Introduction to Artificial Intelligence & Industry use cases

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Agenda

- Why should you care about AI
- What is AI: history & terminology
- Use cases and real world examples of AI

"Artificial Intelligence (AI) is an area of computer science that emphasizes the creation of intelligent machines that work and react like humans."

"The capability of a machine to imitate the intelligent human behavior."

Why should you care about Artificial Intelligence?

Your customers are beginning to care more about AI….

61%

AI will be most significant initiative in the next year*

53%

AI will lead future digitization efforts**

44%

Annual Growth Rate

The artificial intelligence TAM is projected to be greater that **$50 Billion** by 2021

01

Relevancy with customers

02

Greater margin deals

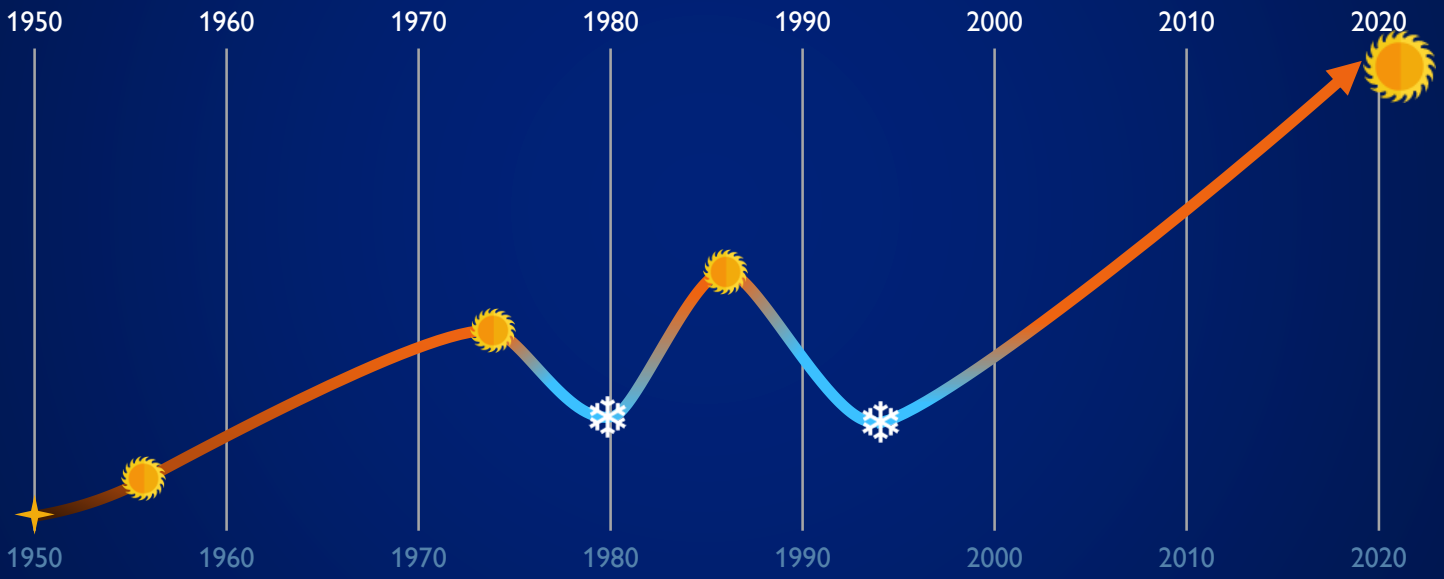
03

Growth opportunities

Why should you care about Artificial Intelligence?

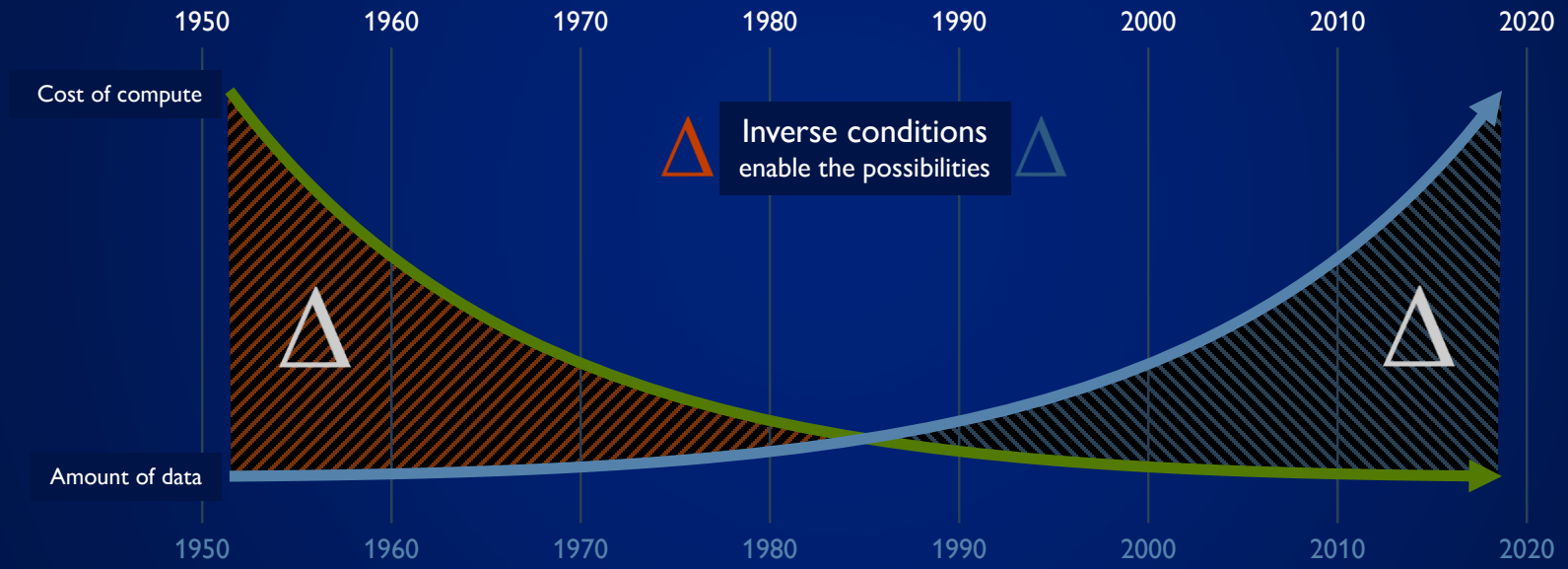
Brief history of Artificial Intelligence

What makes this time any different?

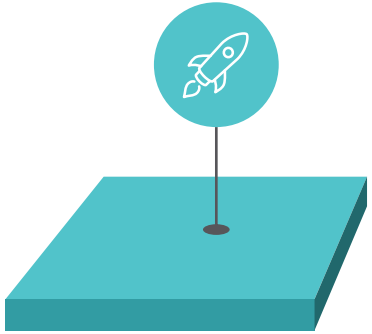


Timing is everything …

What makes this time any different?



How AI fits into the larger Data Analytics story

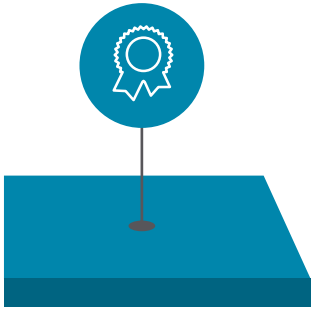


Early stage: Point usage

- Batch oriented jobs
- Targeting 1 use case then moving to others
- Looking for Proof-of-value
- Initiating organizational processes transformation to be data driven
- Looking for alternatives to overrun traditional approaches

Mid stage: Operational maturity

- Interactive and Real-time use-cases
- Data lake philosophy
- Multiple use cases & multiple clusters
- Greater experimentation: multiple hadoop distro; transient workloads
- Solutions that solve business problems
- Solutions that are easy to manage and maintain in production
- More deeply integrating BI tools & processes (ex. Federated Queries)



Advanced stage: advanced analytics & mature consumption models

- Fast real-time use-cases
- Deep Learning / Machine Learning
- On-demand Analytics and Hadoop instances
- Bursting Analytics and Hadoop workloads to Cloud
- Service Provider scale multi-tenant offering
- Entire business models based on tech-approach / system of engagement

What is AI, machine learning and deep learning?

01

Artificial Intelligence (AI)

Artificial Intelligence (AI) is the designing and building of intelligent agents that receive percepts from the environment and take actions that affect that environment.

Russel & Norvig, "Artificial Intelligence: A Modern Approach," 2000

02

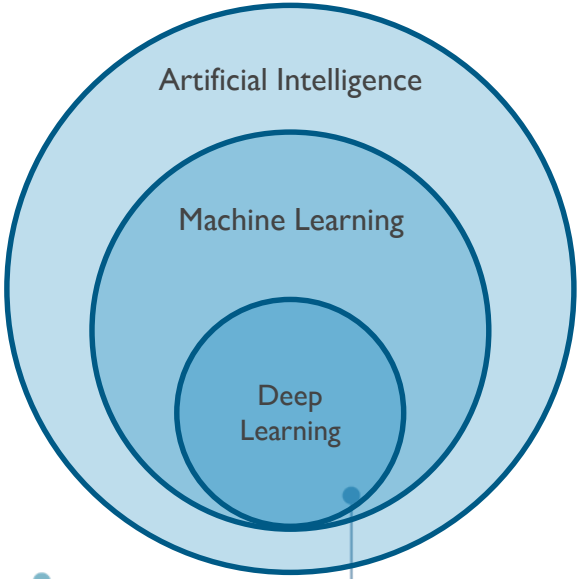
Machine Learning (ML)

Machine Learning (ML) is an application of AI where systems use data to learn how to respond, rather than being explicitly programmed.

03

Deep Learning (DL)

Deep Learning (DL) is a form of ML which uses Artificial Neural Networks



 Artificial Intelligence	 Machine Learning	 Deep Learning
Artificial intelligence originated around 1950s.	Machine learning originated around 1960s.	Deep learning originated around 1970s.
AI represents simulated intelligence in machines.	Machine Learning is the practice of getting machines to make decisions without being programmed.	Deep Learning is the process of using Artificial Neural Networks to solve complex problems.
AI is a subset of Data Science.	Machine learning is a subset of AI & Data Science	Deep learning is a subset of Machine learning, AI & Data Science.
Aim is to build machines which are capable of thinking like humans.	Aim is to make machines learn through data so that they can solve problems.	Aim is to build neural networks that automatically discover patterns for feature detection.

In artificial intelligence (AI), a Turing Test is a method of inquiry for determining whether or not a computer is capable of thinking like a human being.

AI Terminology

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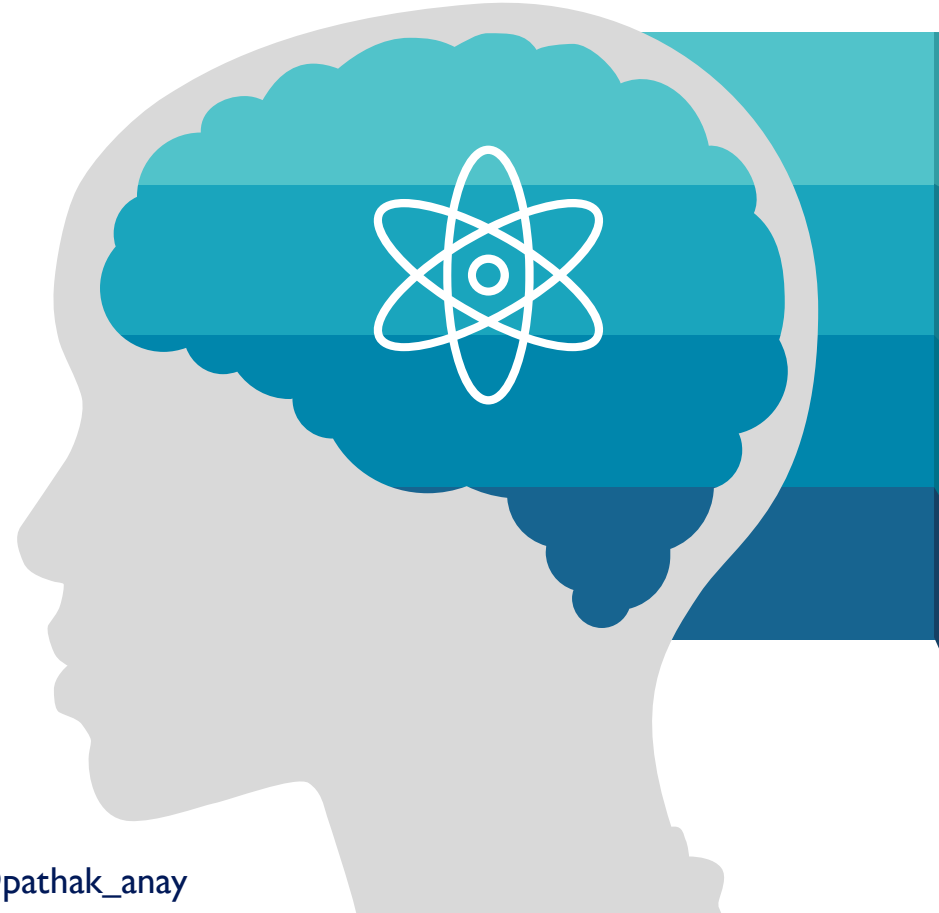
Importance of having foundation understanding



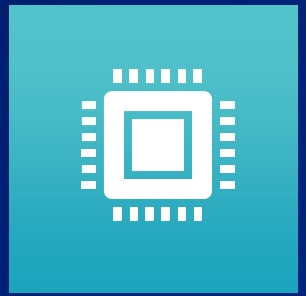
01 Be relatable to customers

02 Understand key pain points and develop opportunities

03 Be able to differentiate between machine learning & deep learning

04 Connect use cases to what you can offer

Machine Learning
vs.
Deep Learning



Training
vs.
Inference

Supervised
vs.
Unsupervised

Libraries
vs.
Frameworks

Machine Learning vs. Deep Learning: Characteristics

Machine Learning

- An algorithmic approach to achieve Artificial Intelligence
- Input data to concrete algorithms in order to train machine to learn how to roughly perform a task.

- Common algorithms include:
  - Decision tree learning
  - Inductive logic programming
  - Clustering
  - Reinforcement learning
  - Linear regression
  - Logistic regression

Deep Learning

- Applying data to neural networks with large numbers of layers and parameters to achieve Artificial Intelligence
- Does not required concrete algorithms to be applied to data.

- Common architectures include
  - Unsupervised pre-trained networks
  - Convolutional neural networks
  - Recurrent neural networks
  - Recursive neural networks

Machine Learning vs. Deep Learning

Machine Learning

How do you engineer the best features?

$N \times N$

$(f_1, f_2, \ldots, f_K)$

Roundness of face
Dist between eyes
Nose width
Eye socket depth
Cheek bone structure
Jaw line length
…etc.

CLASSIFIER ALGORITHM

SVM
Random Forest
Naïve Bayes
Decision Trees
Logistic Regression
Ensemble methods

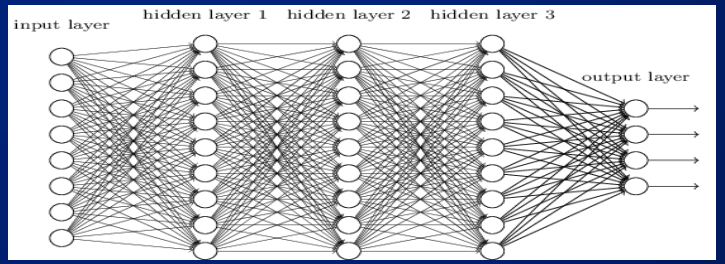
Arjun

Deep Learning

How do you guide the model to find the best features?

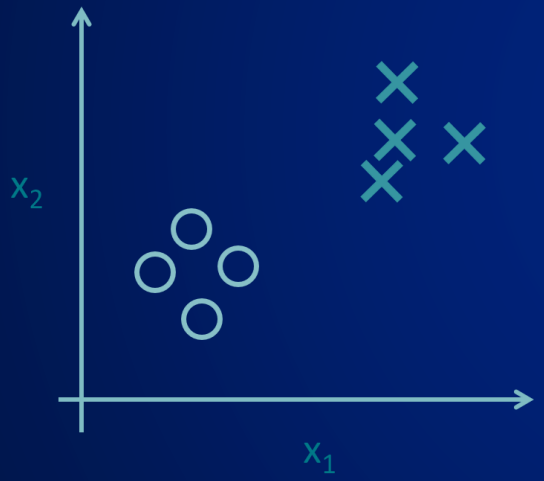
$N \times N$

NEURAL NETWORK



Arjun

Supervised Learning



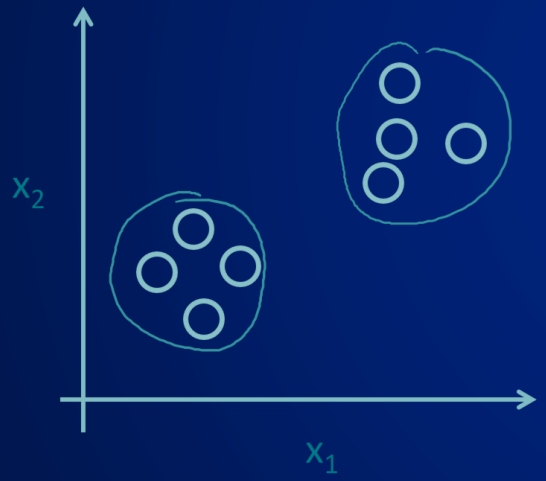
Supervised learning

Train network with known labeled data – Network learns identify known features

Image Classification: You train with images/labels. Then in the future you give a new image expecting that the computer will recognize the new object.

Market Prediction/Regression: You train the computer with historical market data and ask the computer to predict the new price in the future

Unsupervised Learning



Unsupervised learning

Train network with known unlabeled data – Network identifies the features

Clustering: You ask the computer to separate similar data into clusters, this is essential in research and science.

High Dimension Visualization: Use the computer to help us visualize high dimension data.

Generative Models: After a model captures the probability distribution of your input data, it will be able to generate more data. This can be very useful to make your classifier more robust

	Supervised Learning	Unsupervised Learning	Reinforcement Learning
Definition	The machine learns by using labelled data	The machine is trained on unlabelled data without any guidance	An agent interacts with its environment by producing actions & discovers errors or rewards
Type of problems	Regression & Classification	Association & Clustering	Reward based
Type of data	Labelled data	Unlabelled data	No pre-defined data
Training	External supervision	No supervision	No supervision
Approach	Map labelled input to known output	Understand patterns and discover output	Follow trail and error method
Popular algorithms	Linear regression, Logistic regression, Support Vector Machine, KNN, etc	K-means, C-means, etc	Q-Learning, SARSA, etc

What is a Neural Network

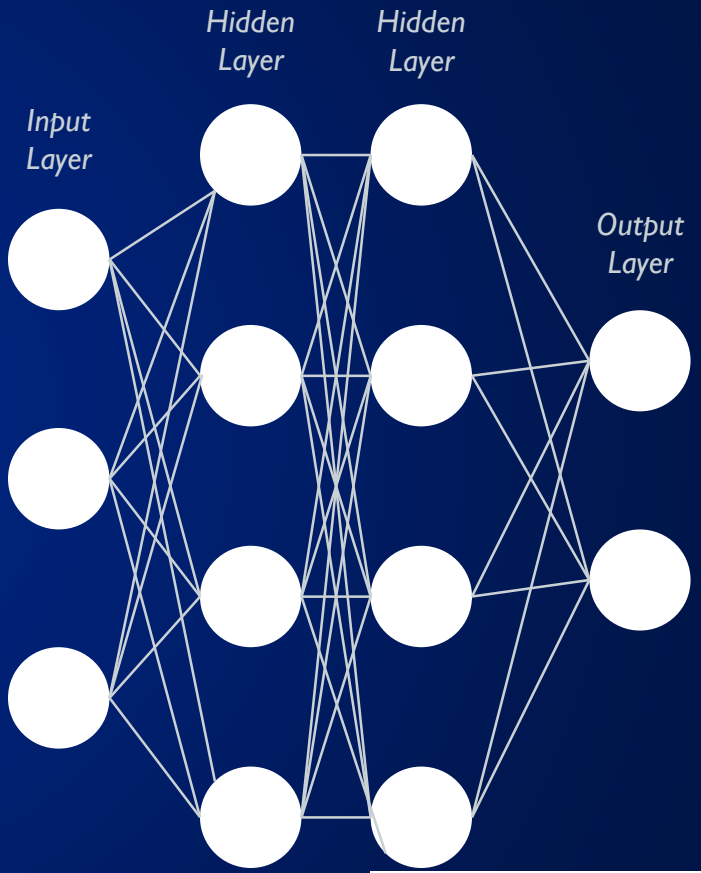
A **method of computing**, based on the interaction of multiple **connected processing elements**

Modeled loosely on the **human brain**, artificial neural networks enable computers to **learn from being fed data**

Comprised of one or more layer of **neurons**

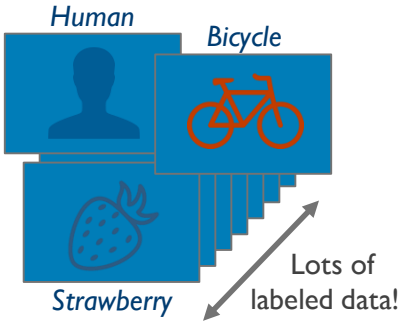
Types of neural networks include:

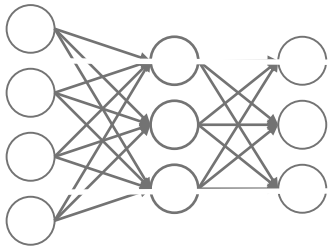
- **Connection type**
- **Topology**
- **Learning methods**



Training vs. Inference

Training





Forward
"Strawberry" **"Bicycle"**

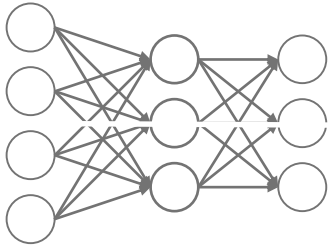
Backward

Error

Model weights

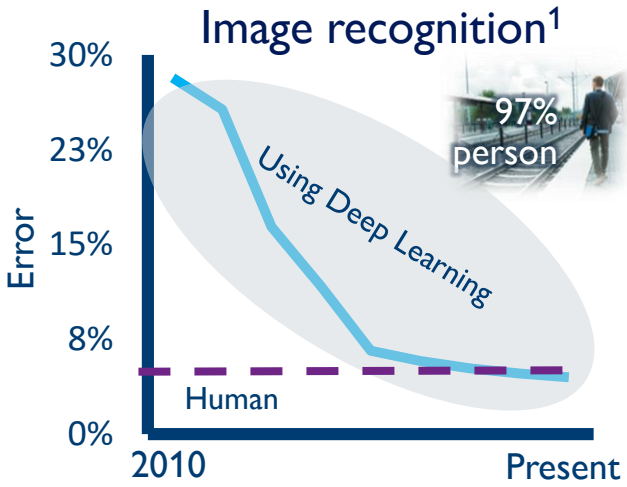
Inference

??????



Forward **"Bicycle"?**

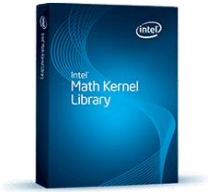
Machines able to meet or exceed human in Image Recognition



Libraries and Frameworks

- Libraries – Help accelerate development by simplifying complex processes or reducing repetitive operations
- Examples:
  - Intel Math Kernel Library (simplify linear algebra on x86)
  - Python Pandas (easy to use data structures and tools)

- Frameworks – Simplifies development by making workloads more portable, manageable, and smaller.
- Examples:
  - Tensorflow
  - Caffe



Use Cases & Examples

Artificial Intelligence Use Cases

Healthcare and life sciences	Financial Services	Government security	Media and entertainment	Energy	Transportation
Drug interaction	Fraud prevention	Facial recognition	Video captioning	Wind power generation	Autonomous vehicles
Cancer detection	Risk management	Video surveillance	Content-based search	Solar forecasts	Pedestrian and object detection
Chronic illness prediction	Investment predictions	Cyber security	Real-time translation	Oil production optimization	Lane tracking and traffic patterns
Drug discovery	Customer service	Satellite imagery	Language processing	Weather prediction	Preventative maintenance
Gene mutation	Digital assistants	Event prediction	Content suggestions	Prediction of consumption demand	Risk assessment
Sanitation	Network security	Emergency Services			

Thanks!

Do you have any questions?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