Cognitive Computing: Architecture, Technologies, and Intelligent Applications

Overview

In this presentation, we will go over the following topics:

- Understanding cognitive processes
- Defining cognitive computing
- Artificial intelligence
- Big data
- Use Cases

What Is a Cognitive Process?

A **cognitive process** is the process of acquiring knowledge through thoughts, experiences, and senses.

This information helps humans make informed decisions based on past and current data and then discovering patterns, an important concept.

Defining Cognitive Computing

Cognitive computing is when a system is built to use AI and machine learning models to mimic the way a brain thinks and works.

Essentially, it’s trying to programmatically replicate the thinking processes of a human brain.

Similar Topics

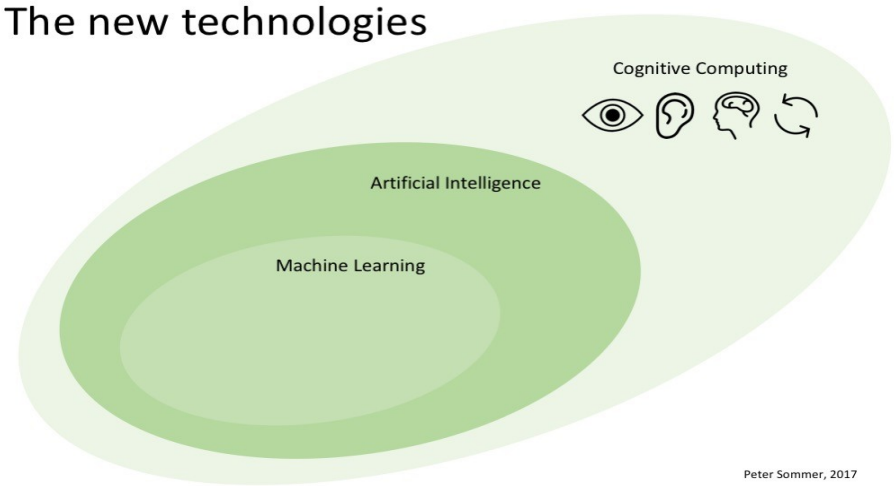
Cognitive computing is often mixed up with two other similar topics: machine learning and artificial intelligence

Artificial Intelligence – When machines can make informed decisions to carry out actions.

Machine Learning – An application of AI where data in taken in and processed through algorithms and models.

Similar Topics

Though different, both machine learning and AI are parts of what make up cognitive computing.



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Artificial Intelligence

Artificial intelligence are the algorithms that analyze data and make decisions.

Play a significant role in **pattern recognition**, which determines whether a possible decision is good or bad.

Kinds of AI

Weak AI

- When a system is built for the purpose of only carrying out one function.

Strong AI

- When a system can carry out multiple functions at once.
- More dynamic, or can change actions based on new data

The Goal of Cognitive Computing

A goal of cognitive computing is to create a **strong AI**. This can allow a more dynamic system and provide:

- Accurate pattern detection
- Better informed decisions

Big Data

Big data is an important component of cognitive computing. **Big data** provides a large dataset that can be analyzed computationally to show a pattern with human behavior.

It can process two kinds of data:

1. Structured data
2. Unstructured data

Structured vs. Unstructured Data

Structured Data

- Is repetitive and easily predictable
- Has a universal or well-known data pattern
  - SQL or MySQL
  - Relational data
  - Document based data

Unstructured Data

- Random, difficult to process
- Often include large files
  - Videos
  - Real-time data
- Challenging to detect a pattern

Why Unstructured Data is Key

Though structured data is easier for cognitive systems to process, **unstructured data** is more realistic.

- Humans are random, the signals we broadcast are often abstract to a computer system i.e. difficult to calculate
  - Emotions
  - Context
  - Morals

Being able to calculate patterns from unstructured data strengthens a cognitive system immensely.

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Case Studies

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Self-Driving Vehicles and Roundabouts

Cognitive computing was studied in self-driving vehicles in hopes of decreasing the amount of accidents that occur in roundabouts.

The study focused on using Internet of Things (IoT) devices to send signals that tell a self-driving car when it's safe to enter a roundabout or not.

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Self-Driving Vehicles and Roundabouts

One device was in the roundabout and sends signal to a device in the vehicle.

Cognitive computing was used…

- To calculate if a self-driving car was safe to proceed based on past and current data.
- To calculate if a driver was a more aggressive or conservative driver.

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Rainfall Prediction

Cognitive computing was used to predict rainfall in India. This was critical in determining **monsoon periods**, which can be catastrophic to farming and villages.

Used external data such as temperature, wind speed, and previous data models to determine when and for how long a monsoon will occur.

Customer Co-Innovation

Co-innovation is when a company works directly with its partners to solve business problems.

Focuses on the analysis of **unstructured data** in three stages:

1. Idea generation
2. Idea integration
3. Idea evaluation

Customer Co-Innovation

Cognitive computing is able to allow more co-innovation by programmatically stepping through those three stages.

This will allow a cognitive system to provide clearer and more accurate insights to the data given by a company.

Smart Crowd Management

Focuses on the use of cognitive computing to determine threats and dangerous situations in a crowd before it happens.

The creation of this system was inspired by an unfortunate event that happened at a concert in Venezuela, where a stampede occurred and killed 4 people.

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Smart Crowd Management

The cognitive system processes **unstructured data**

- System analyzes surveillance video feed
- Peoples' movements are unpredictable

The solution to this challenge is implementing **deep learning**. Multiple deep learning patterns were used

- Able to identify individuals that walk against the flow of a crowd

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Conclusion

Cognitive computing incorporates artificial intelligence and big data to make well informed decisions.

Allows for computers to handle smaller problems so humans can focus their attention on solving bigger ones.

An application for cognitive computing can be found in everyday life.

References

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