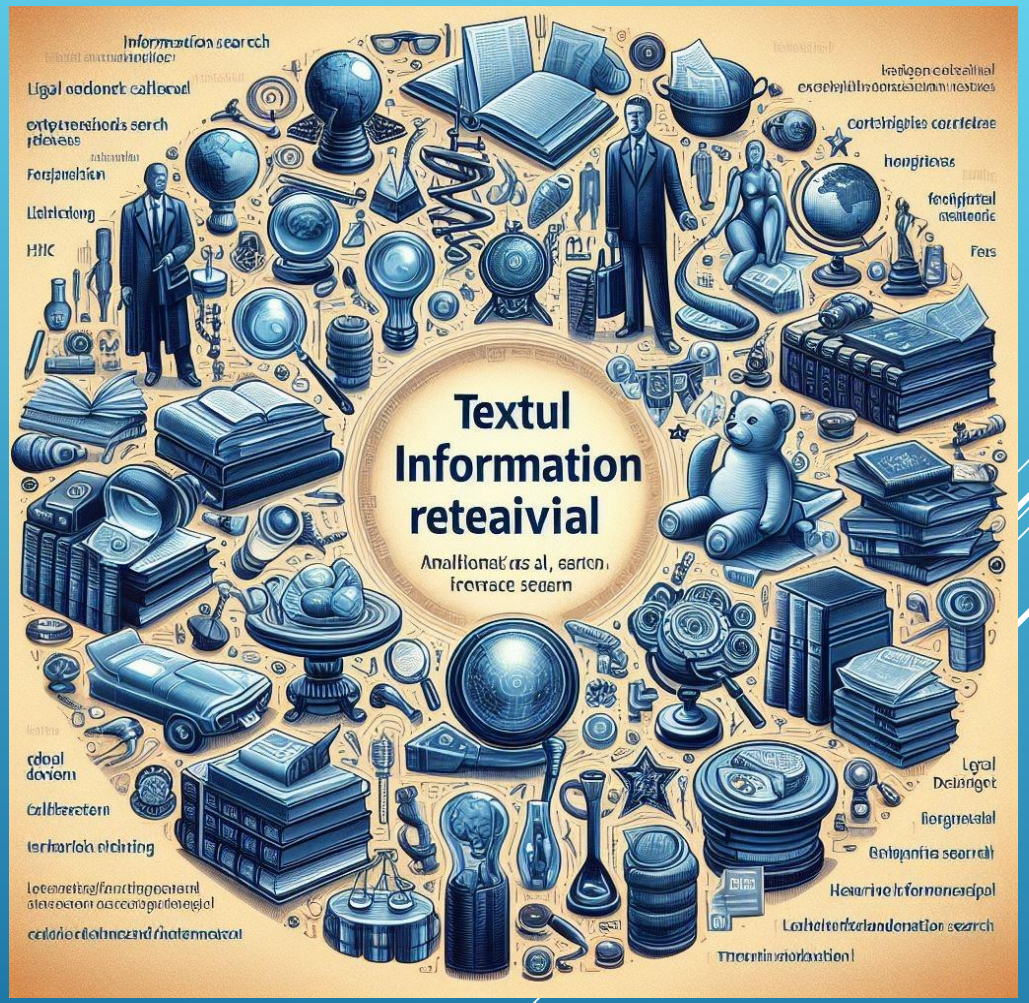
KEY COMPONENTS OF INFORMATION RETRIEVAL INCLUDE:

- **Query:** The user expresses their information need through a query, which is a set of keywords, phrases, or questions.
- **Indexing:** Documents in the database are preprocessed and indexed to create a structure that allows for efficient and effective searching. Indexing involves extracting and organizing key terms or features from the documents.
- **Search:** The system uses the query to search the indexed database for relevant documents. This involves matching the terms in the query with the indexed terms in the documents.
- **Ranking:** Once potential matches are found, the system ranks them based on relevance to the query. Various algorithms are used to determine the order in which results are presented to the user.
- **Retrieval:** The final step is to present the user with the retrieved information in a meaningful and organized manner.



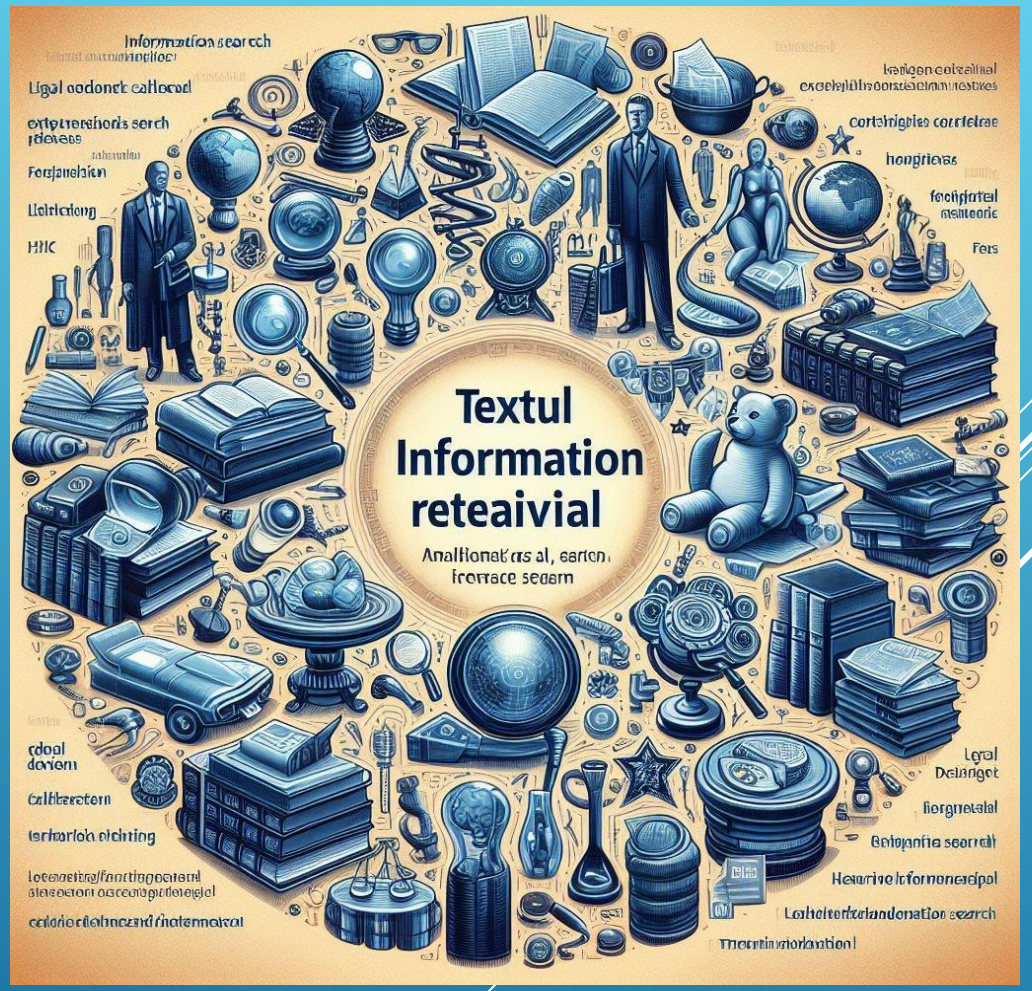
APPLICATIONS OF INFORMATION RETRIEVAL

- Applications of Information retrieval can be broadly categorized into visual applications and textual applications
- **Textual Information Retrieval Applications:**
- **Web Search Engines:** Retrieving textual information from the vast content available on the internet based on user queries.
- **Library Catalogs:** Organizing and retrieving books, articles, and textual resources in libraries and databases.
- **Enterprise Search:** Searching and retrieving textual documents, reports, and data within large organizations.



APPLICATIONS OF INFORMATION RETRIEVAL

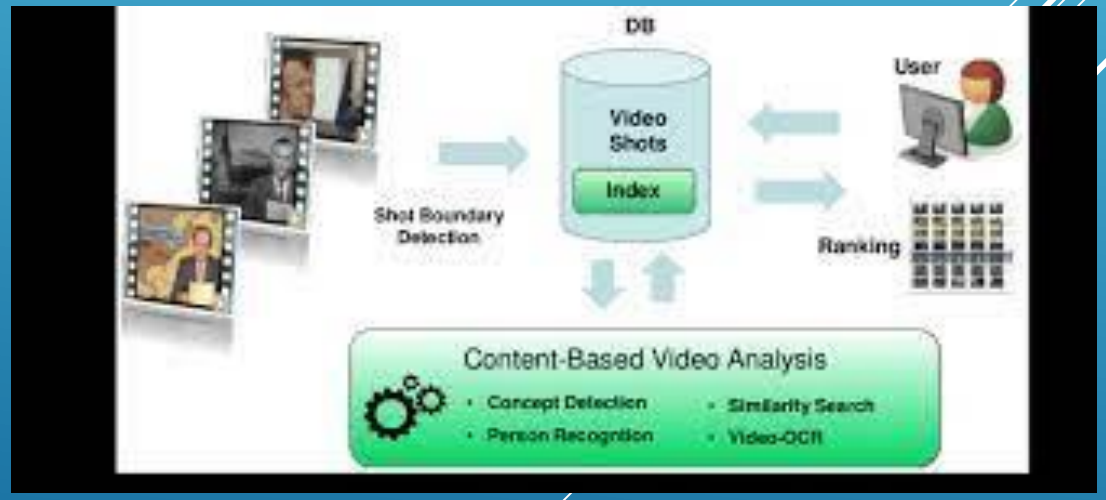
- **Legal Document Retrieval:** Accessing legal texts, case law, statutes, and other legal documents for research.
- **Academic Research:** Retrieving scholarly articles, research papers, and textual information from academic databases.
- **Healthcare Information Systems:** Managing and retrieving textual patient records, medical literature, and research papers.
- **News Aggregation:** Searching and presenting relevant textual news articles based on user interests.
- **Information Filtering:** Recommending textual content to users based on their preferences and behavior.
- **Government and Public Records:** Managing and retrieving textual public records and government documents.



APPLICATIONS OF INFORMATION RETRIEVAL

Visual Information Retrieval Applications:

- **Image Search Engines:** Retrieving images based on visual queries, often used in reverse image searches.
- **Video Retrieval Systems:** Searching and retrieving videos based on visual content, such as scenes, objects, or patterns.
- **Medical Imaging Retrieval:** Retrieving medical images and diagnostic information for healthcare applications



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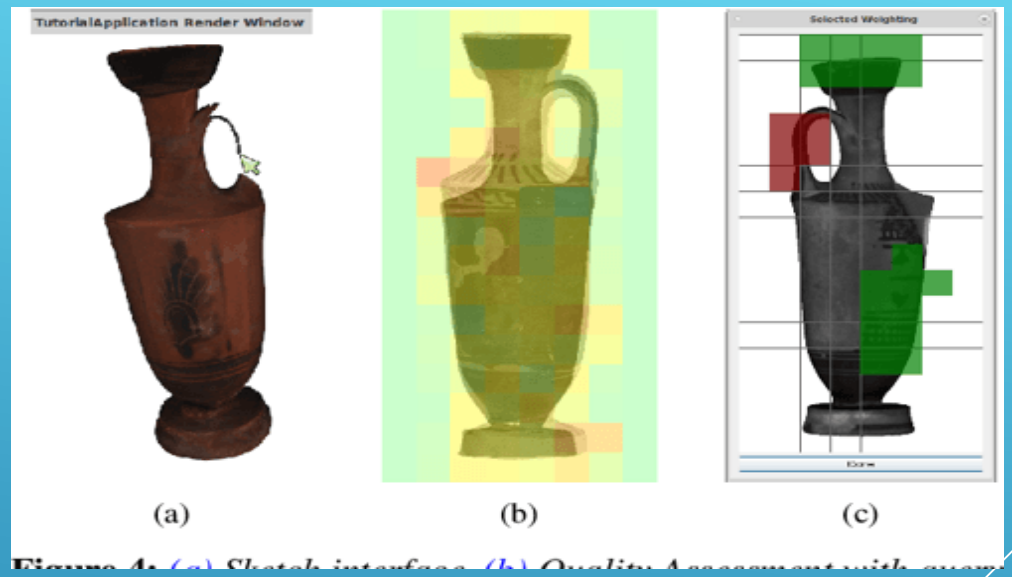
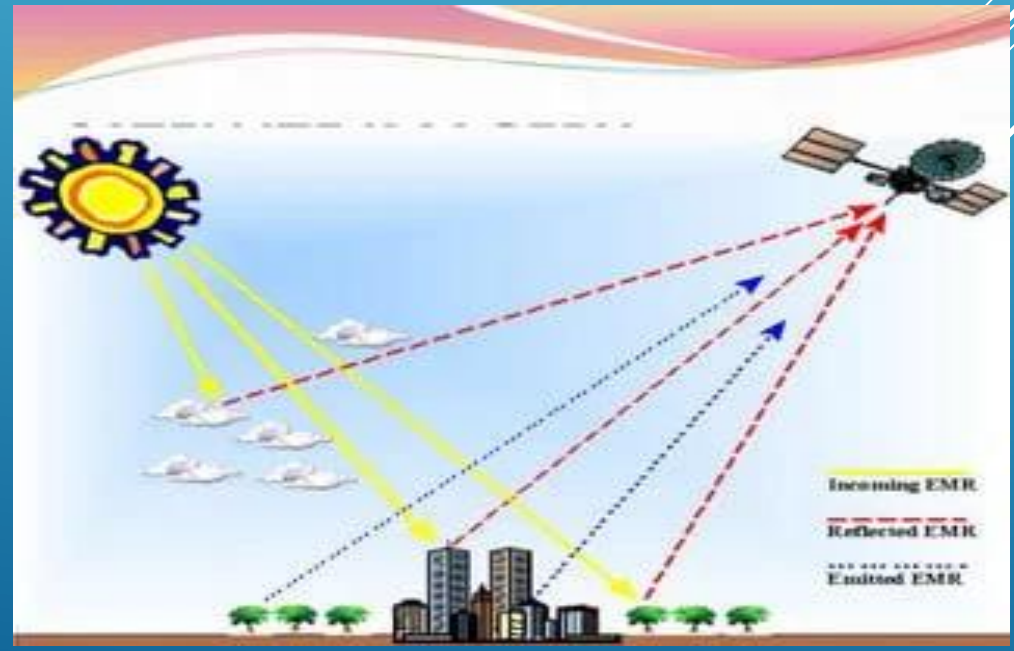
- **Art and Cultural Heritage:** Retrieving visual artworks, artifacts, and historical images for cultural and artistic purposes.
- **Satellite Image Retrieval:** Searching and analyzing satellite images for various applications, including environmental monitoring.





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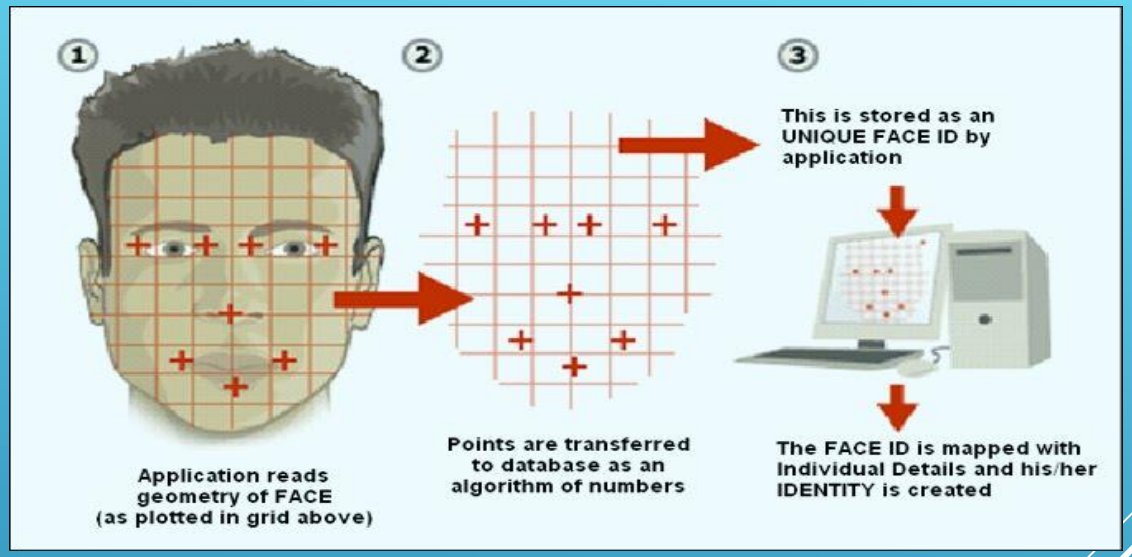
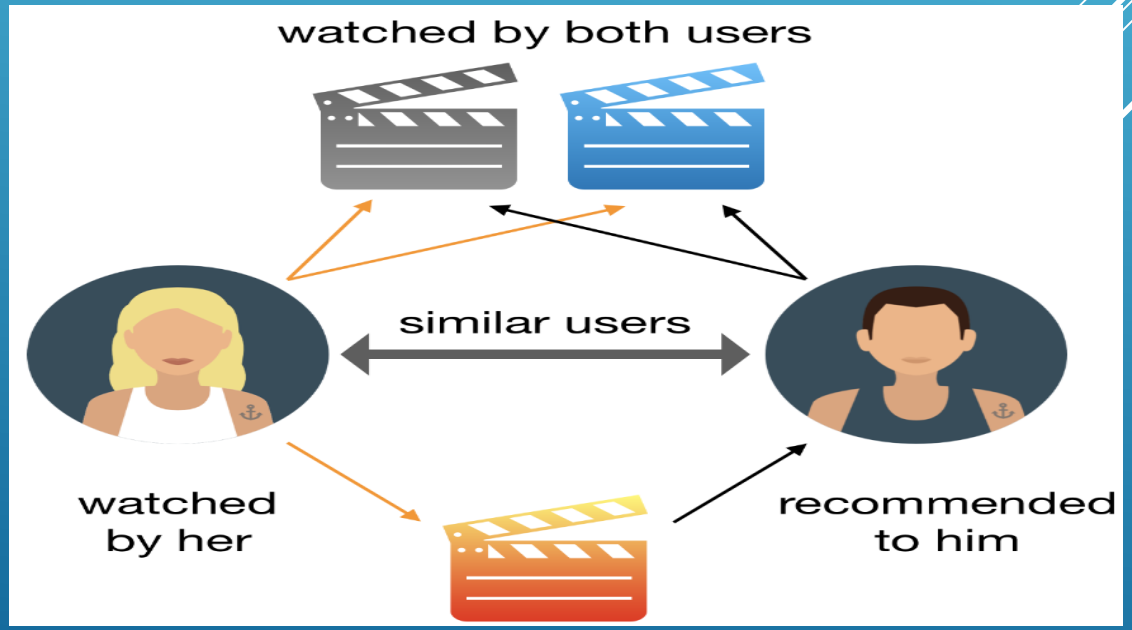
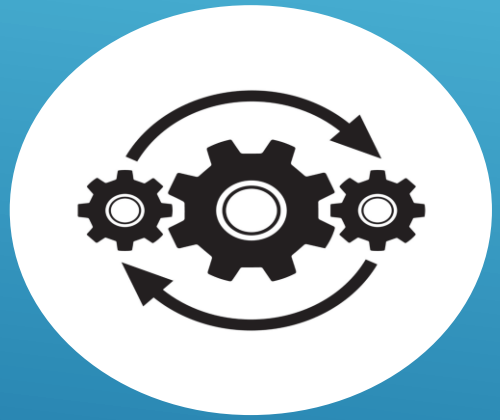
- **Facial Recognition:** Identifying and retrieving visual information related to individuals based on facial features.
- **Visual Recommendation Systems:** Recommending visual content, such as images or videos, based on user preferences.





Information retrival



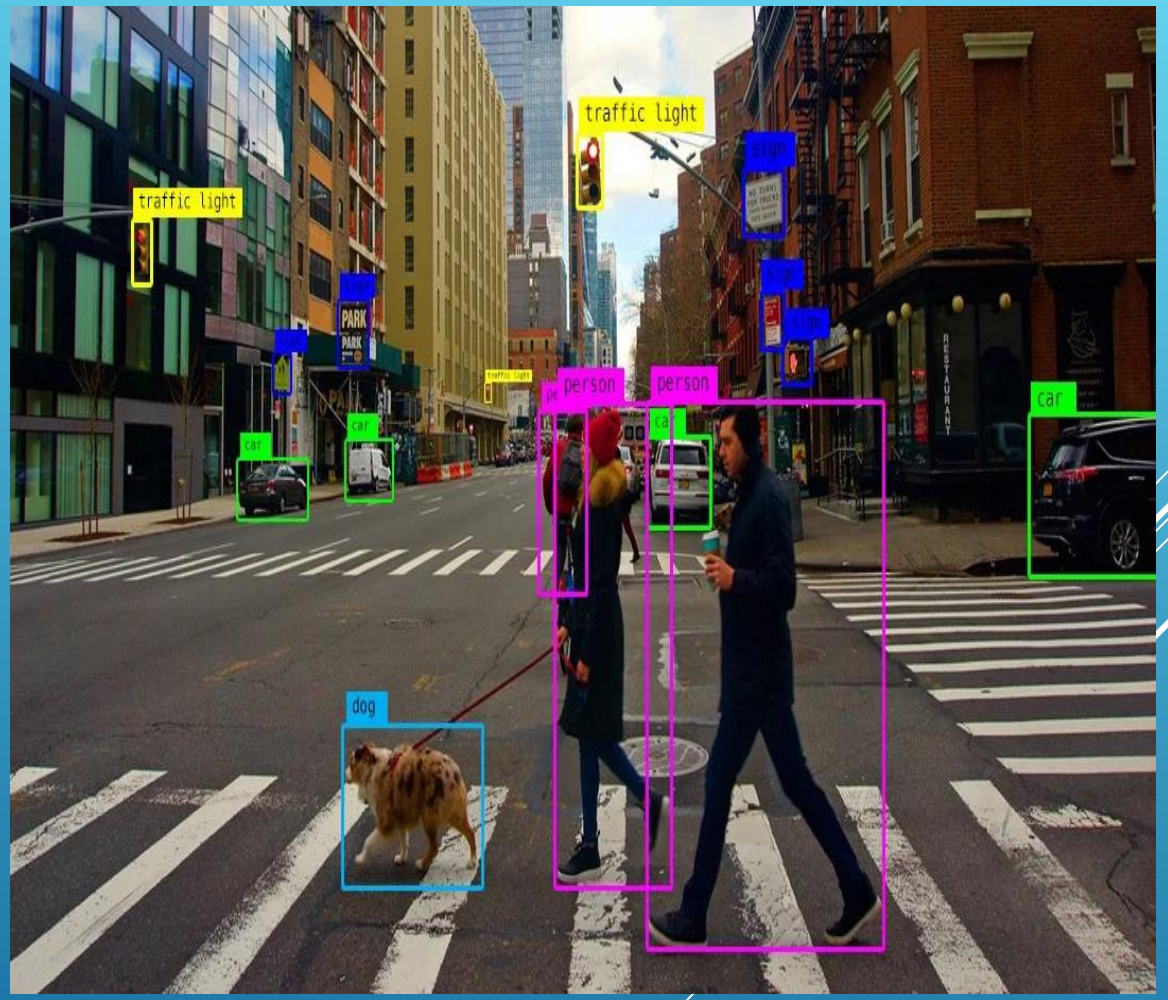
Integrition

Computer Vision

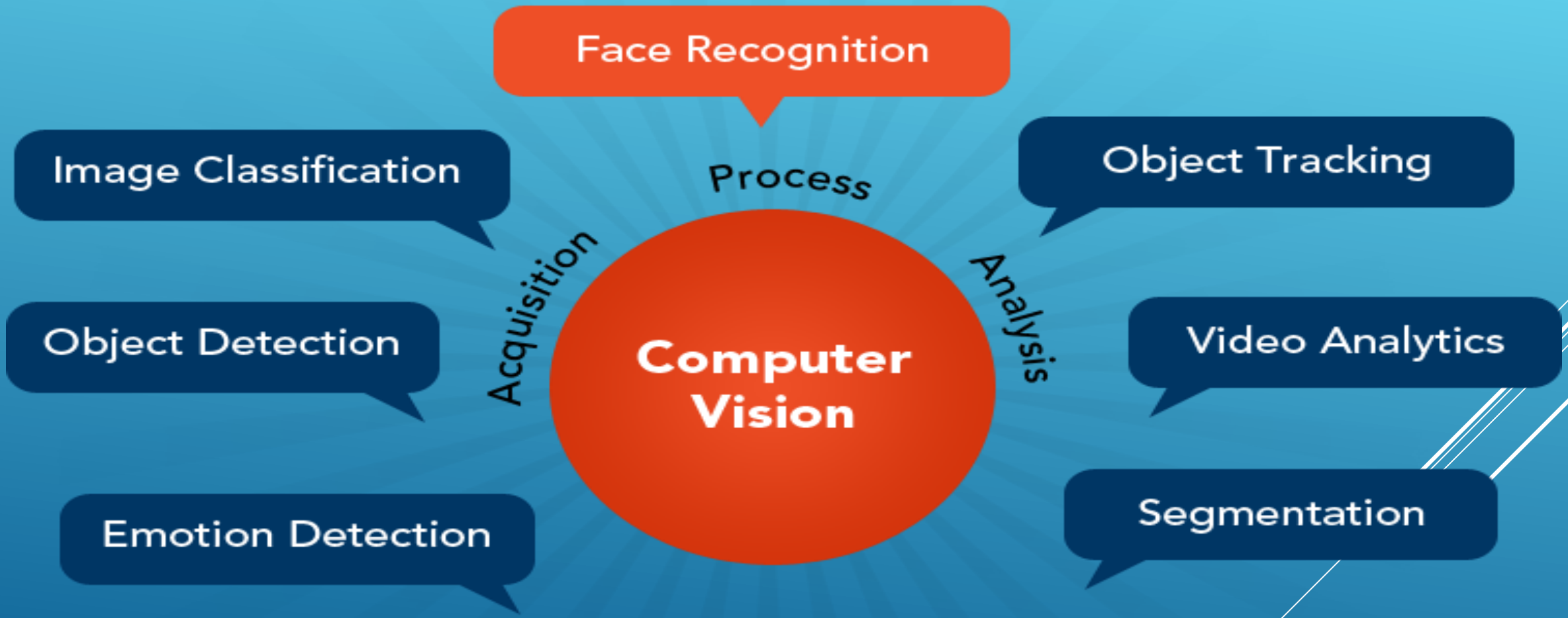
WHAT IS COMPUTER VISION?

COMPUTER VISION:

- Computer vision is a multidisciplinary field that enables computers to interpret and make decisions based on visual data, such as images and videos. The goal is to replicate human vision capabilities by developing algorithms and systems that can understand, analyze, and interpret visual information. Computer vision involves tasks such as image recognition, object detection, image segmentation, and scene understanding.

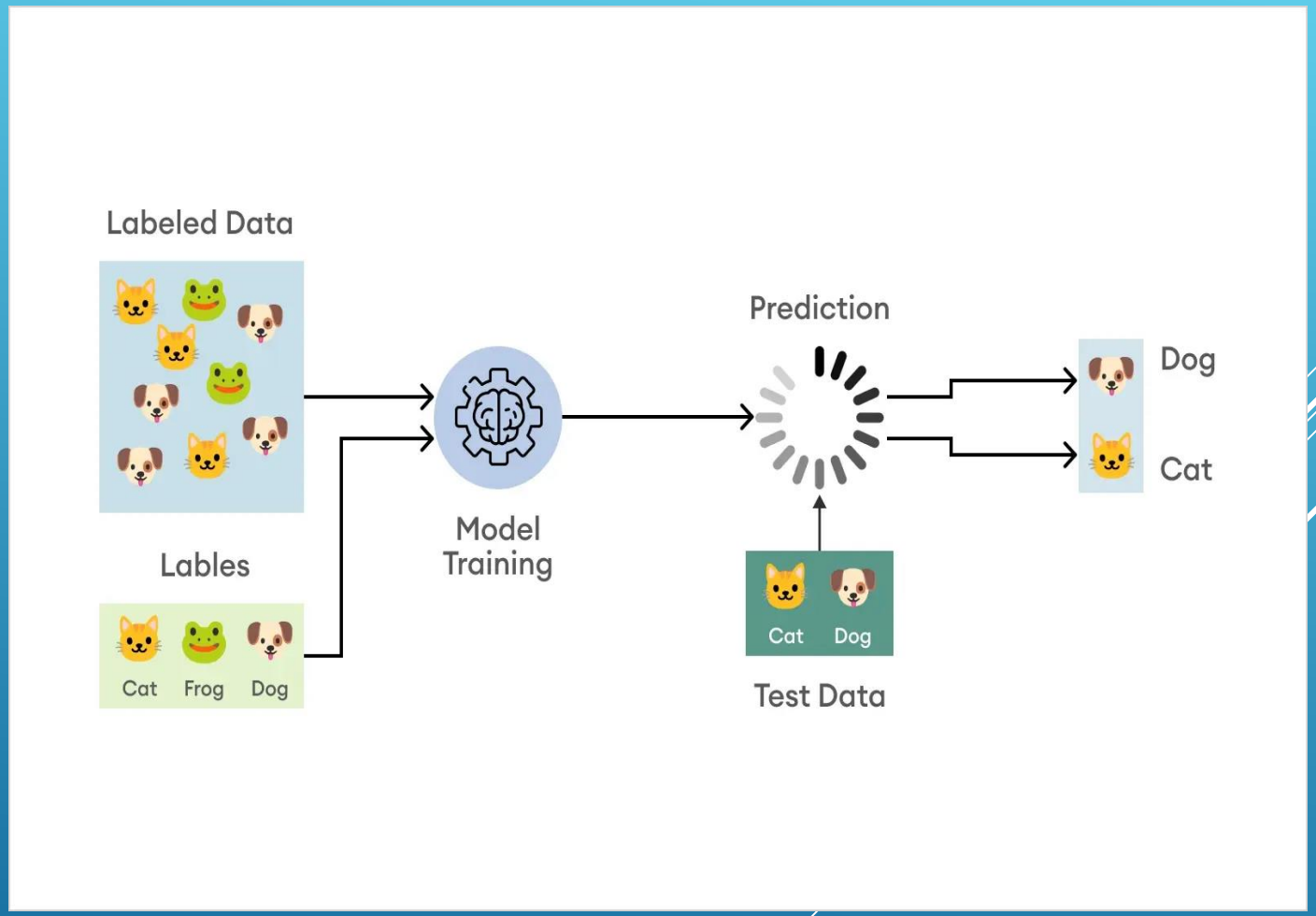


APPLICATION OF COMPUTER VISION

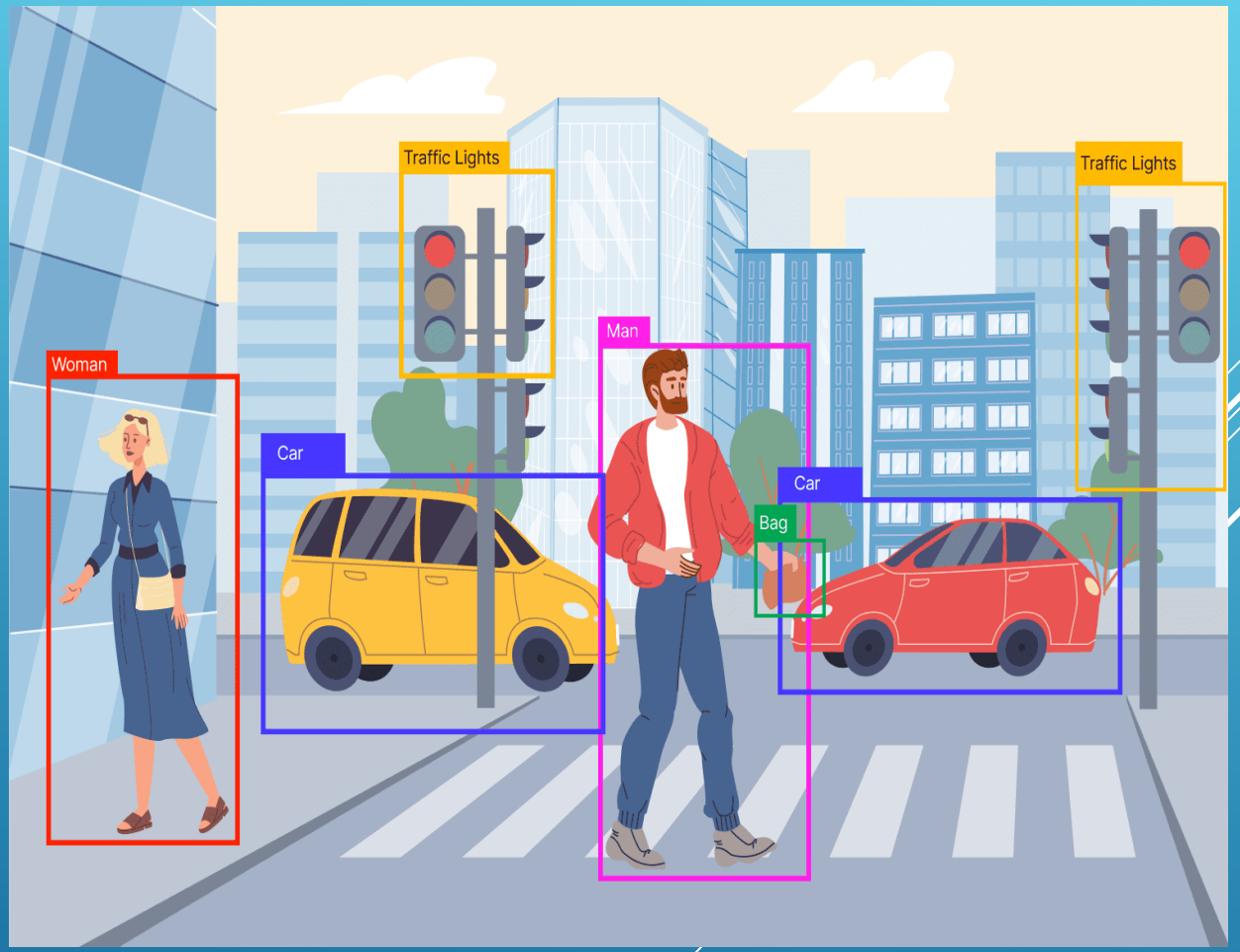


APPLICATION OF COMPUTER VISION

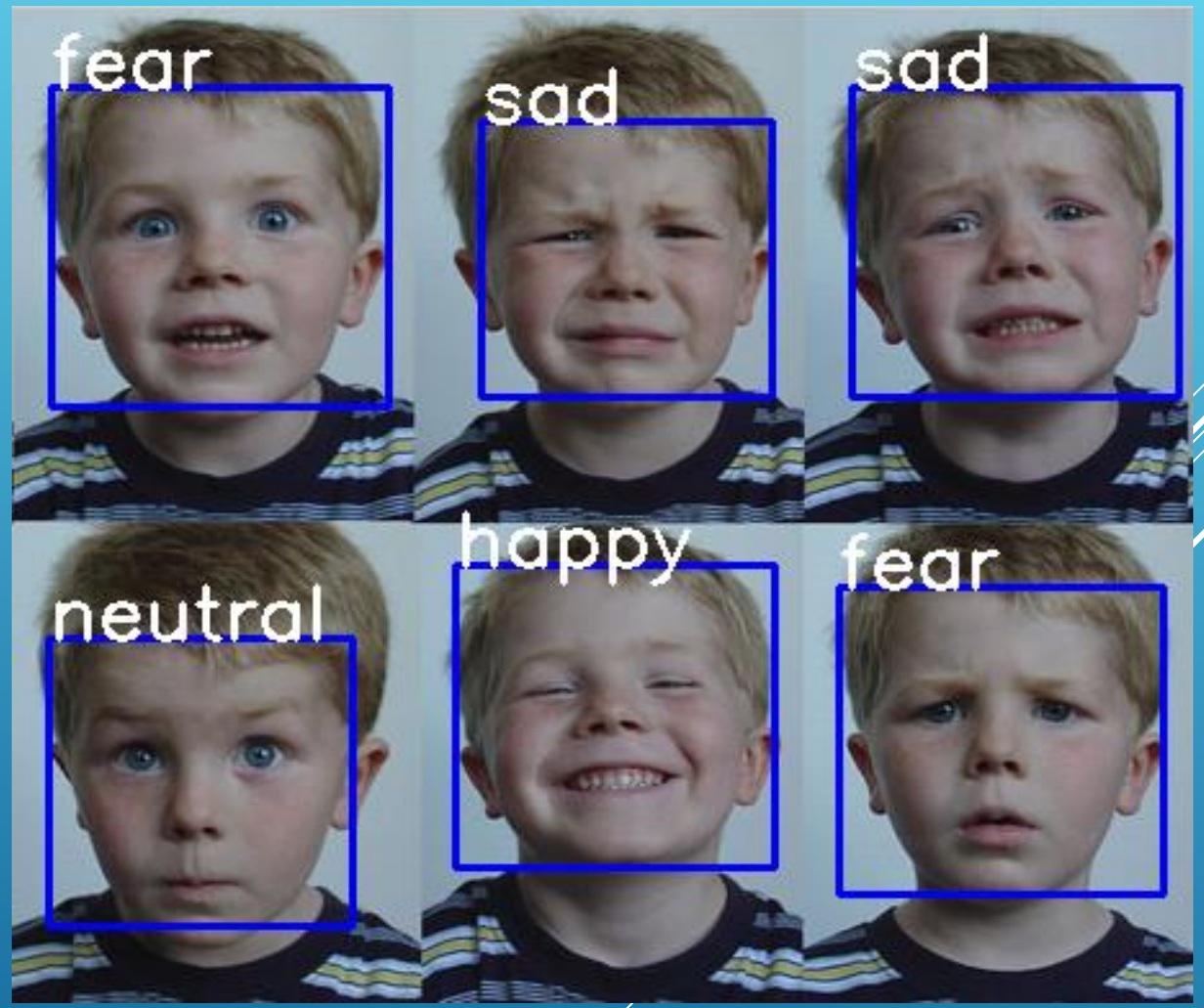
- **Image Classification:** Image classification is a computer vision task where the goal is to assign a label or category to an input image based on its visual content.
- In simpler terms, it involves teaching a computer to recognize and categorize objects or scenes in images.
- The system learns to distinguish between different classes or categories, and when presented with a new image, it predicts the most relevant label for that image



- **Object Detection:** Object detection is teaching a computer to find things in images or videos.
- It doesn't just name what's in a picture; it can also draw boxes around multiple objects. To do this, the computer is shown many labeled images of objects.
- Once trained, it can then spot and outline various objects in new images. Object detection is used in security cameras to identify people, in self-driving cars to recognize other vehicles, and in retail to track products on shelves.
- The aim is to make the computer able to locate and understand different objects in visual content.



- **Emotion detection:** Emotion detection is like training a computer to recognize and understand emotions in people's faces.
- Instead of just seeing a face, it can identify if someone looks happy, sad, surprised, or other emotions.
- This is done by teaching the computer with many images of faces labeled with emotions. Once trained, it can then analyze new faces and determine the emotions expressed.
- Emotion detection is used in various applications, including video conferencing to enhance communication, in customer service to gauge satisfaction, and in healthcare for mental health assessments.
- The goal is to make the computer able to sense and interpret emotions from facial expressions.



Object Tracking: Object tracking is like teaching a computer to follow and monitor a specific object in a sequence of images or frames from a video. Instead of just recognizing objects, it keeps track of their movements over time.

- This is achieved by providing the computer with initial information about the object's location, and then algorithms are used to follow and update its position as it moves through subsequent frames.
- Object tracking is applied in various fields, such as surveillance systems to monitor people or vehicles, in sports analysis to track players during a game, and in robotics for navigating and interacting with objects.
- The goal is to make the computer able to continuously follow and understand the path of a particular object in motion.

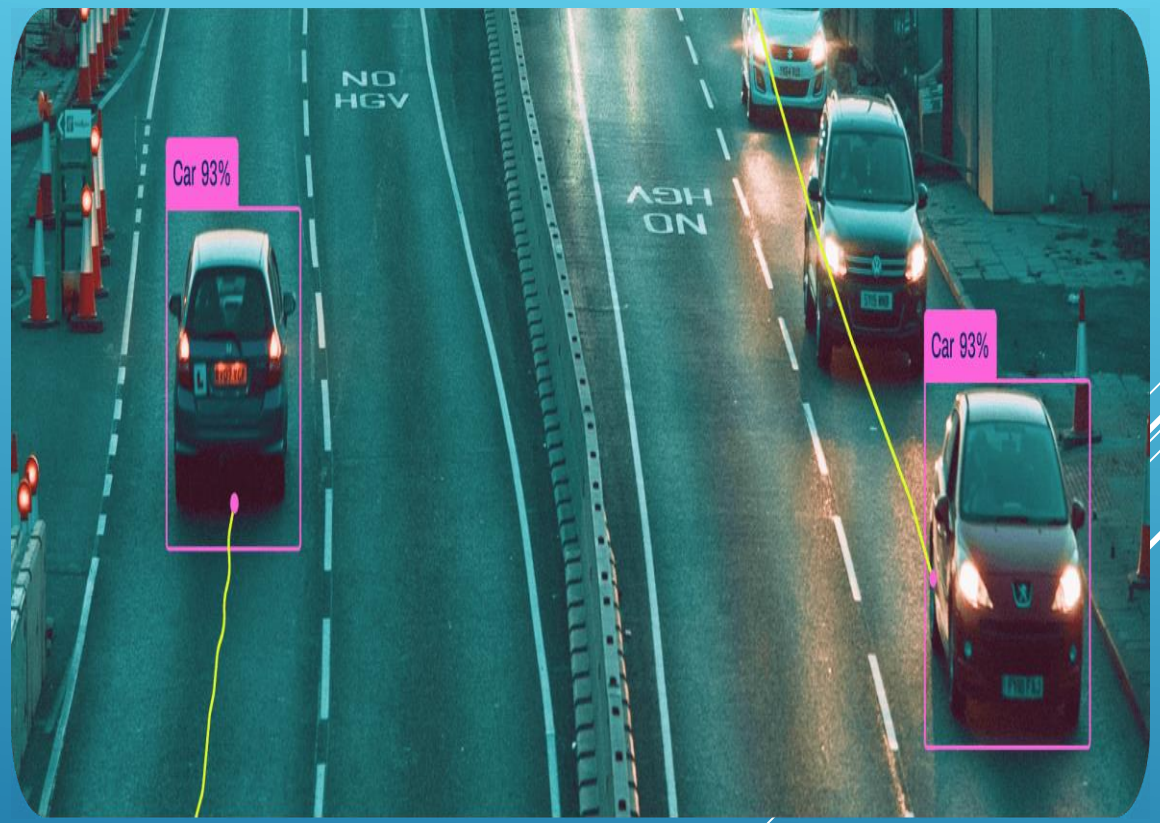
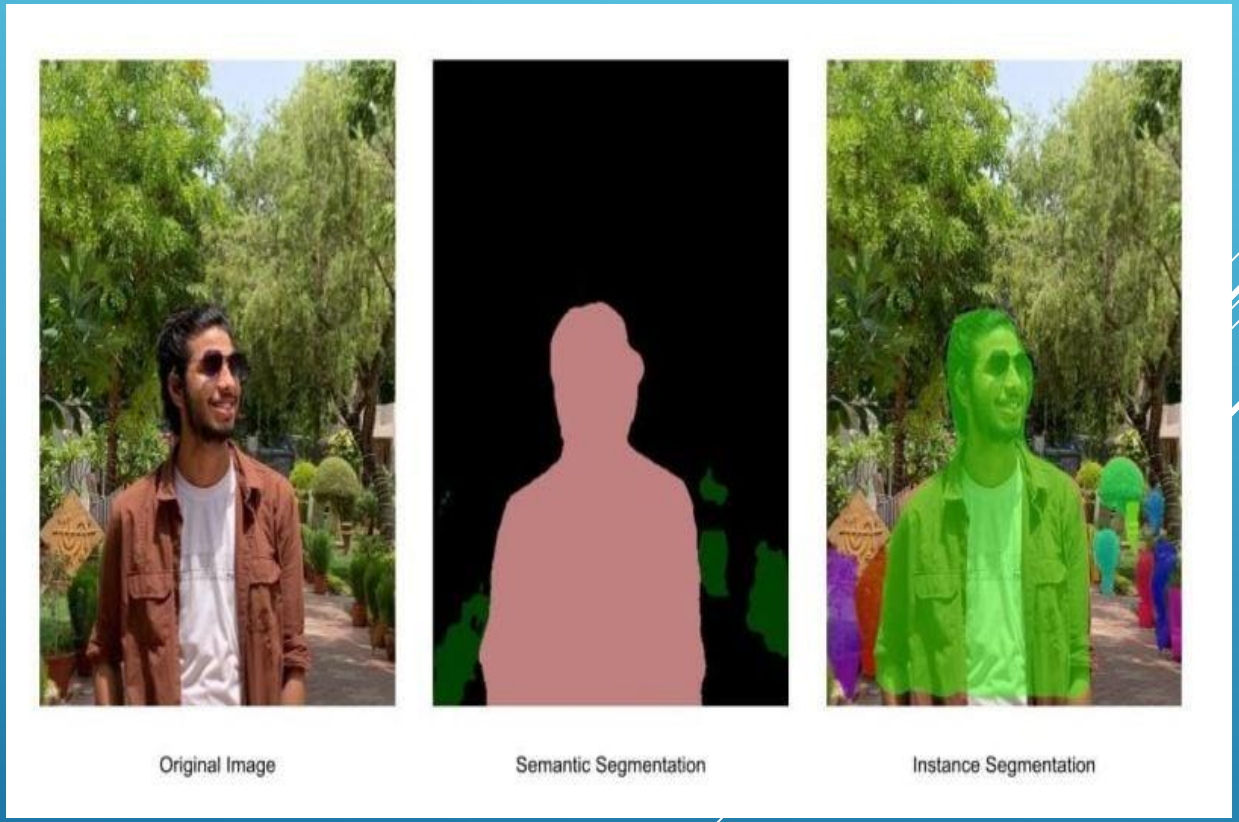


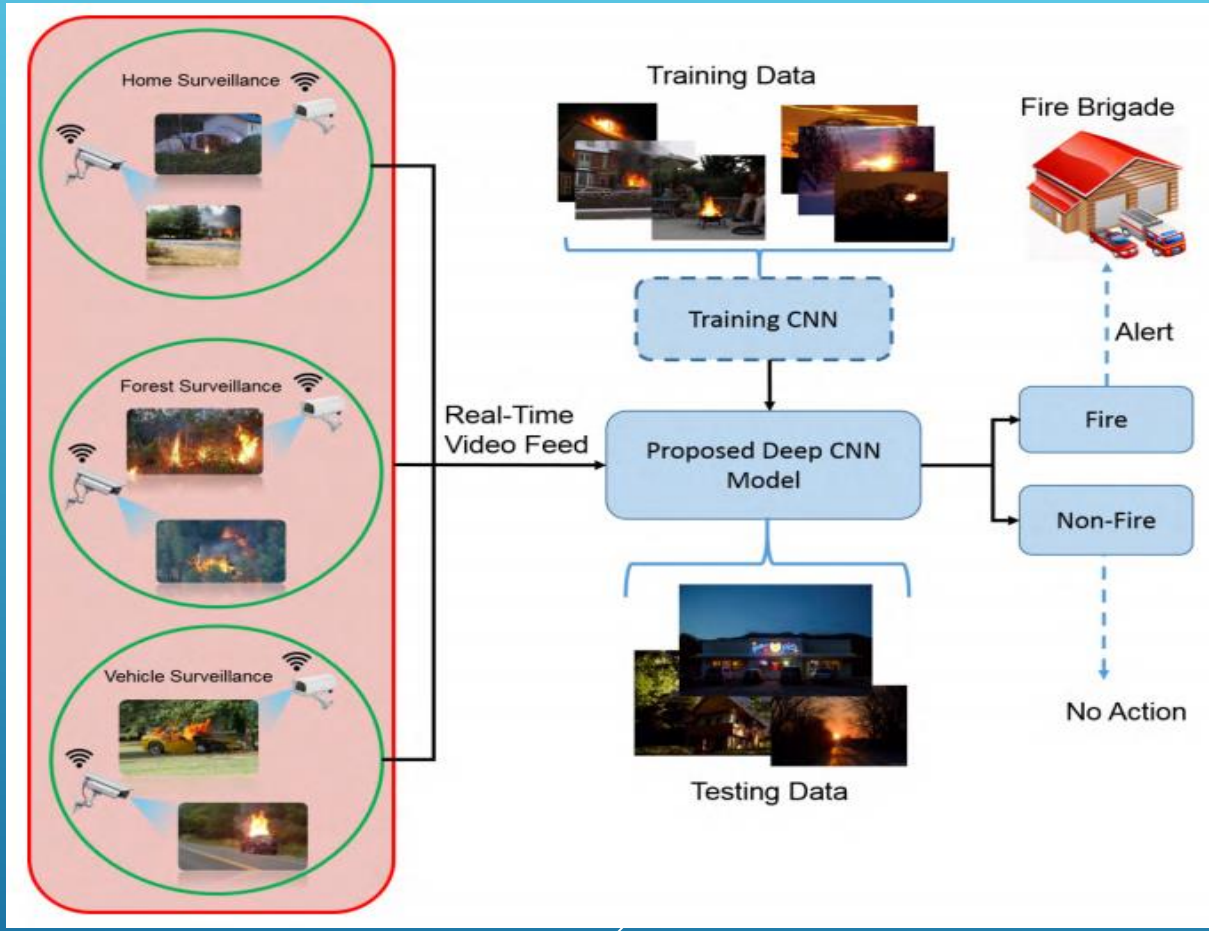
Image segmentation:

- Image segmentation is like telling a computer to pick out different parts in a picture. Instead of understanding everything at once, it separates the picture into meaningful sections.
- First, the computer learns by looking at labeled pictures, showing each part.
- After learning, it can outline and group different areas in new pictures. Image segmentation is used in medical pictures to find organs, helps self-driving cars understand the road, and assists in video editing by separating the main things from the background.
- The goal is to let the computer recognize and outline specific parts in pictures.



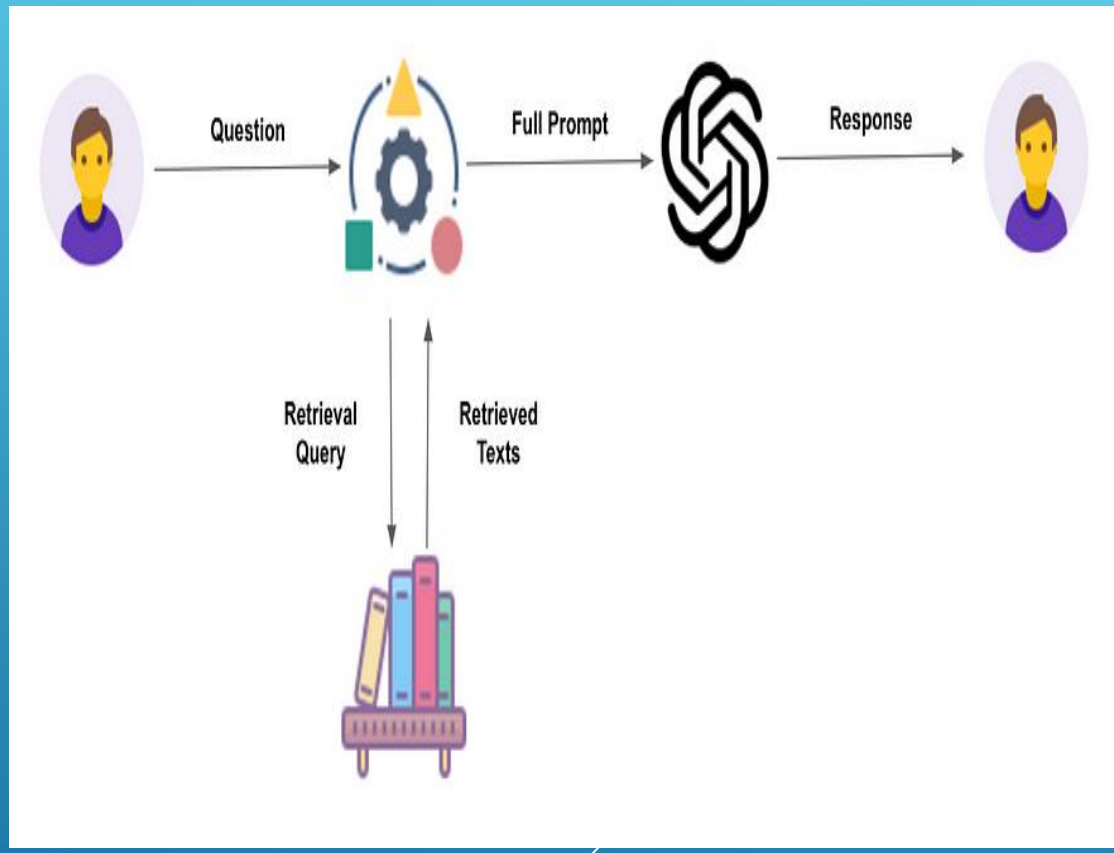
Video Analytics:

- Video Analytics, or intelligent video analytics, is software designed to analyze large amounts of video content and identify specific events it has been programmed to detect.
- This software processes video data from various sources, with CCTV cameras being a common example, especially in security applications.
- Instead of just watching the videos, the software is trained to recognize predefined events or patterns, providing valuable insights from unstructured video data.
- This technology is widely used for security surveillance, allowing automated monitoring and alerting based on programmed criteria.



IMPORTANCE OF EFFECTIVE IMAGE AND VIDEO RETRIEVAL SYSTEMS:

- Effective systems that find images and videos are crucial in many areas. They help make things easier to access, improve how users experience technology, and make decision-making smoother.
- These systems are especially useful in healthcare, law enforcement, and research, where quickly getting visual information is really important.
- In business, they help with smart decision-making, studying markets, and staying competitive.
- These systems also push advancements in technology like AI, robotics, and better search engines. Being able to organize and get visual content fast gives a competitive edge, making users happier and sparking innovation.



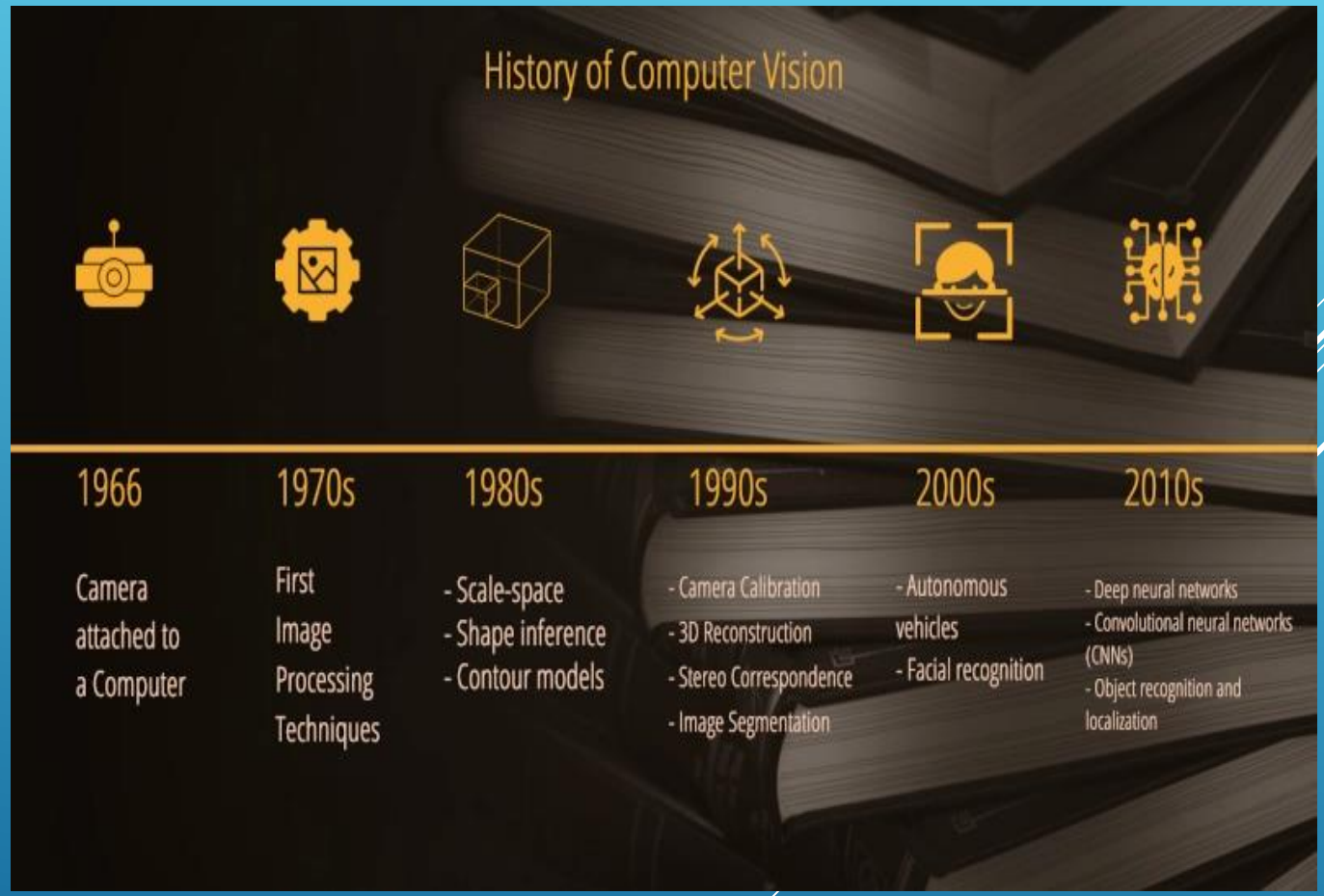
Historical Perspective and Evolution of Computer Vision Information Retrieval:

Early Stages (1950s-1960s):

- The origins of computer vision and information retrieval can be traced back to the 1950s and 1960s.
- Initial developments focused on basic image processing techniques and early attempts at machine vision.

1970s-1980s:

- Research expanded into computer vision applications for industrial automation and quality control.
- The foundation for information retrieval systems began with text-based approaches, paving the way for more complex visual data



1990s:

- Content-based image retrieval (CBIR) gained attention, allowing users to search for images based on visual features rather than just text annotations.
- The concept of indexing and retrieving visual information became more prominent.

Early 2000s:

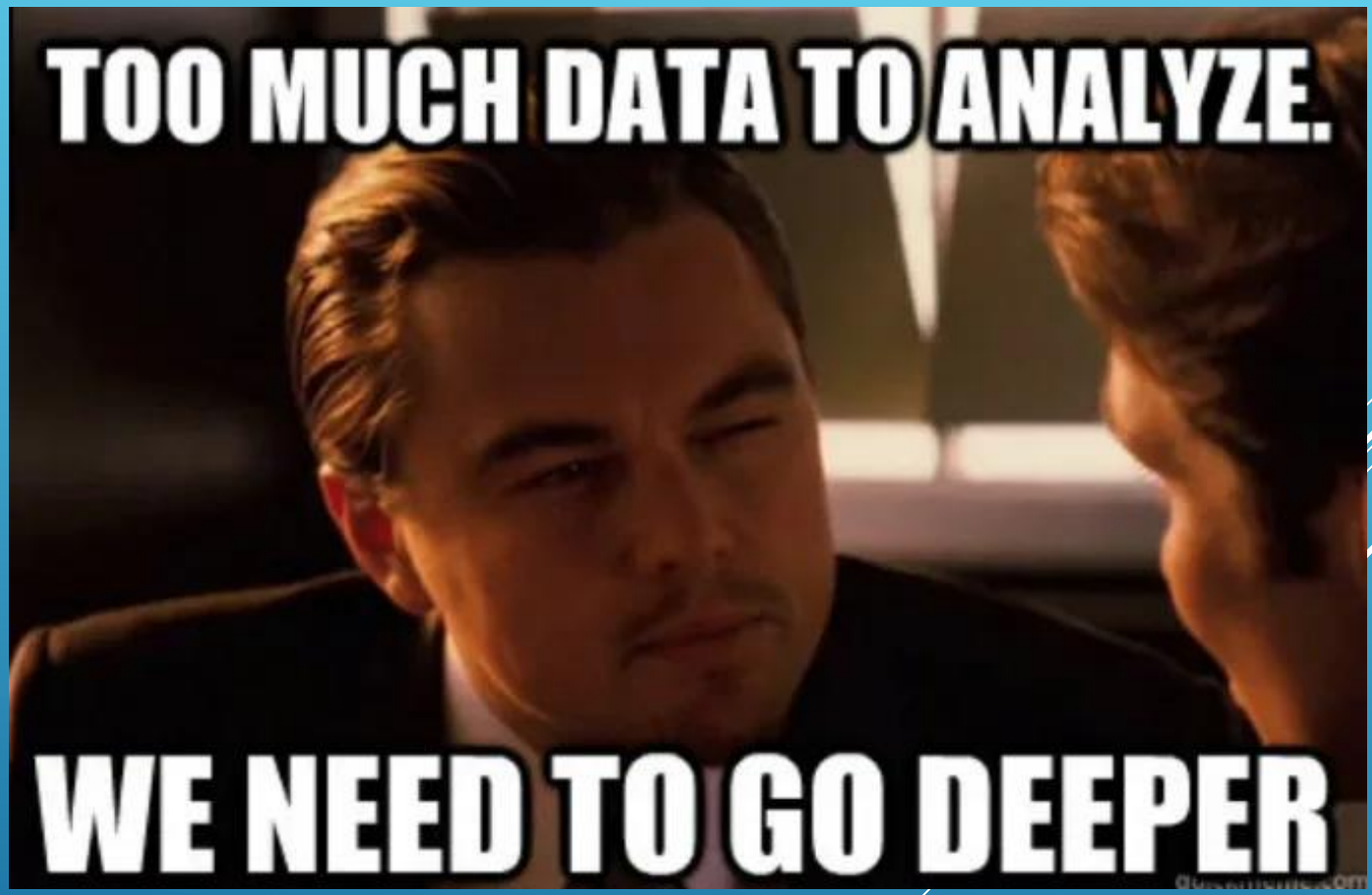
- Advancements in machine learning, especially in computer vision, led to improved image recognition and object detection.
- Integration of computer vision with traditional information retrieval systems started to emerge.

2010s:

- Deep learning, particularly Convolutional Neural Networks (CNNs), revolutionized computer vision, significantly improving image understanding.
- The focus shifted towards multimodal information retrieval, combining text and visual data for more comprehensive search capabilities.

Present (2020s):

- Computer vision and information retrieval are integral components of various technologies, from image search engines to recommendation systems.
- Continued research addresses challenges like scalability, interpretability, and cross-modal retrieval.



Thank you