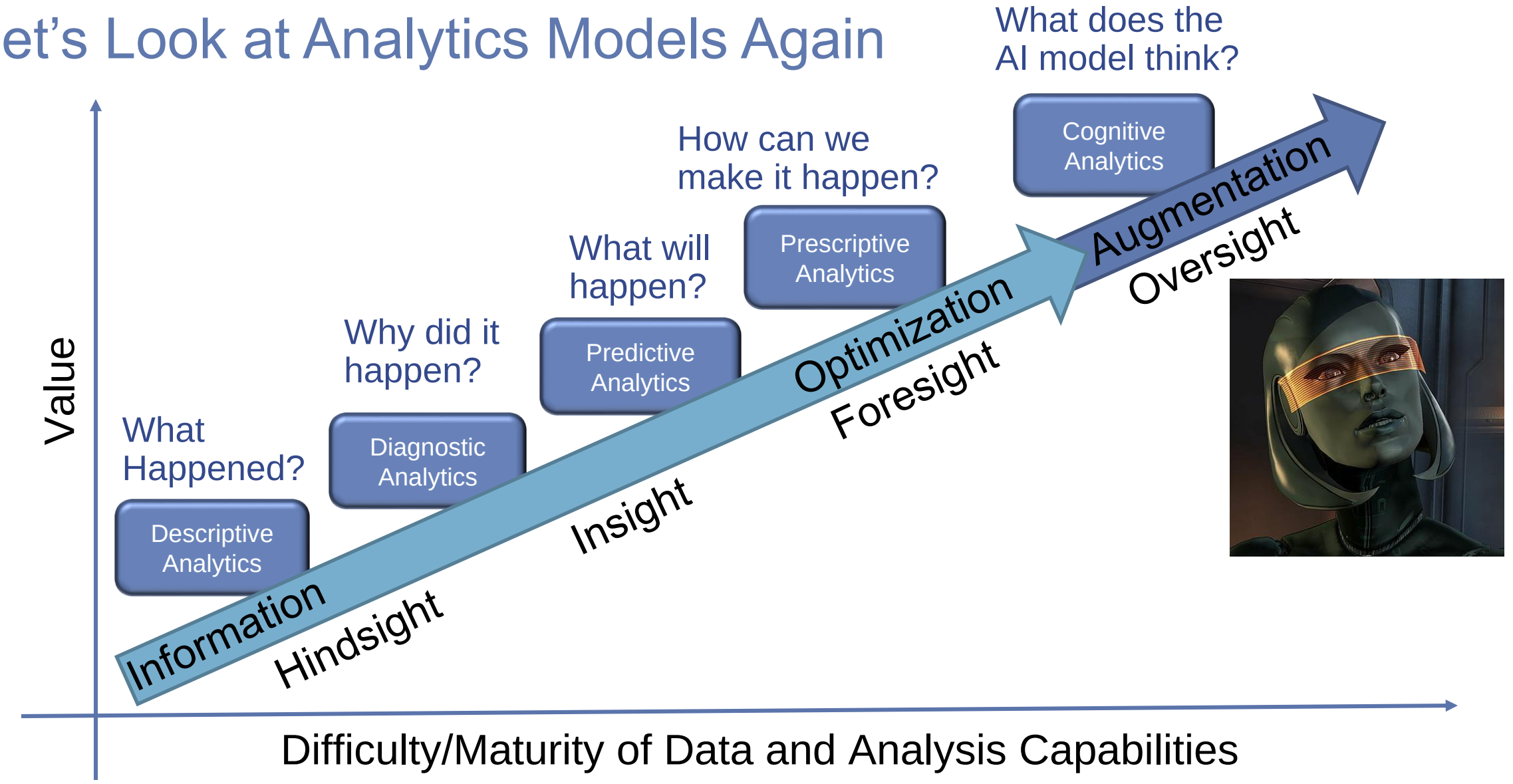
CS3121 - Introduction to Data Science

Cognitive Analytics

Dr. Nisansa de Silva,
Department of Computer Science & Engineering
http://nisansads.staff.uom.lk/

Let's Look at Analytics Models Again



Cognitive Analytics

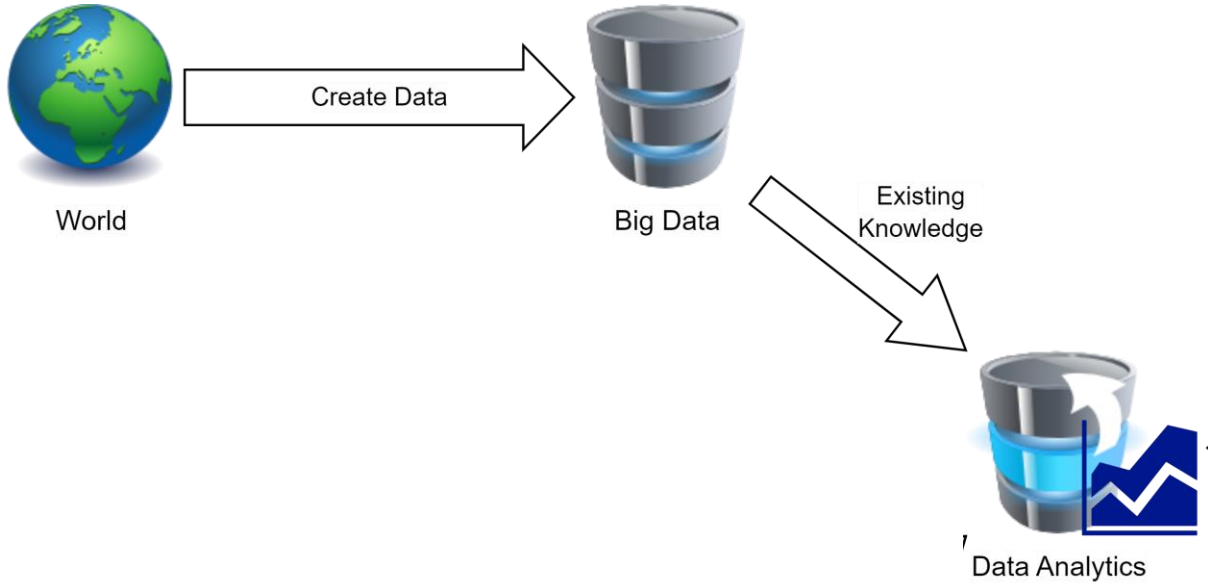
- Cognition is the mental action or process of acquiring knowledge by understanding true thought, experience and the senses.
- Cognitive processes use existing knowledge and **generate new knowledge**.
- The Purpose of cognitive computing is to perform tasks that only humans used to be able to do.
- It augments human capabilities (As opposed to AI which just automates)

Cognitive Analytics

- Cognitive analytics reveals certain patterns and connections that simple analytics cannot.
- Cognitive computing allows a wide variety of problems previously incapable of being solved by fixed program instructions to be calculable and estimable.
- Cognitive analytics can be thought of as **analytics with human-like intelligence** applied to certain tasks, and brings together a number of intelligent technologies, including:
  - Semantics
  - Artificial intelligence algorithms
  - Deep learning
  - Machine learning.
- This allows a **cognitive application to improve over time**.

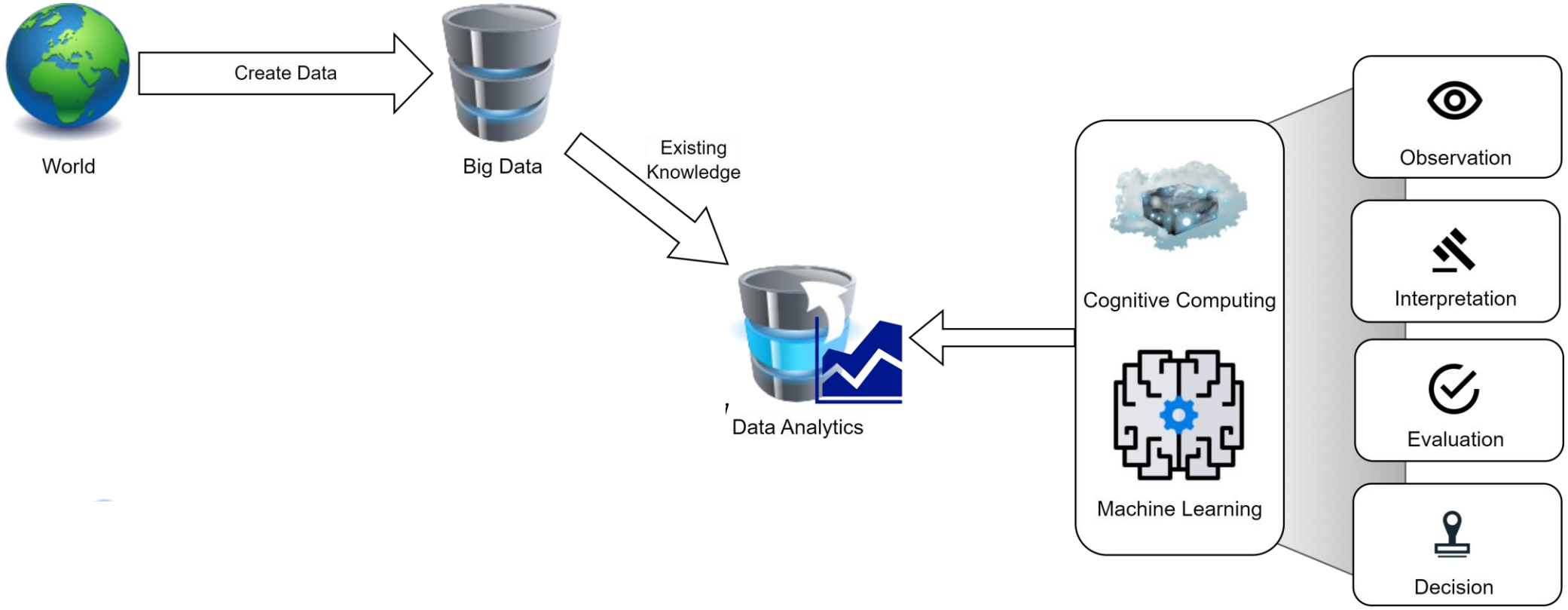
Cognitive Analytics

Combining Artificial Intelligence (AI) and Data Analytics



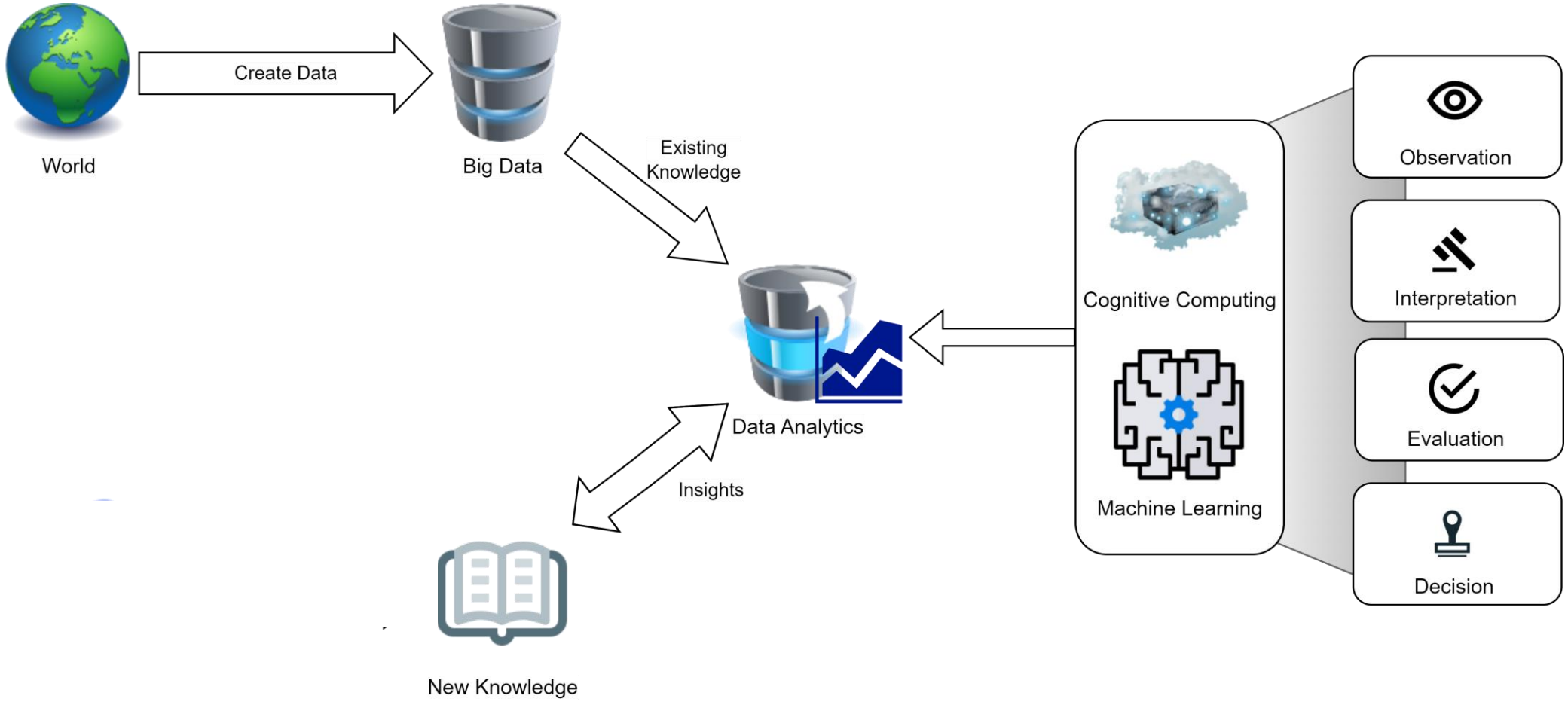
Cognitive Analytics

Combining Artificial Intelligence (AI) and Data Analytics



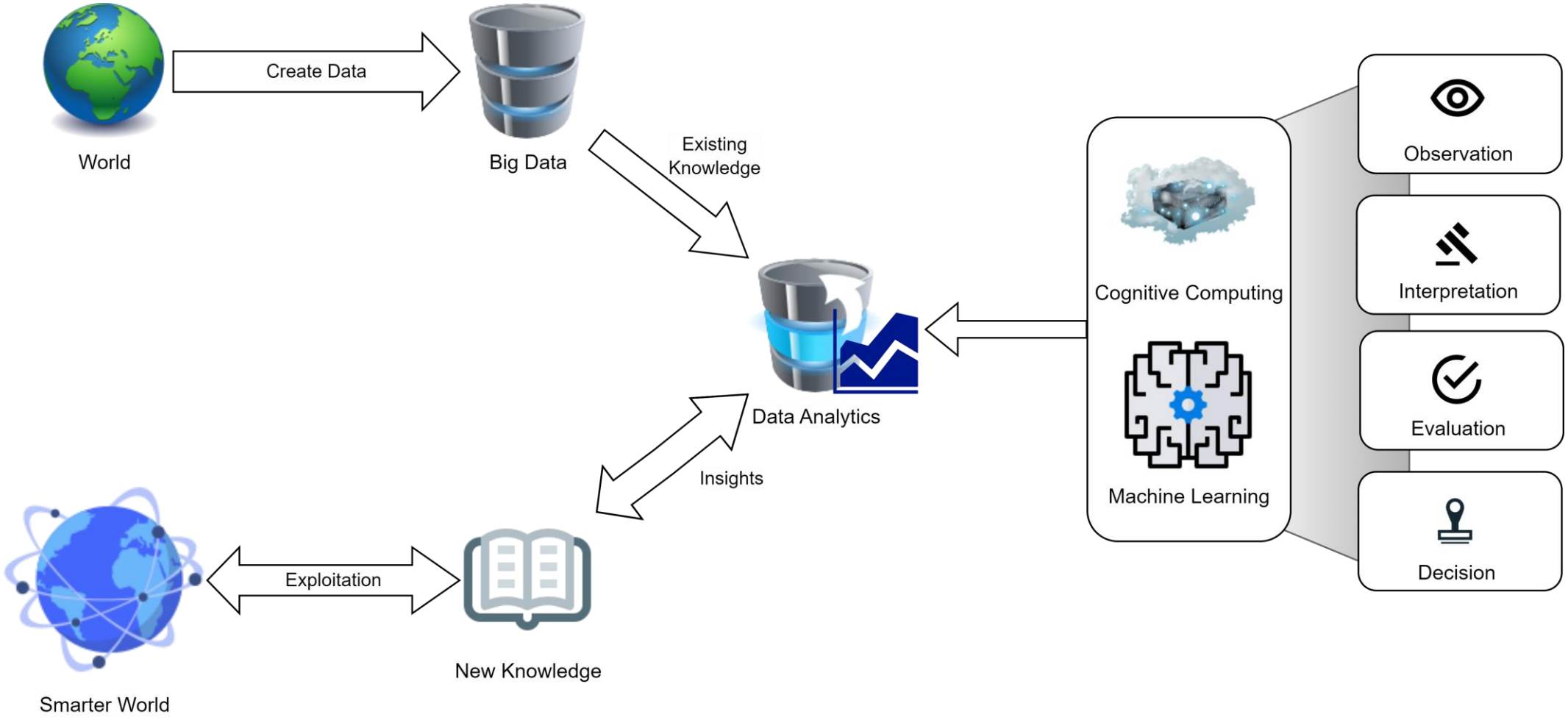
Cognitive Analytics

Combining Artificial Intelligence (AI) and Data Analytics



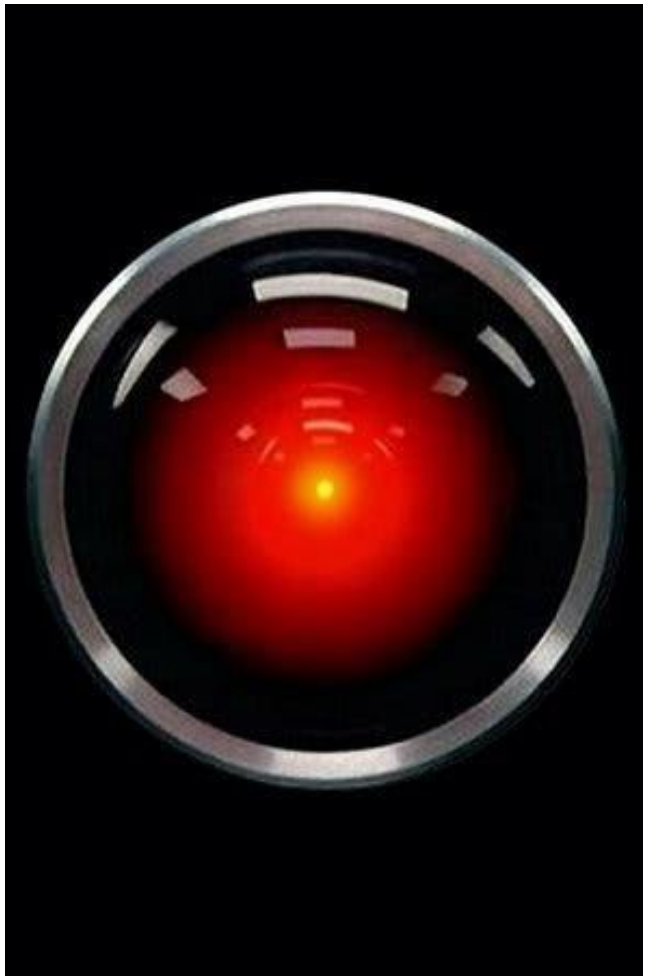
Cognitive Analytics

Combining Artificial Intelligence (AI) and Data Analytics



Cognitive Analytics

- It uses several visual perceptions, speech recognition, decision-making and NLP (Natural Language Processing) concepts to make sense of previously untapped data from rich sources such as conversational logs, feedback, reviews, social media and so on.
- Applying such techniques, a cognitive application can **get smarter and more effective over time by (self) learning** from its interactions with data and with humans.
- Inferences are not structured queries based on a rules database, rather could be **unstructured hypotheses** gathered from several data sources and expressed with varying degrees of **confidence level**.



Cognitive Analytics

- Cognitive Analytics is intelligent technology that **covers multiple analytical techniques** to analyze large data sets and give **structure to the unstructured data**.
- Cognitive analytics system searches through the data that exists in its knowledge base **to find solutions that make sense for the questions posed**.
- A cognitive system can create competitive advantage to business, providing **real-time answers** with the ability to:
  - Search through massive amounts of information
  - Making sense of context and meaning of a sentence
  - Computing the most likely answer.
  - Recognizing certain objects in an image given large amounts of information.

Cognitive Analytics

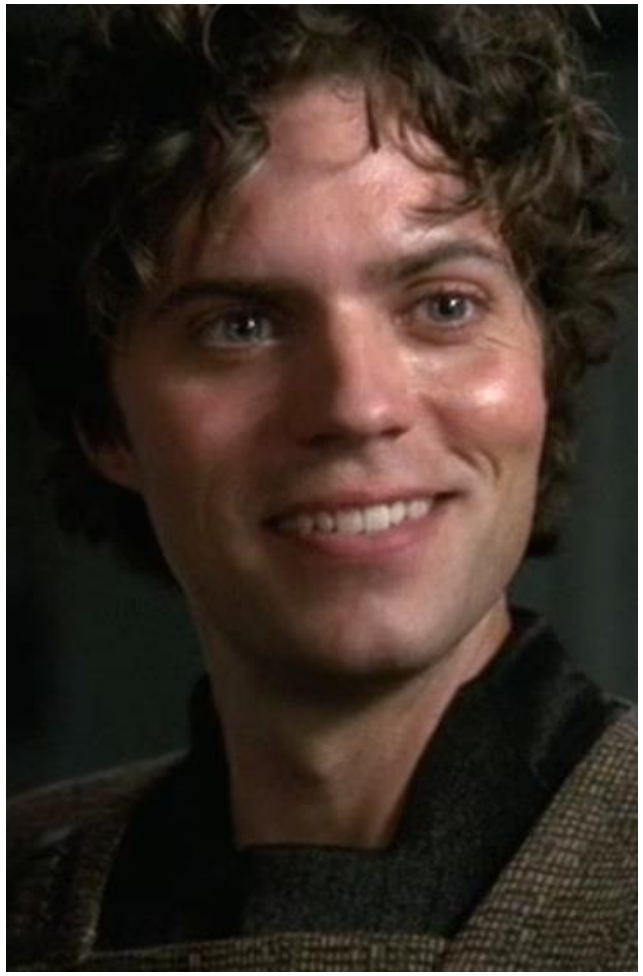
- An organization might use cognitive analytics to **monitor their customer behavior patterns** and emerging trends. This way the organization can predict future outcomes and plan their objectives accordingly to improve their performance.
- Some sections of **cognitive analytics also fall under predictive analytics**, where data in business intelligence is used to make predictions.

How Does Cognitive Computing Work?

- **Adaptive:**
  - Flexible systems which learn as information changes in tandem with the evolution of goals and requirements.
  - Cognitive applications must be adaptive in nature.
  - Capable of integrating latest or frequently changing data feeds like real-time, or near real-time, to master ambiguity and unpredictability.
- **Interactive:**
  - The cognitive system must be able to interact easily with users so that users can define their needs comfortably.
  - Similarly, it must also interact with other processors, devices, and Cloud services..

How Does Cognitive Computing Work?

- **Iterative:**
  - Iterative process to solve problems which are ambiguous
  - The system should remember previous interactions in a process.
  - It should be able to define the problem by asking questions or finding an additional source.
  - For this, ensure that the cognitive system is always provided with enough validated quality information and that the data sources it operates are reliable and up to date.
- **Stateful:**
  - The system should return information that is suitable for the specific application at that point in time.



How Does Cognitive Computing Work?

- **Contextual:**
  - Cognitive applications should be able to understand, identify, and extract contextual elements such as meaning, syntax, time, location, appropriate domain, process, task and goal.
  - It must draw on multiple sources of information, including both structured and unstructured digital information.
- **Dark Data Compatibility:**
  - Cognitive computing systems should be able to deal with “dark data” such as social media postings, EMR notes, fitness device readings, unstructured images, videos and the digital or non-digital documents generated by users in day to day life.
  - Cognitive Computing applications process such multi-structured and unstructured dark data along with structured information to pull out non-obvious insights and subject it to analytics.

Real-Life Applications of Cognitive Analytics

- The medical industry is now starting to use cognitive analytics to match its patients with the best possible treatments.
- Some examples of cognitive analytics which are in use today include Microsoft's Cortana, Apple's Siri, and IBM's Watson.
- Organizations are using cognitive analytics to tap into unstructured data sources such as images, emails, text documents, and social posts.
- Though cognitive analytics is still in its infancy, it may be the solution to finding real-time answers for large amounts of diverse data, and bringing a paradigm shift from traditional analytics.

Real-Life Applications of Cognitive Analytics

Cognitive Analytics: Pros and Cons

Advantages

- Reduction in Human Error
- Prevention of wrong decision by machines.
- Available 24x7
- Helping in Repetitive Jobs
- Digital Assistance
- Faster Decisions

Disadvantages

- Security
- Change management
- Lengthy and Costly development cycles
- Making Humans Lazy
- No Emotions
- Unemployment
- Lacking Out of Box Thinking

References

- Prescriptive and Cognitive Analytics slides by Dr Shehan Perera
- Harnessing the power of Cognitive Analytics to reinvent your business by 10xDS
- Cognitive Analytics - combining Artificial Intelligence (AI) and Data Analytics by Cognitive Analytics Research Lab, Ulster University
- Cognitive computing by Kripapious