Fundamentals of Deep Learning
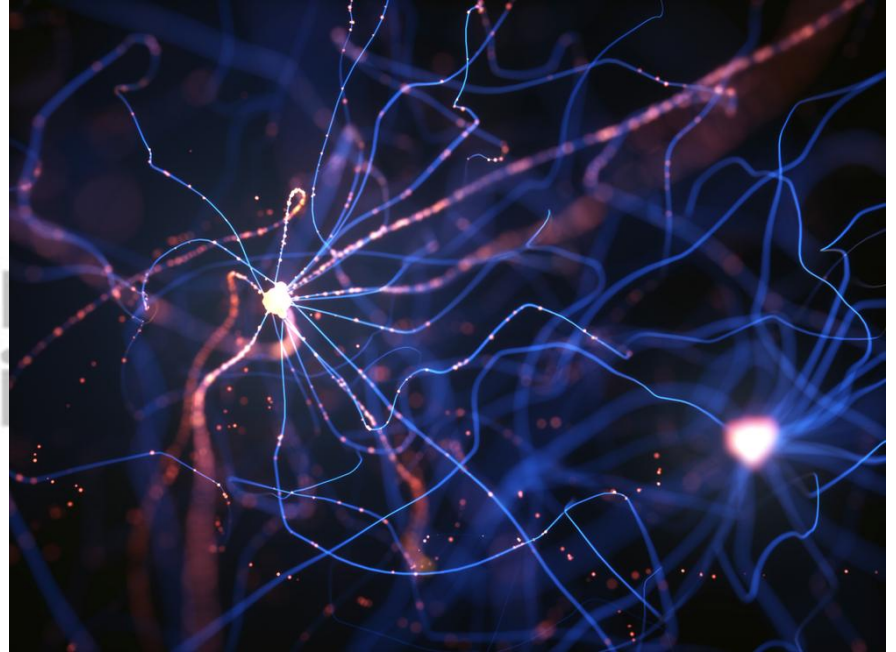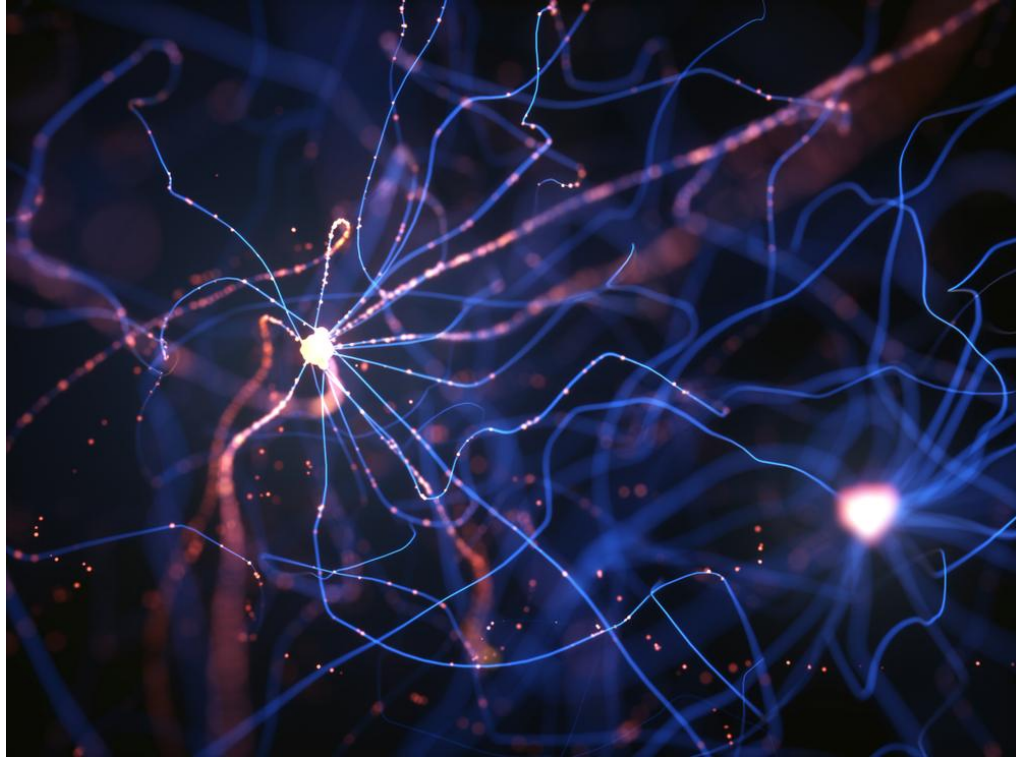
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What is Deep Learning?

Deep Learning is a type of Machine Learning

Machine Learning vs. Deep Learning

Input

Cat
Not Cat

Output

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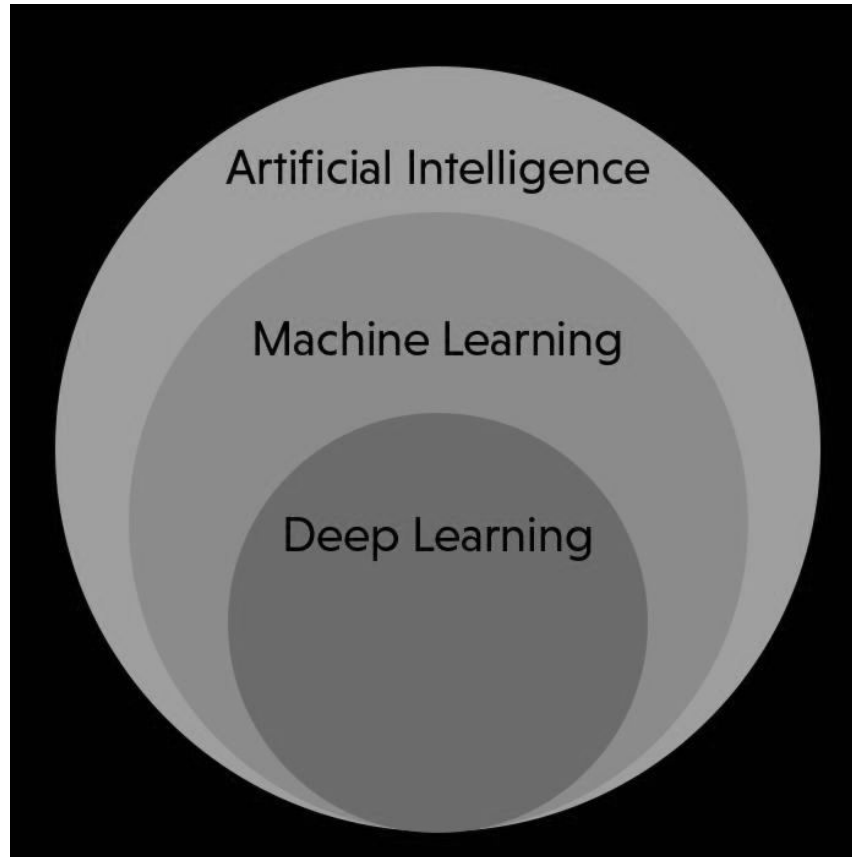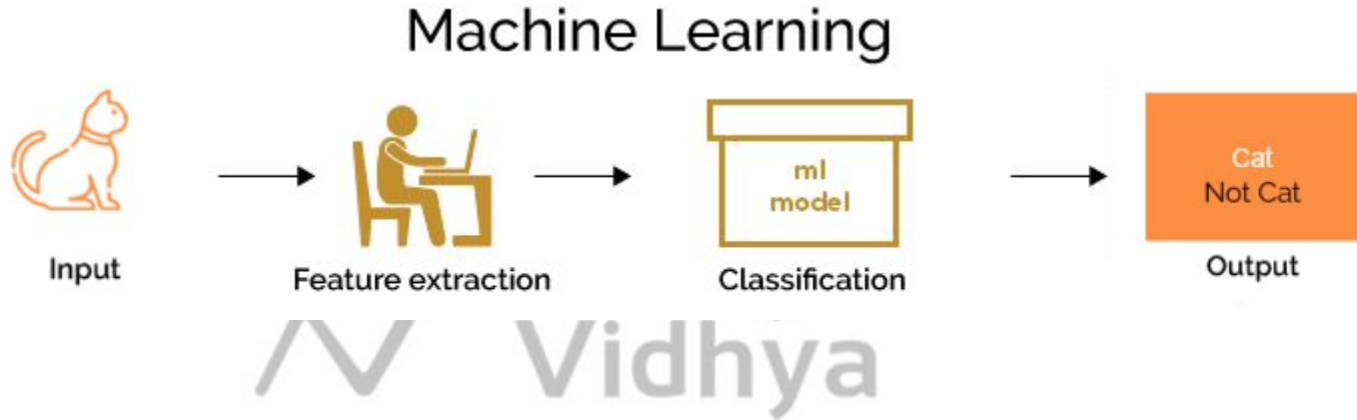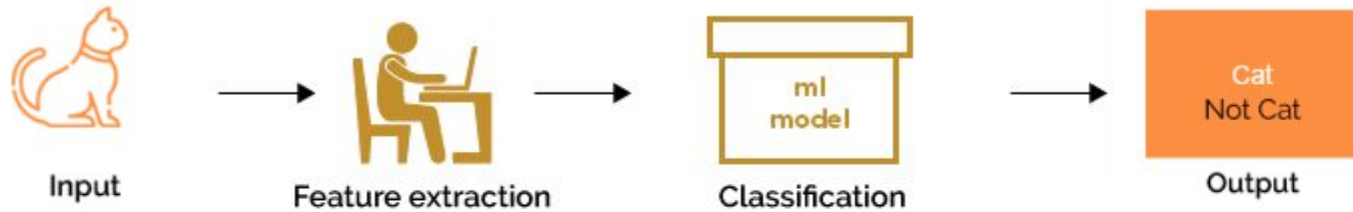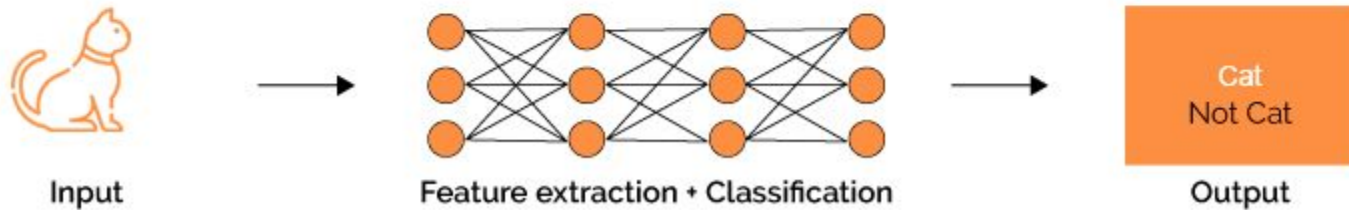
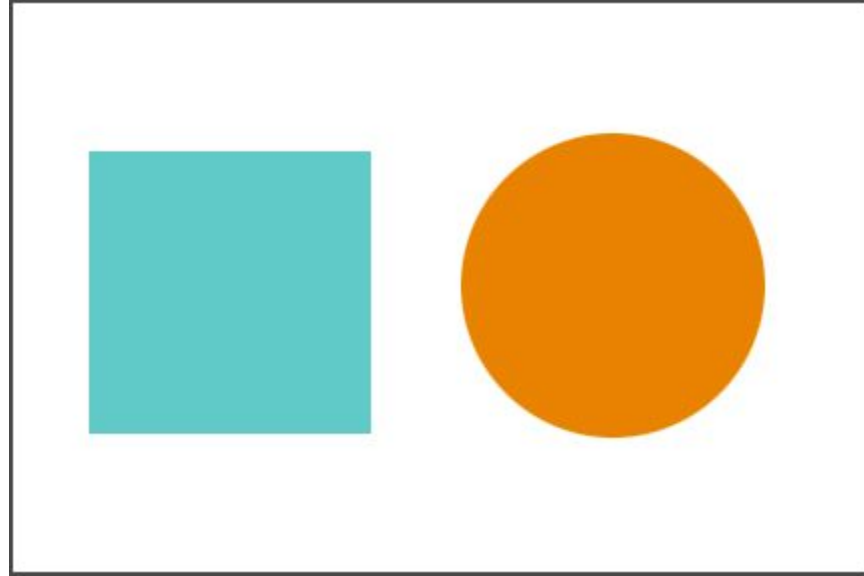# Machine Learning vs. Deep Learning

Machine Learning vs. Deep Learning
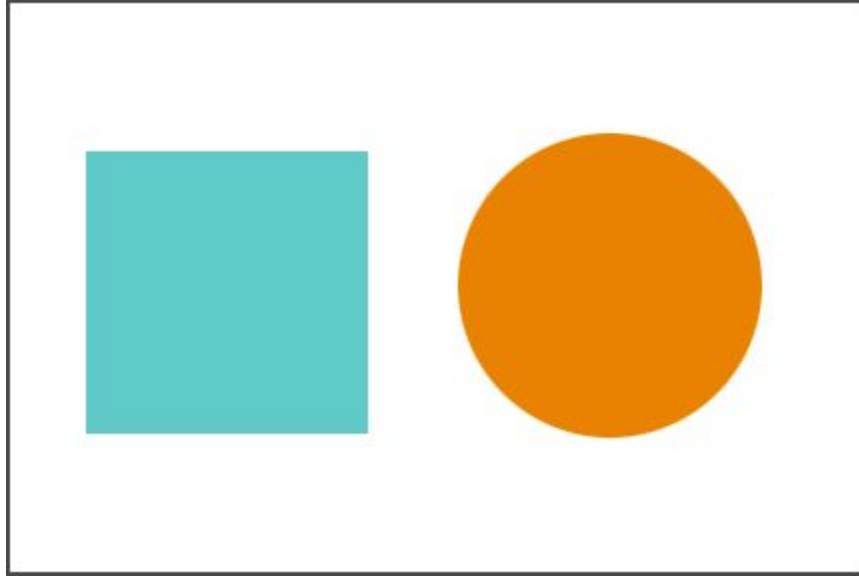
Represent the world as nested hierarchy of concepts

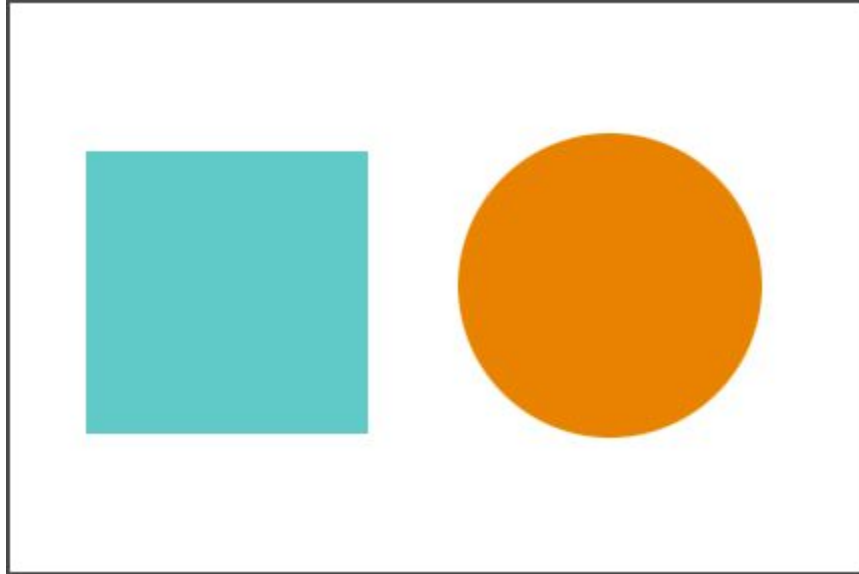# Represent the world as nested hierarchy of concepts

1. Four Lines

Represent the world as nested hierarchy of concepts

1. Four Lines

2. They are connected, Closed,

   perpendicular to each other
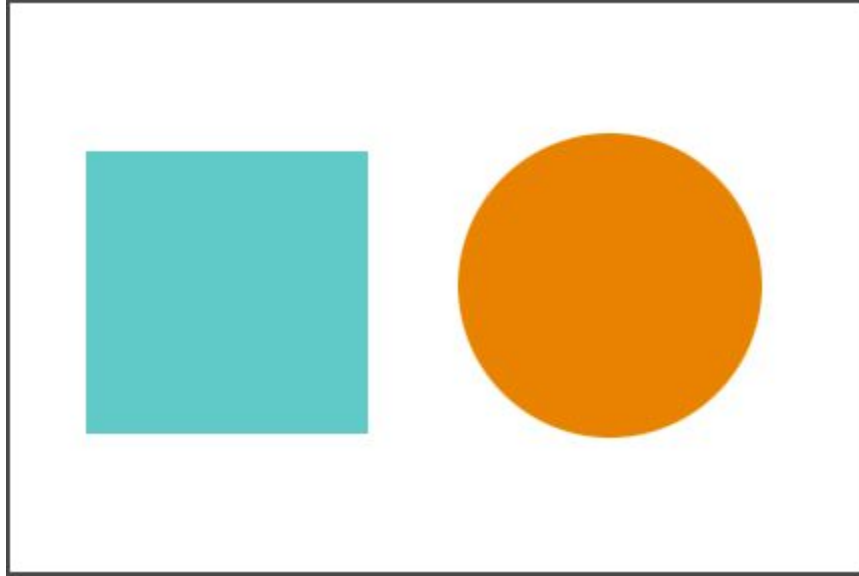
Represent the world as nested hierarchy of concepts

1. Four Lines

2. They are connected, Closed, perpendicular to each other

3. All lines are equal in length

What is Deep Learning?
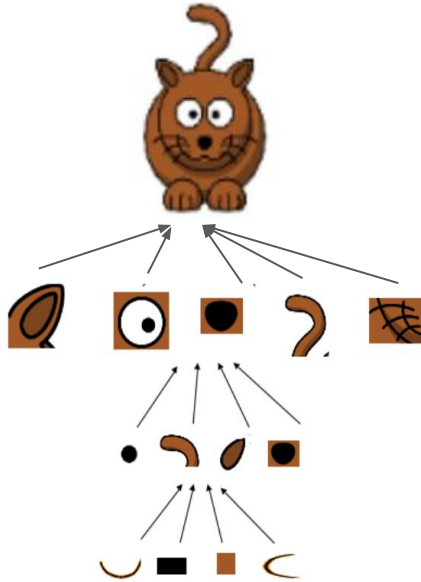
1. Identifies what are the edges

2. Builds on this hierarchically to find combination of shapes and edges

What is Deep Learning?

What is Deep Learning?

1. Identifies what are the edges

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What is Deep Learning?

1. Identifies what are the edges

2. Builds on this hierarchically to find combination of shapes and edges

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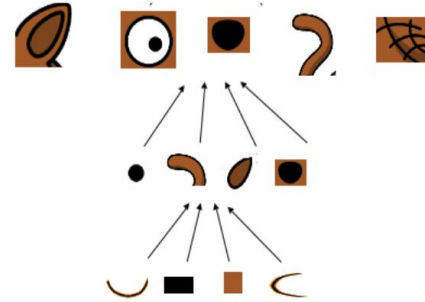
What is Deep Learning?

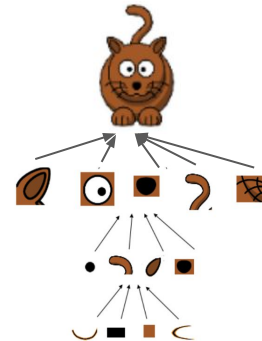

1. Identifies what are the edges

2. Builds on this hierarchically to find combination of shapes and edges

3. Identifies which of these features are responsible for Cat Vs. Dog classification

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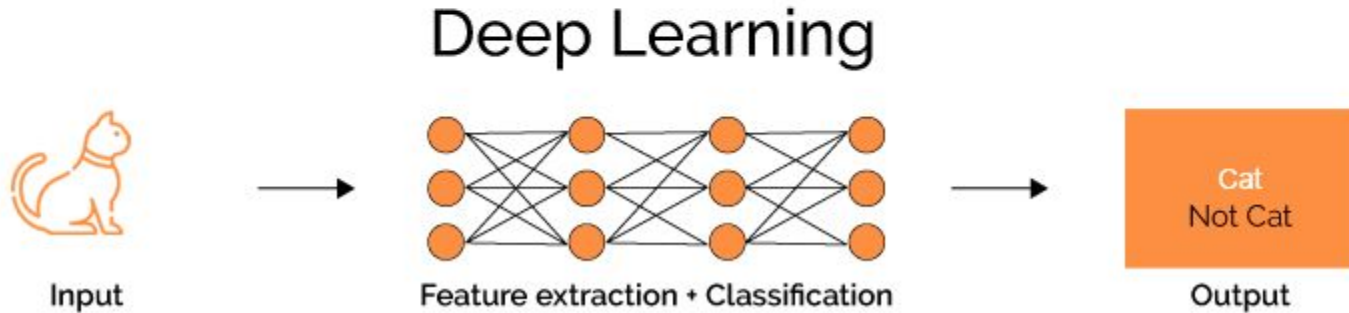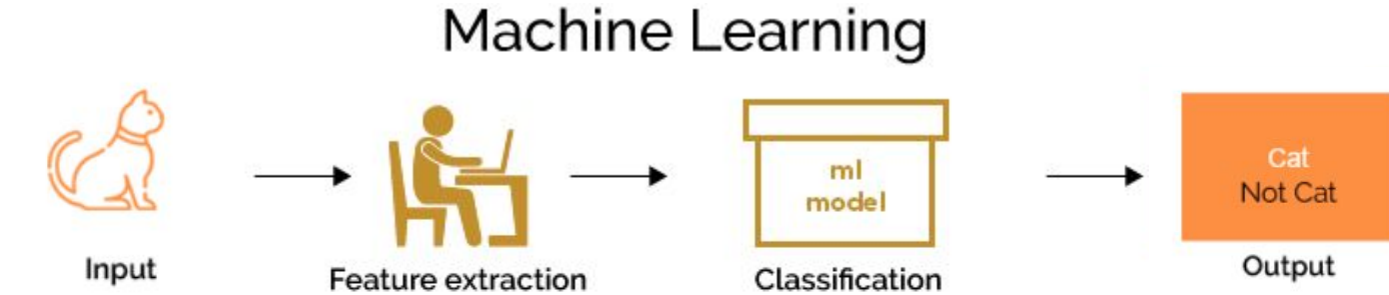Learn everything about analytics

What is Deep Learning?

"Deep learning is a **particular kind of machine learning** that achieves great power and flexibility by **learning to represent** the world as **nested hierarchy of concepts**, with each concept defined in relation to simpler concepts, and more abstract representations computed in terms of less abstract ones"
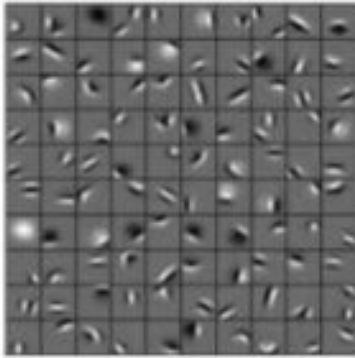
Fundamentals of Deep Learning

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Deep Learning Vs Machine Learning

Automatic Feature Extraction

Machine Learning

Input → Feature extraction → Classification → Output

ml model

Cat Not Cat

Deep Learning

Input → Feature extraction + Classification → Output

Cat Not Cat

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Automatic Feature Extraction

Low-level feature   Mid-level feature   High-level feature

Source : Deep Learning in a Nutshell: Core Concepts, Nvidia
https://devblogs.nvidia.com/parallelforall/deep-learning-nutshell-core-concepts/

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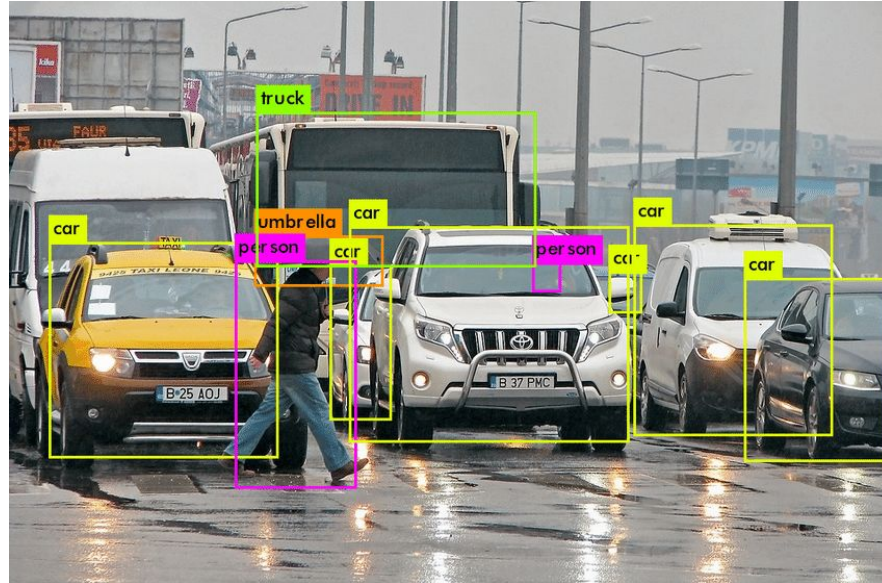
Performs well with high amount of Data

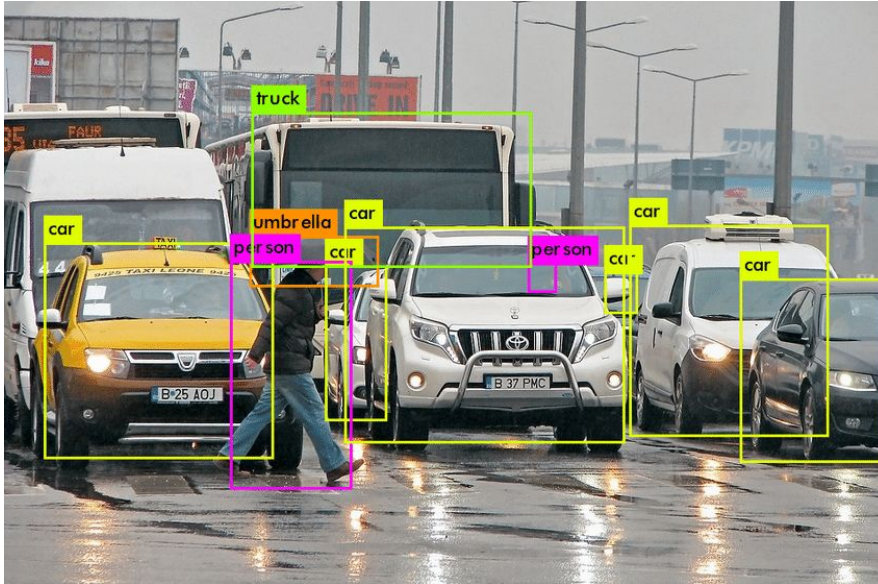# Performs well with high amount of Data
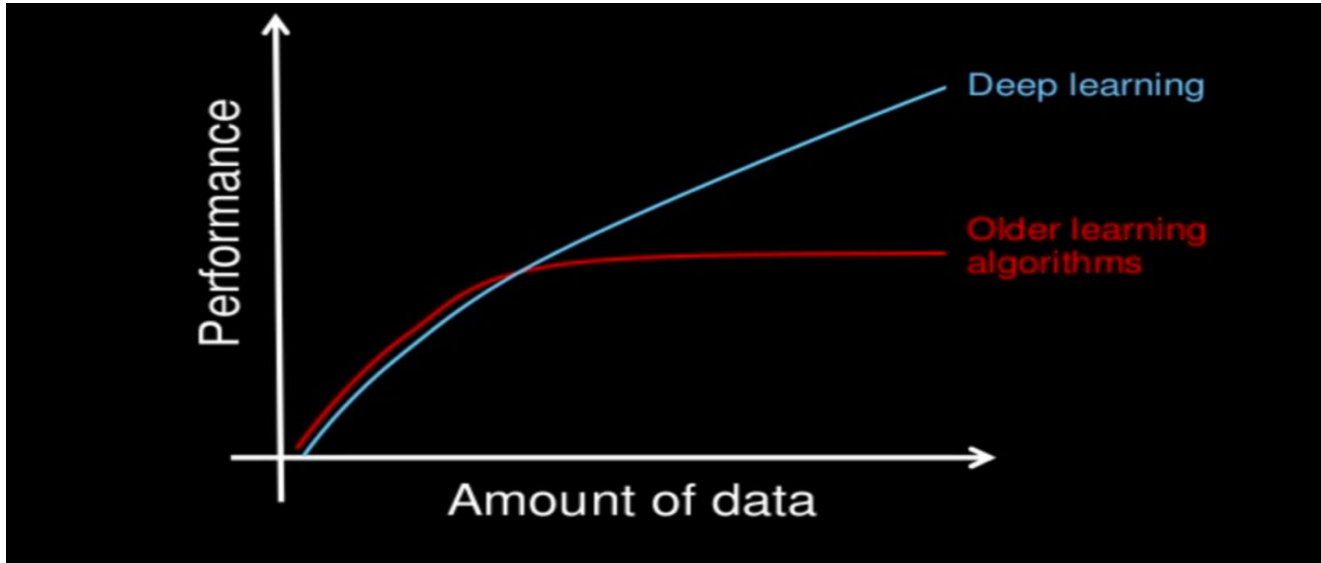
Deep Learning algorithms require more computation power

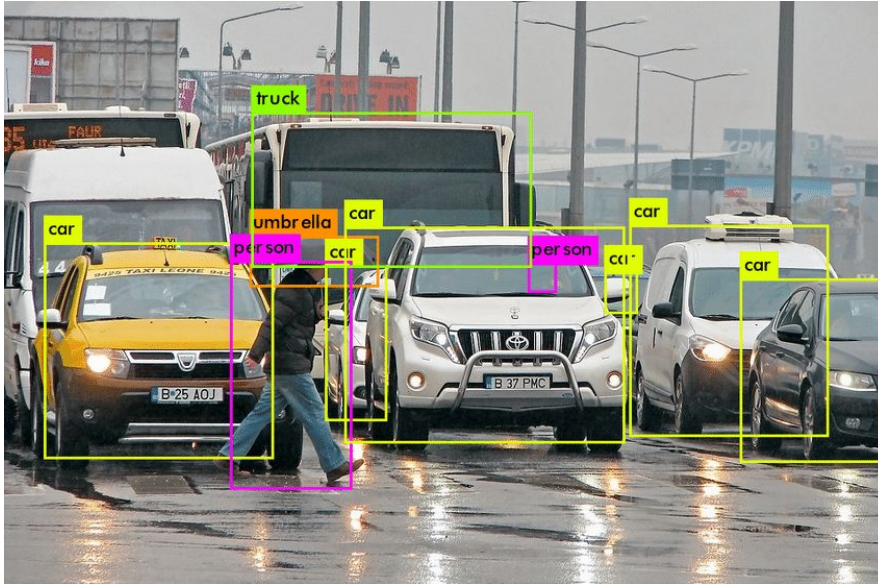# Deep Learning helps to solve problems End -to- End

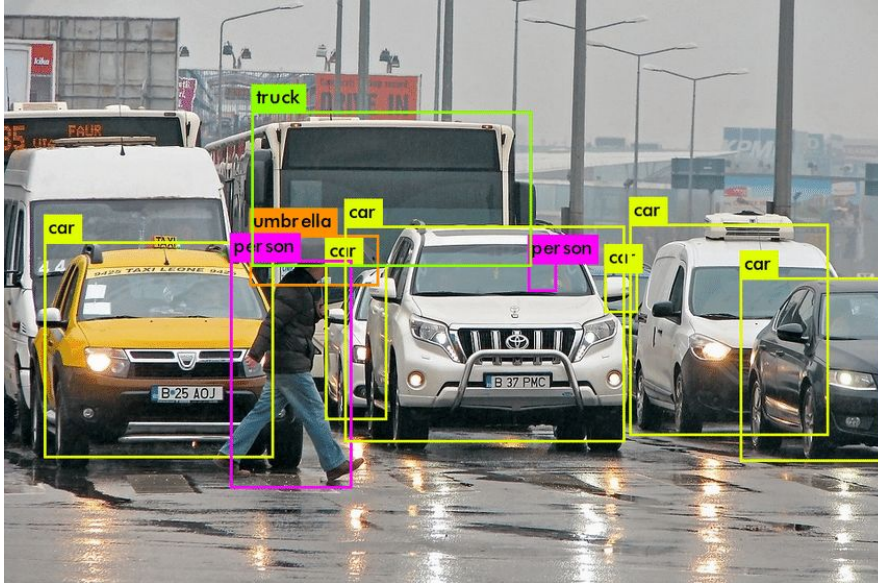# Deep Learning helps to solve problems End -to- End

Deep Learning helps to solve problems End -to- End

1. Object Detection

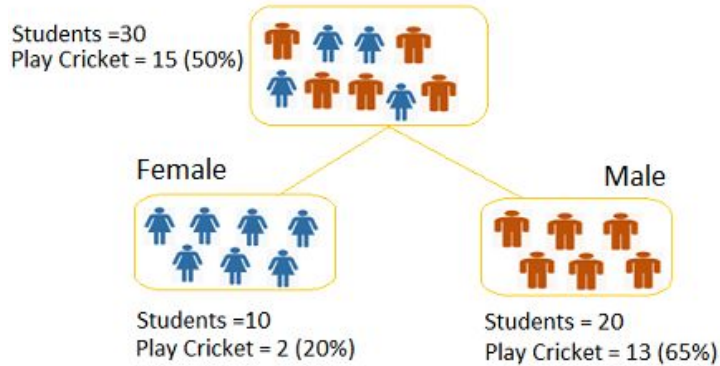# Deep Learning helps to solve problems End -to- End

1. Object Detection

2. Object   Recognition

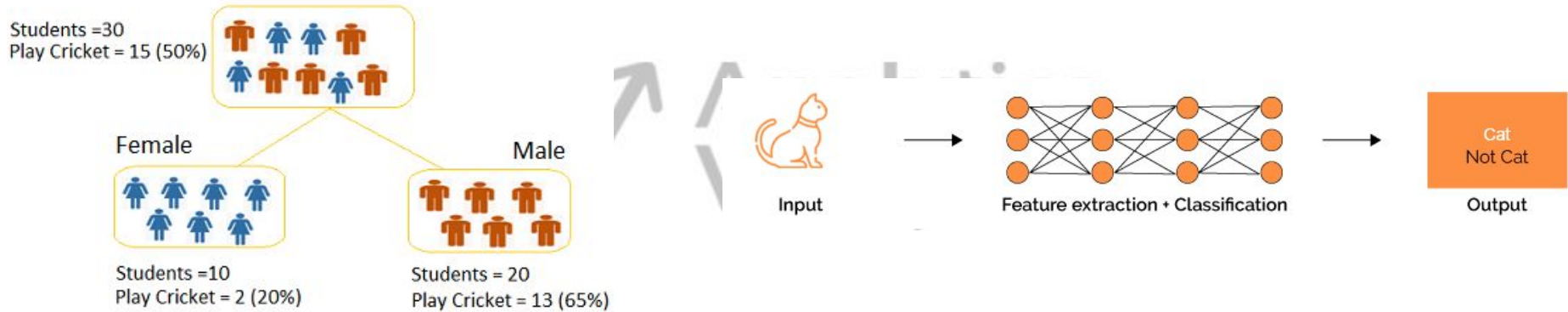# Deep Learning is less interpretable

Deep Learning is less interpretable

Students =30
Play Cricket = 15 (50%)

Female

Male

Students =10
Play Cricket = 2 (20%)

Students = 20
Play Cricket = 13 (65%)

Deep Learning is less interpretable

Students =30
Play Cricket = 15 (50%)

Female

Male

Students =10
Play Cricket = 2 (20%)

Students = 20
Play Cricket = 13 (65%)

Input

Feature extraction + Classification

Cat
Not Cat

Output

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Machine Learning Vs. Deep Learning

Automatic Feature Extraction

Performs well on More Data
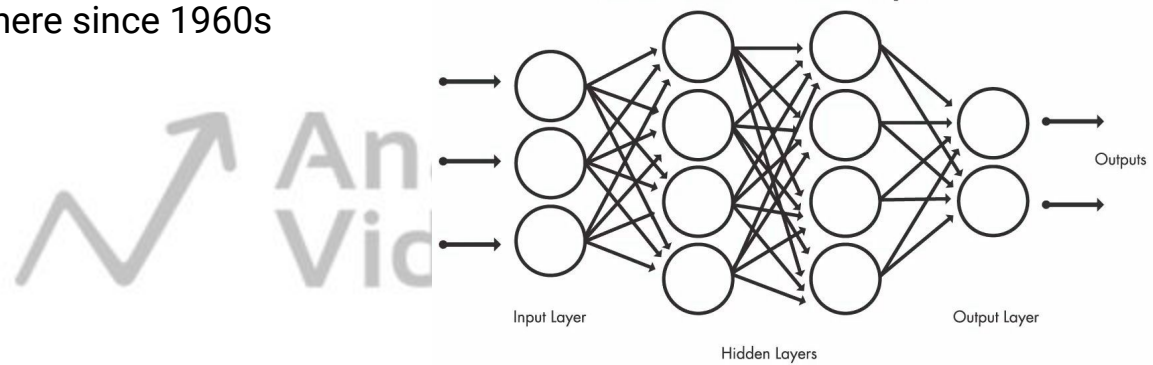
Less Interpretable

Requires More Computation Power

Fundamentals of Deep Learning

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Why Deep Learning has become so popular among data scientists?
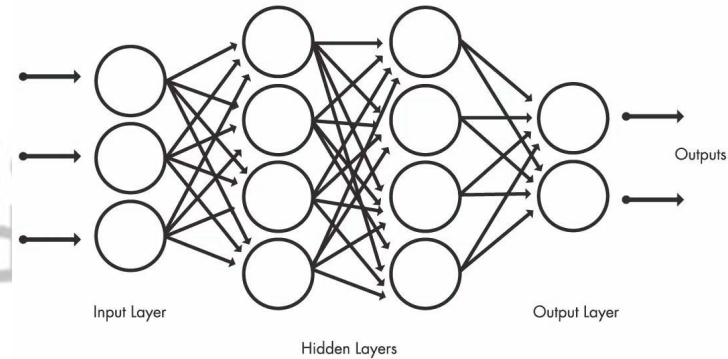
Why Deep Learning has become so popular?

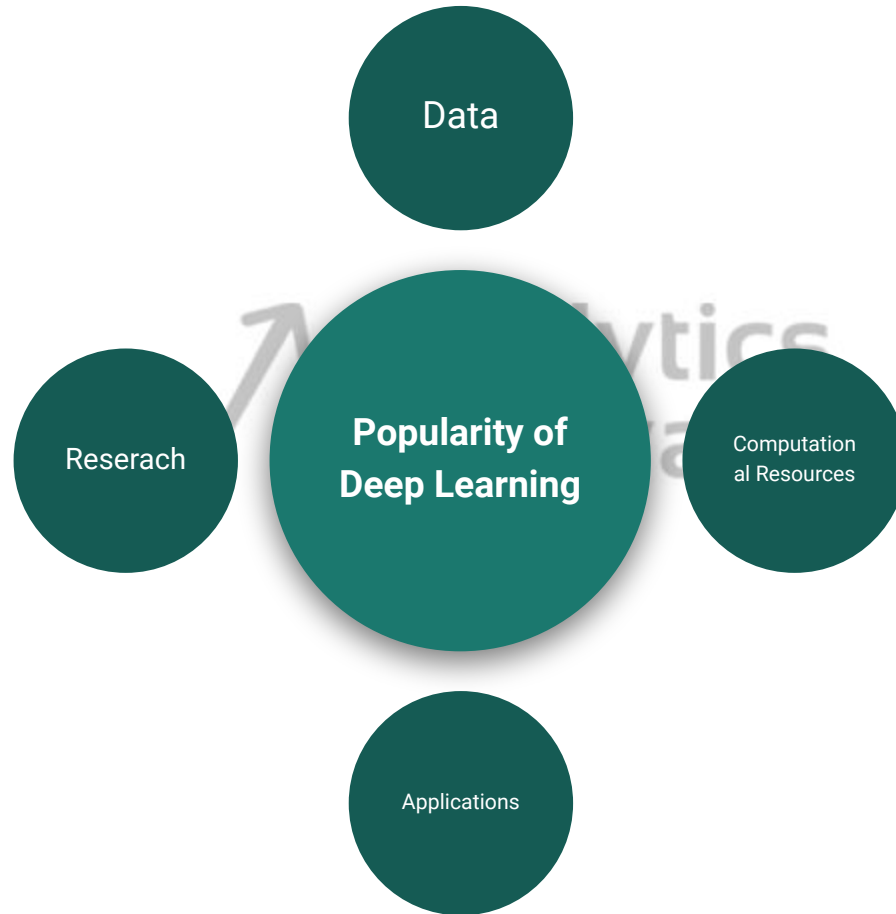1. Neural Networks were there since 1960s

Why Deep Learning has become so popular?
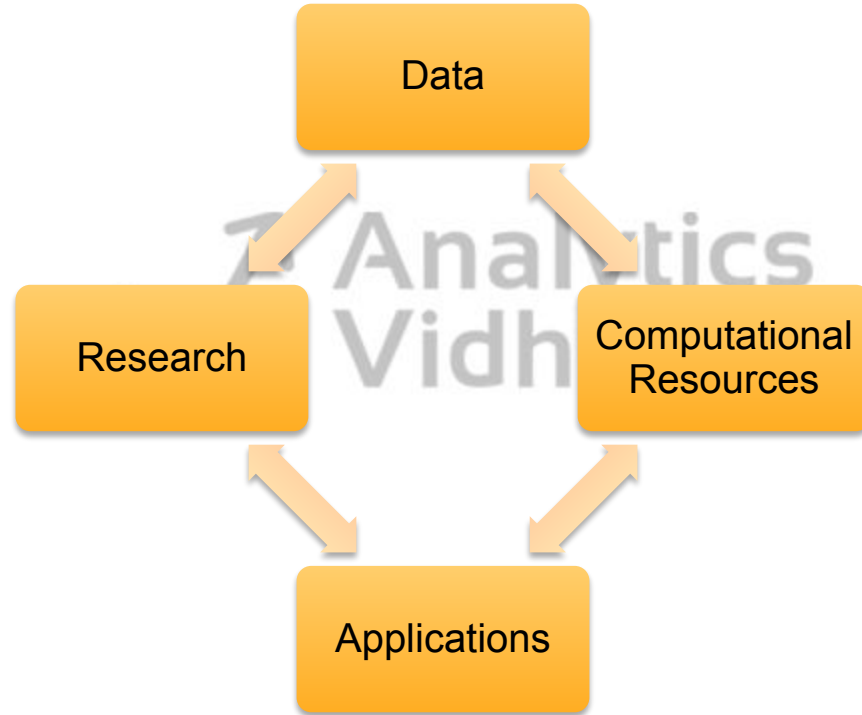
1. Neural Networks were there since 1960s

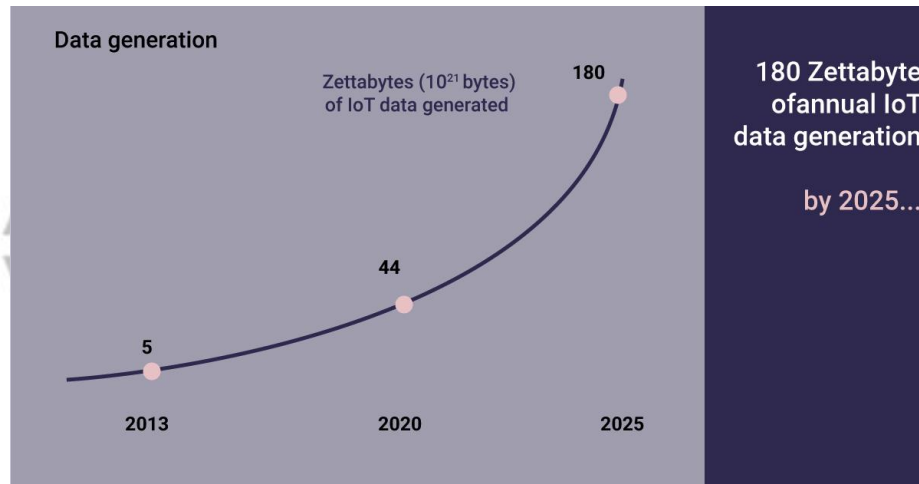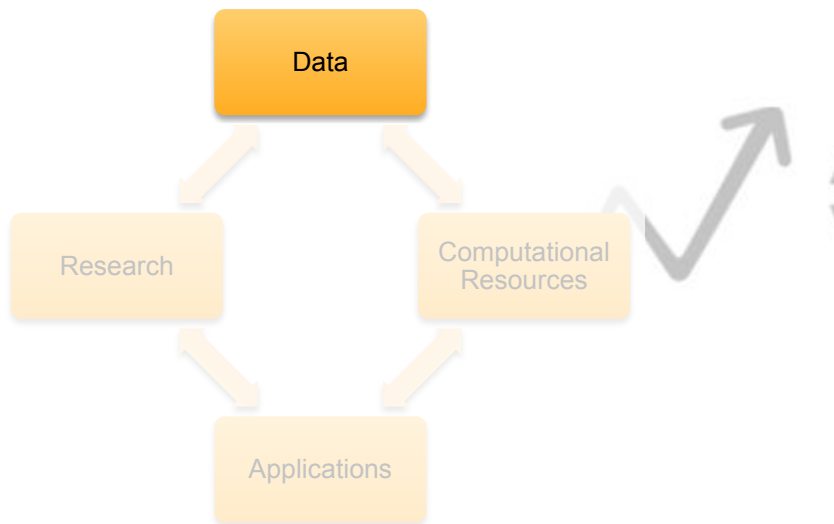2. Deep Learning is basically more complex or deeper Neural Network

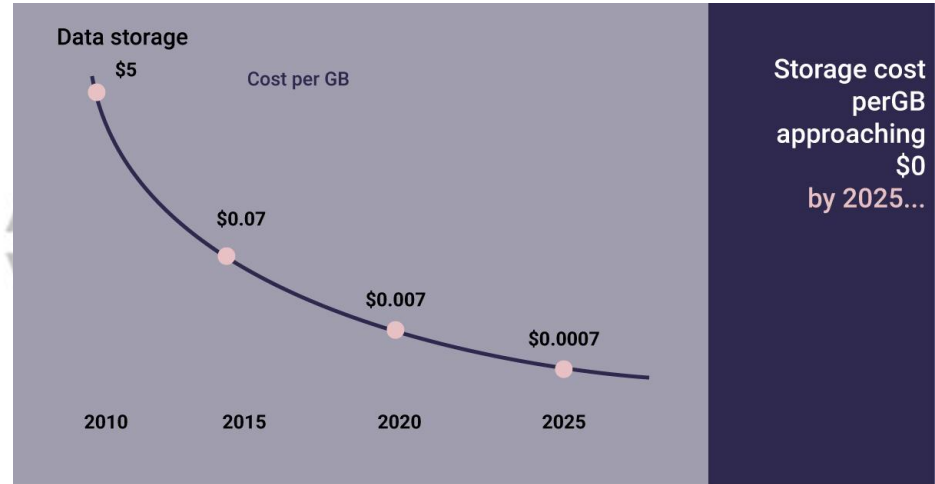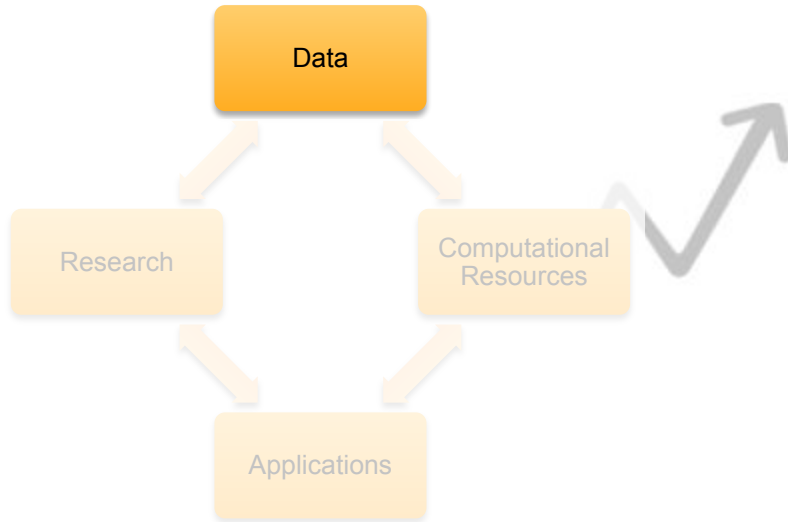# Reasons behind this attention

Reasons behind this attention

Exponential Data Growth since 2013
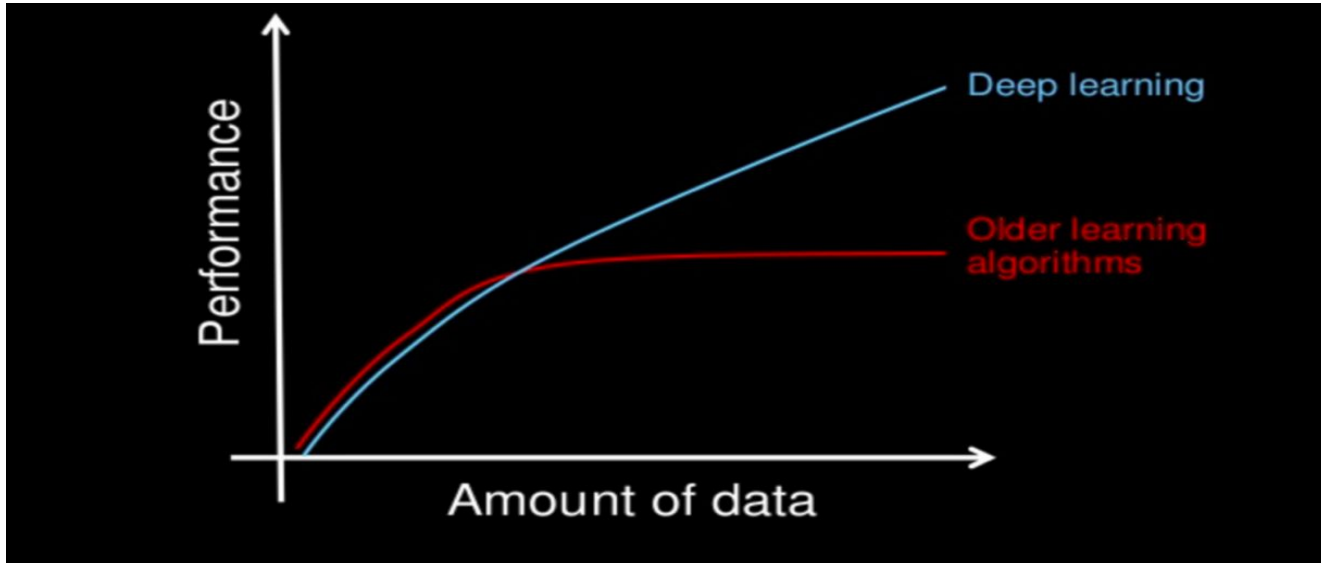

Source: https://fortune.com/2018/09/24/business-strategy-technology-mckinsey/

Reduction in Data Storage cost

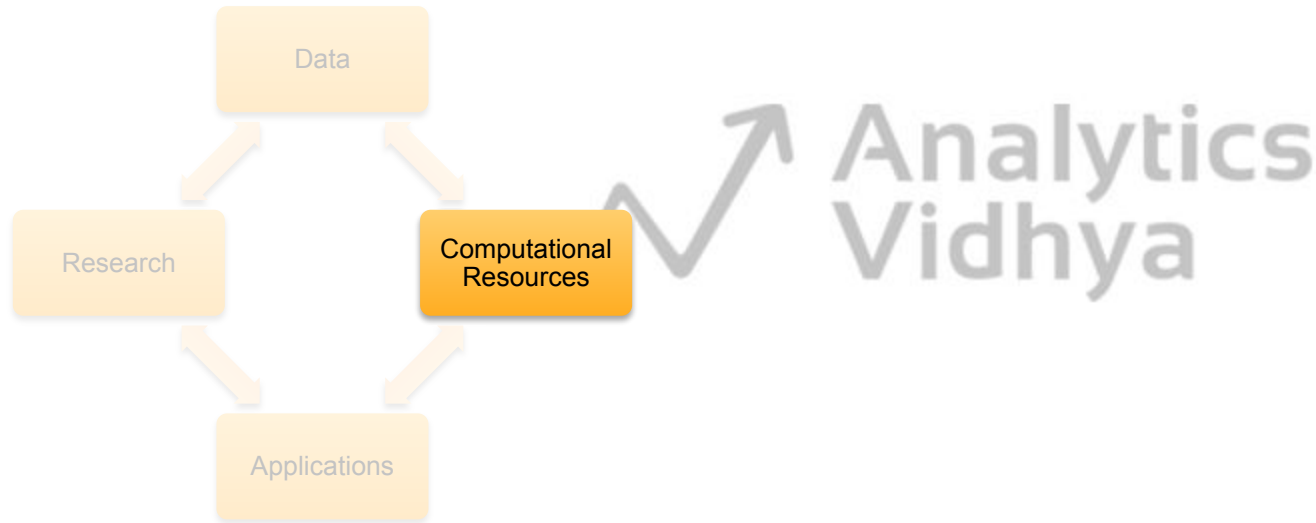Source: https://fortune.com/2018/09/24/business-strategy-technology-mckinsey/
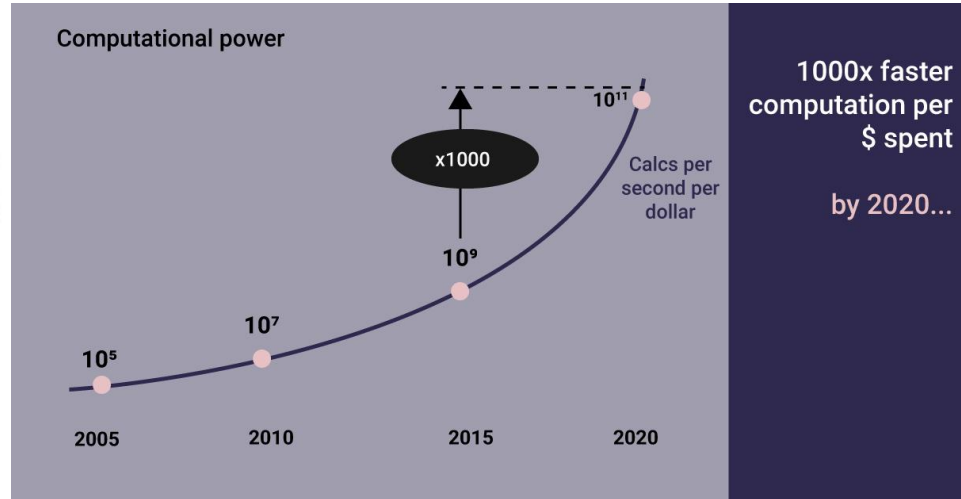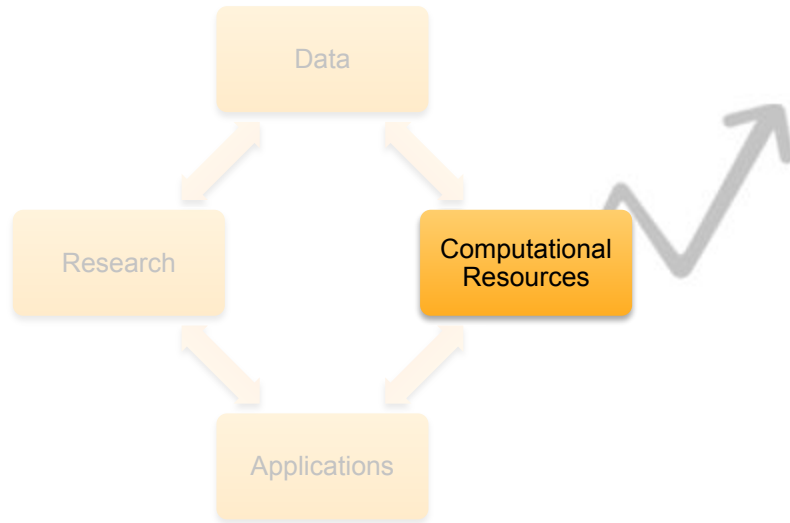
Performs well with high amount of Data

The Computational Power increased by 100,000 times since 2000

The Computational Power increased by 1000 times since 2015

Source: https://fortune.com/2018/09/24/business-strategy-technology-mckinsey/

CPU vs GPU vs TPU
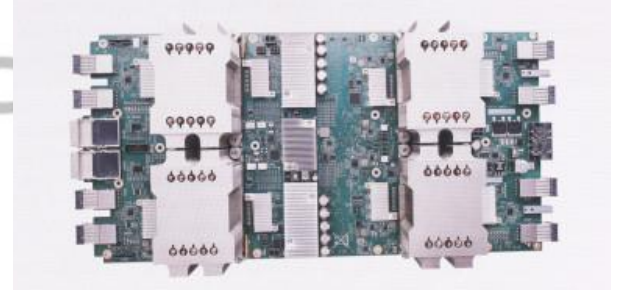

CPU

GPU

TPU

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Cloud GPU/ TPU Alternatives for Deep Learning

- Google Colaboratory (Both GPU and TPU)

- Kaggle Kernels

- Paperspace

- Vast.AI

- Oracle Cloud

- Amazon Web Services (AWS)

- Microsoft Azure

- Google Cloud Platform (GCP)

Deep Learning Framework

What kind of Hardware is needed for Deep Learning?

1. **Graphics Processing Unit (GPU)**

    a.   NVIDIA GTX 1060, GTX 1070, GTX 1080 and above

2. **RAM**

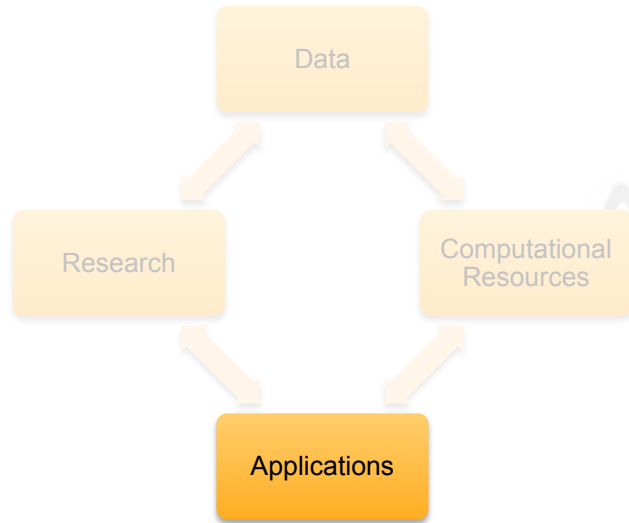   a.   8 GB and above

3. **HDD/SSD**

    a.   1TB HDD (datasets) and good to have 256GB SSD (faster preprocessing)

4. **CPU**

    a.   i5 8th Gen and above

Availability of Data and Computational Resources leads to more Applications
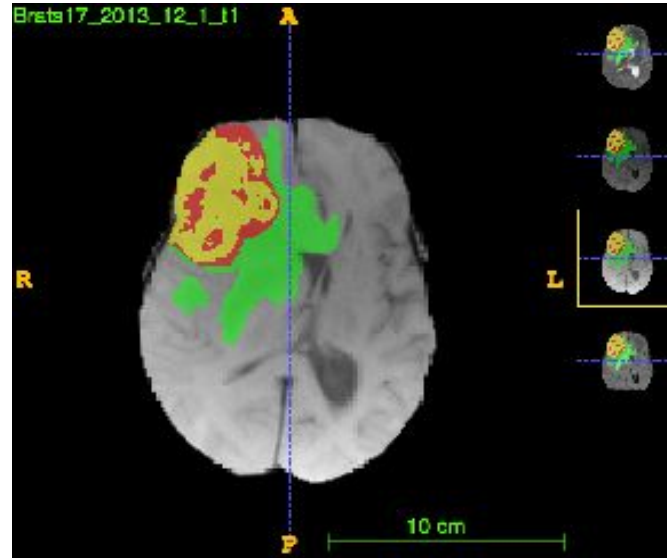
Data

Research

Computational Resources

Applications

Neural Network was there since 1960's but due to less availability of data and computer resources, we were not able to apply in industry

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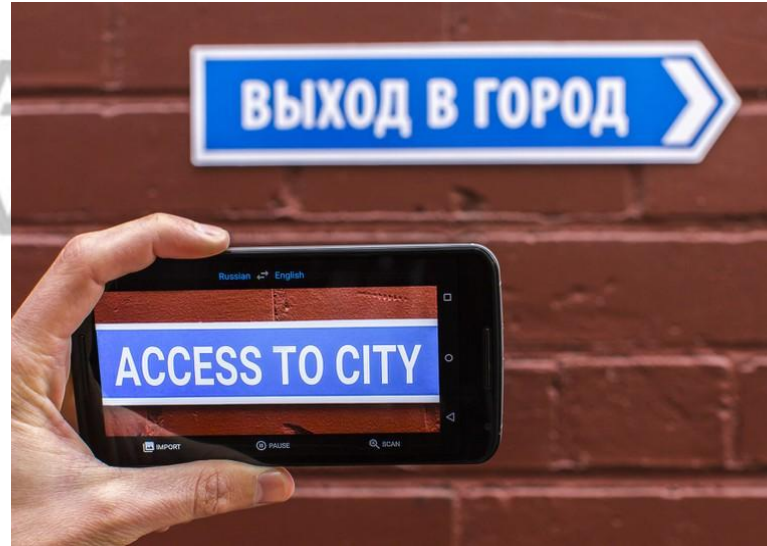# Applications of Deep Learning: Automobile

Applications of Deep Learning: Healthcare

Applications of Deep Learning: AI assistant

Applications of Deep Learning: Tourism

E-Commerce
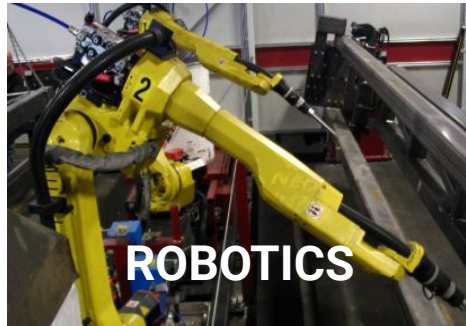
BANKING & FINANCE

EDUCATION

CYBER SECURITY

SPORTS

DEFENCE

SOCIAL MEDIA

ROBOTICS

SPACE EXPLORATION

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Availability of Data and Computational Resources leads to more Applications and Research