

# An Introduction to AI

WEEK 1, COHORT 4



“aimed at getting you to  
kickass in AI”

# What is Artificial Intelligence?

- Before we answer this question, let see if we remember some familiar personalities.



**Agamemnon**



**Odysseus**



**Achilles**

# What is Artificial Intelligence?

- How about these guys?



Artemis



Athena



Thetis

- What do they all have in common?

# What is Artificial Intelligence?

- How about these guys?



Artemis



Athena

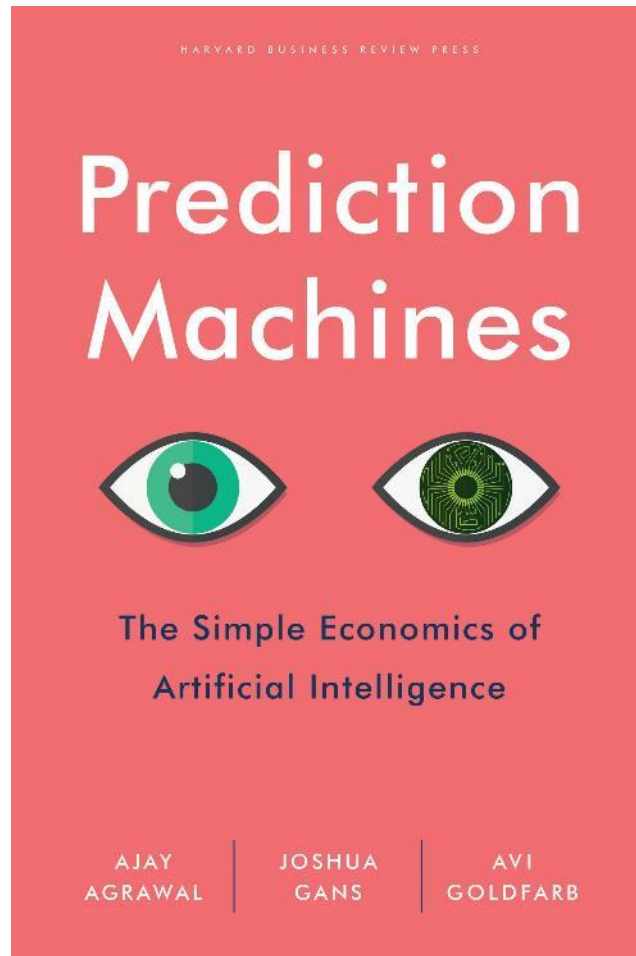


Thetis

- What do they all have in common?

**Prophecy**, and we can say **Prophecy** which is **Prediction**, is the act of saying what will happen in future

# What is Artificial Intelligence?

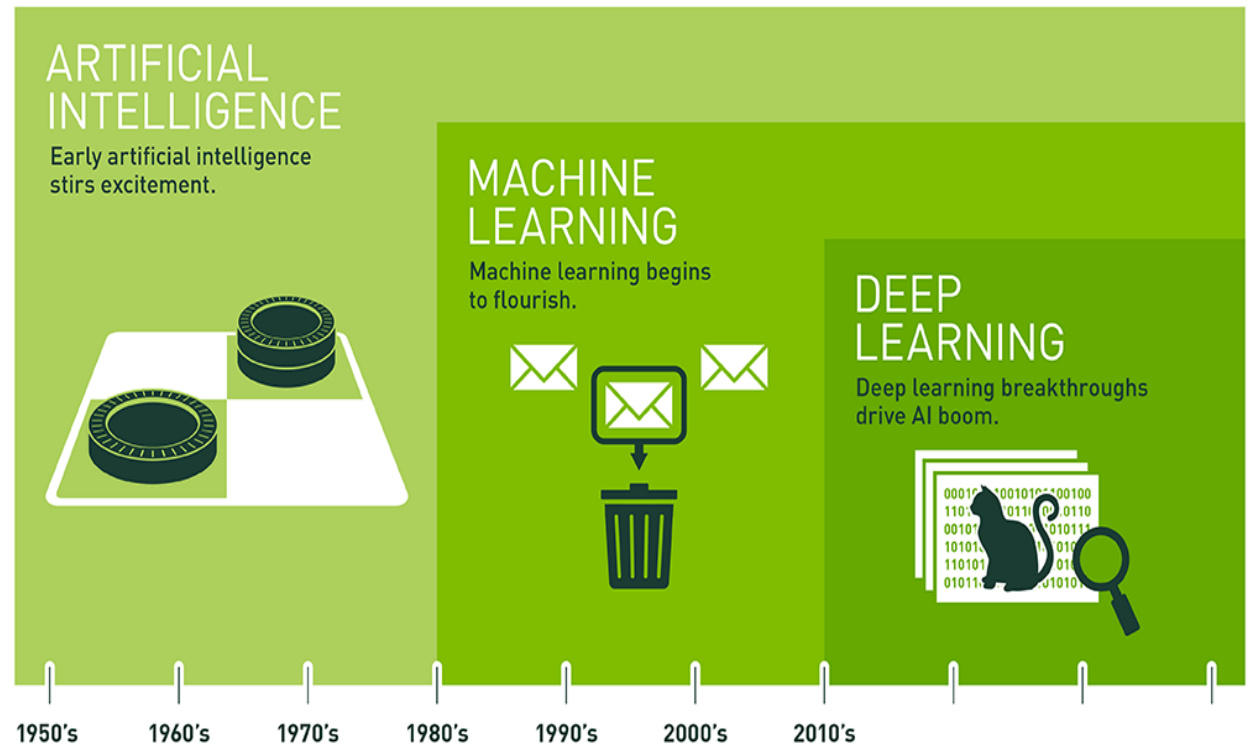
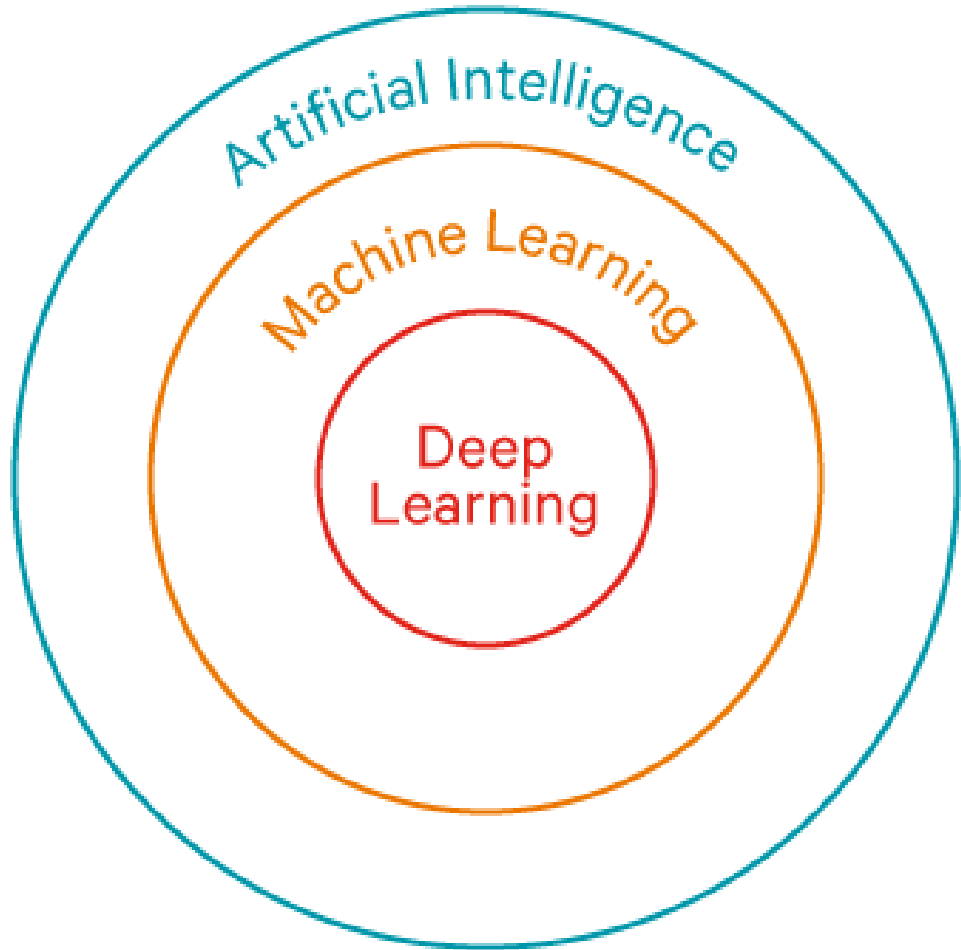


## Back to Artificial Intelligence

*“The current wave of advances in AI **doesn't** actually bring us intelligence but instead a critical component of intelligence, **prediction**”*

- AI, in the broadest sense, describes the different ways a machine interacts with the world around it. To maximize our chance of achieving a given goal. At its core, ML is a simply way of achieving AI.

# Overview of Artificial Intelligence



Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence – first machine learning, then deep learning, a subset of machine learning – have created ever larger disruptions.

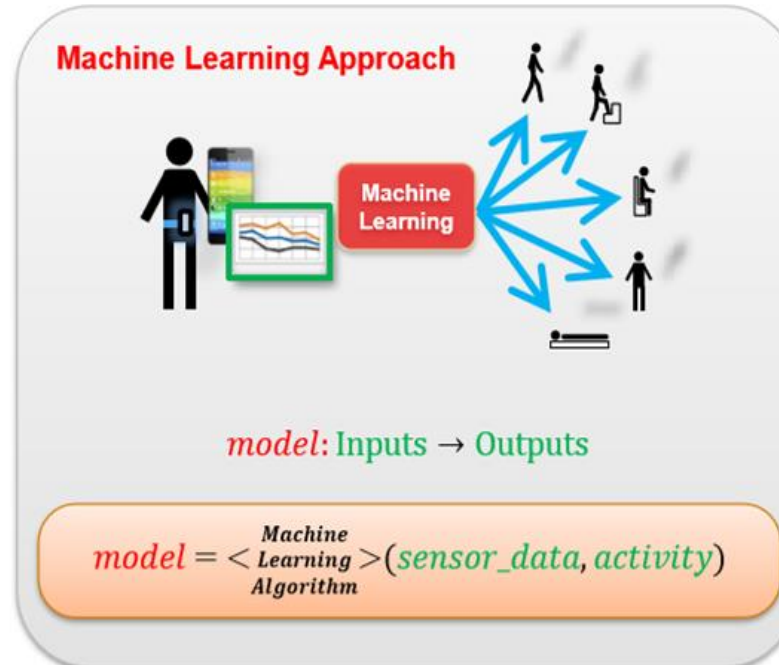
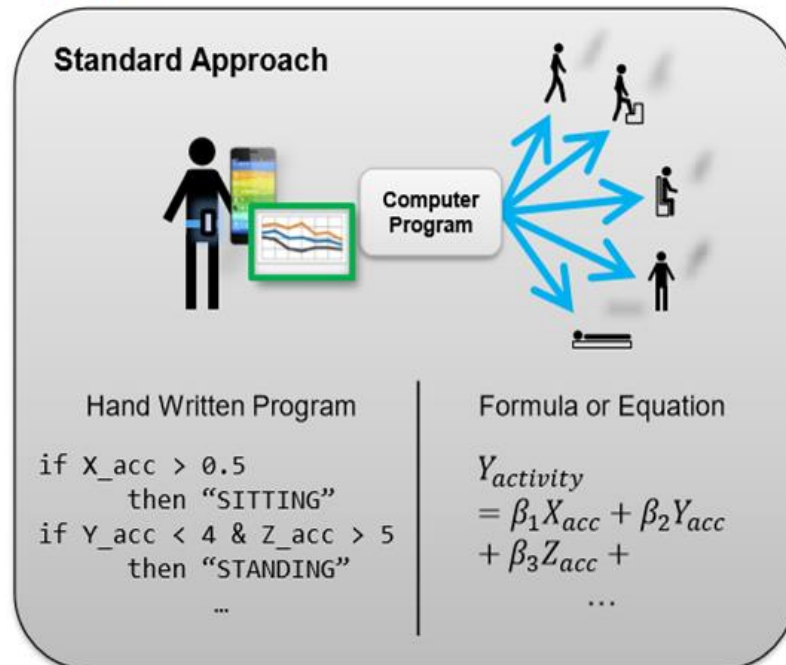


# Machine Learning

## What is Machine Learning

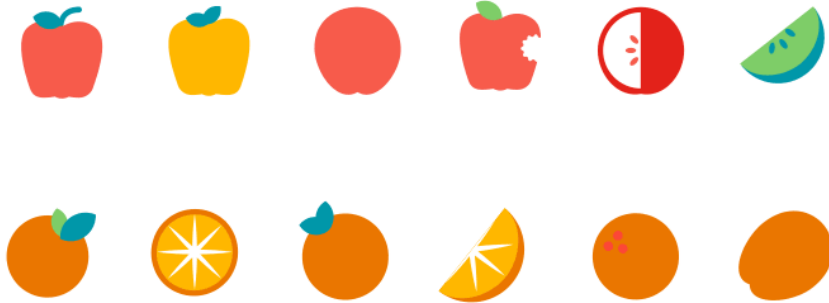
Machine learning uses **data** and produces a **program** to perform a **task**

**Task:** Human Activity Detection



# Machine Learning vs Deep Learning

## ML



- ML - subset of AI
- Machines learn to do task without explicitly programmed to do so.
- Reinforcement learning, decision tree, DL, clustering ...

## DL



- DL - subset of ML
- DL learns to do task without explicitly programmed to do so.
- Mimics the neurons in a human brain.
- CNN, RNN, AutoEncoder ...



# Classes of Machine Learning

## Supervised Learning:

Predicting values. **Known** targets.

User inputs correct answers to learn from. Machine uses the information to guess new answers.

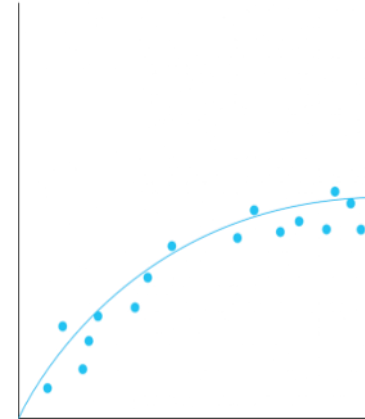
### **REGRESSION:**

Estimate continuous values  
(Real-valued output)

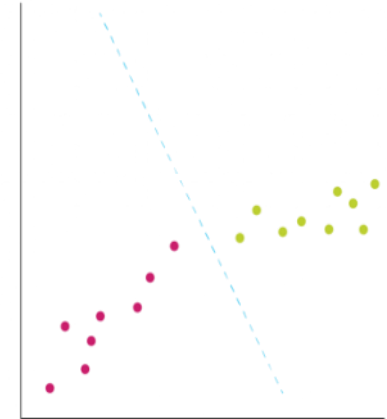
### **CLASSIFICATION:**

Identify a unique class  
(Discrete values, Boolean, Categories)

Regression



Classification



## Unsupervised Learning:

Search for structure in data. **Unknown** targets.

User inputs data with undefined answers. Machine finds useful information hidden in data.

### **Cluster Analysis**

Group into sets

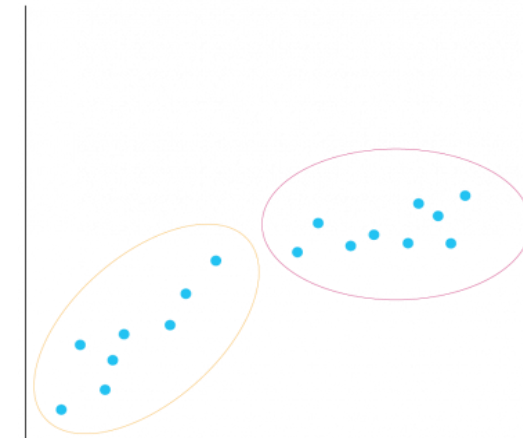
### **Density Estimation**

Approximate distributions

### **Dimension Reduction**

Select relevant variables

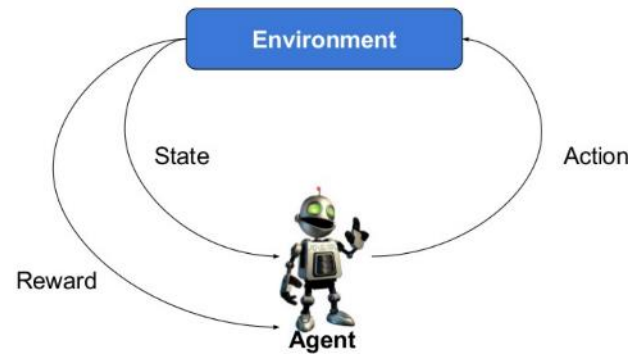
Clustering



Others: RL

# Reinforcement Learning

- In the problem, an agent is supposed to decide the best action to select based on his current state which will earn the agent a reward. When this step is repeated, the problem is known as a *Markov Decision Process*.



Deep Minds



Alpha Go

# Reinforcement Learning

## Dota 2



Open AI Bots vs Humans

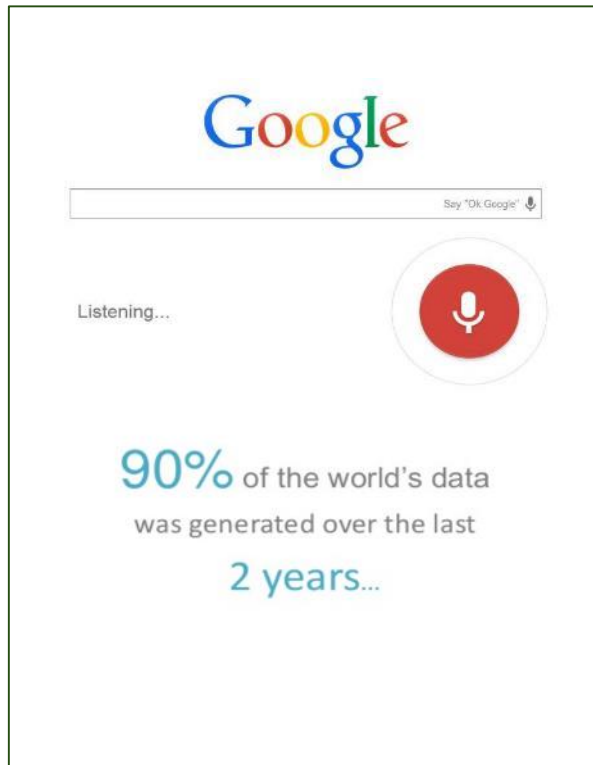
- Using a separate [LSTM](#) for each hero and no human data, it learns recognizable strategies.
- OpenAI Five plays 180 years worth of games against itself every day, learning via self-play.

# Deep Learning

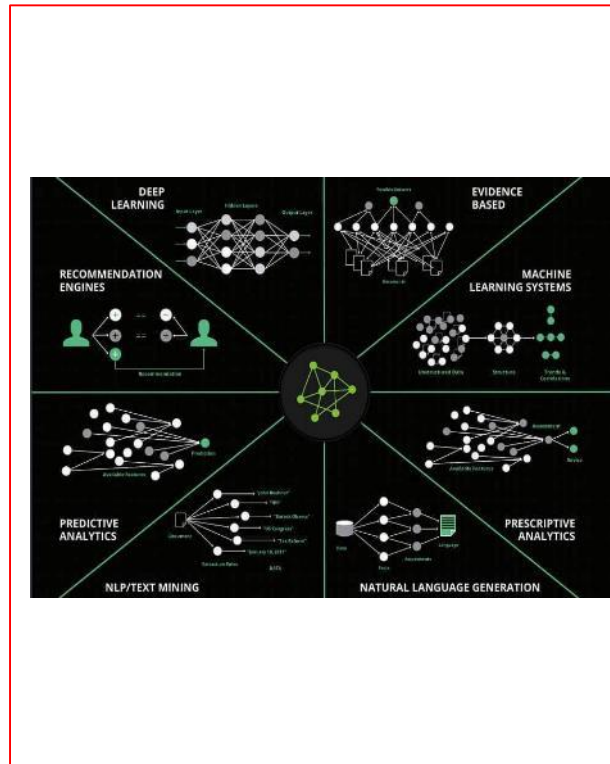
Lets focus a little more on Deep Learning.

Why deep learning is having great impact in the world?

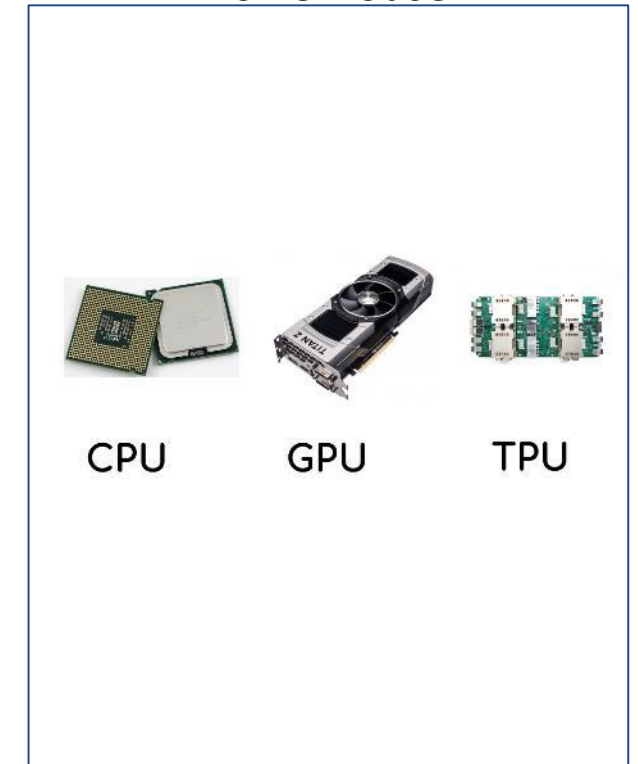
Massive Data



Modern Algorithms

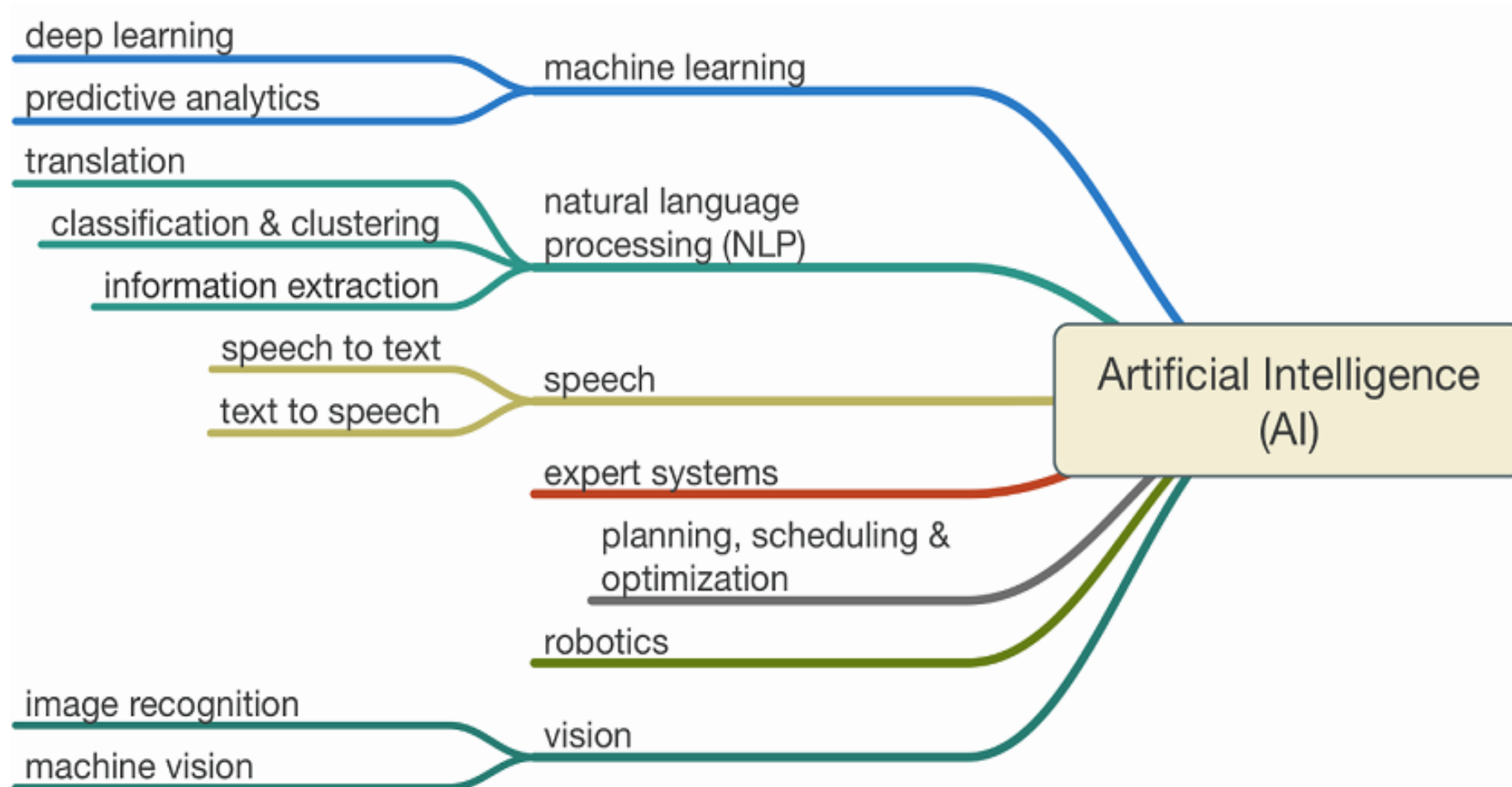


Computational Powerhouse



# Deep Learning

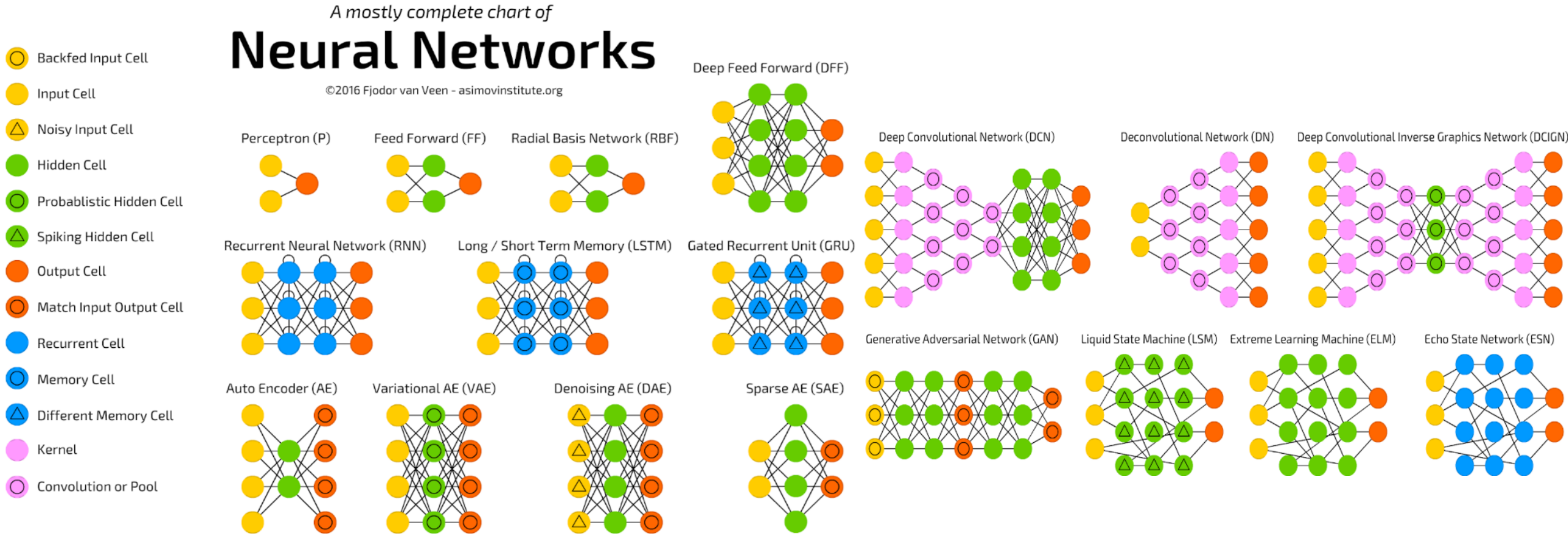
- DL isn't a single approach but a rather a class of algorithms that you can apply to broad spectrum of problem.





# Deep Learning

There are different types of Deep Learning Architecture



# Deep Learning

## Natural Language Processing

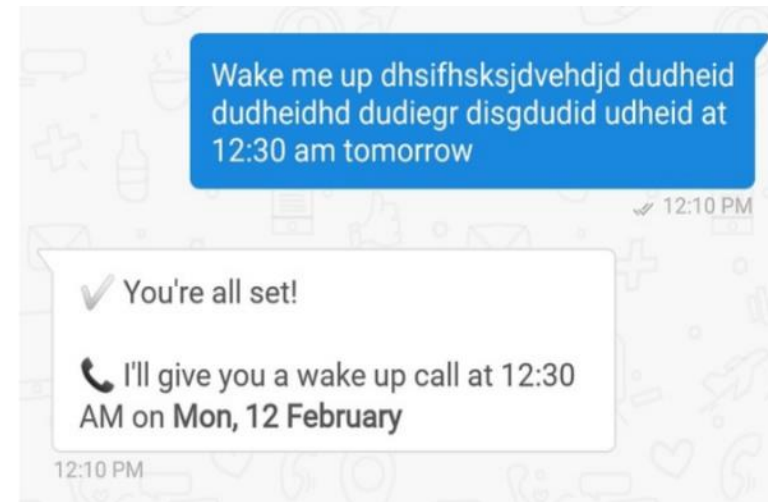
- Study of interaction between computers and human languages.

### Interdisciplinary Tasks: Speech-to-Text



- Sentimental analysis
- Chatbot
- Machine translation
- Text classification

### Why NLP is hard?



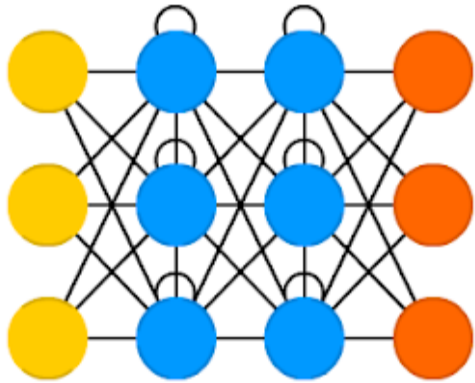
- 300+ ethnic groups in Nigeria( NLP Bigger than Wazobia)
- Languages are ambiguous("I love Blackberry?")
- Interpretation of context(I am hungry, because I am broke)
- Machine don't understand Language.



# Deep Learning

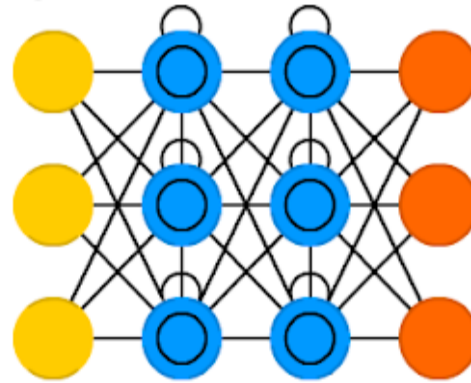
## Natural Language Processing - Architectures

Recurrent Neural Network (RNN)



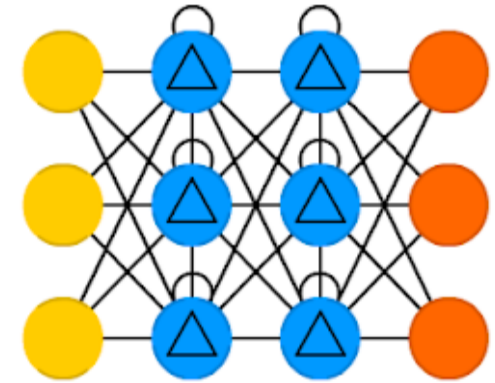
- Feed-forward network
- Feedback mechanism

Long / Short Term Memory (LSTM)



- Memory cell
- Retain information
- Can remember info. Not just the last computed value.

Gated Recurrent Unit (GRU)



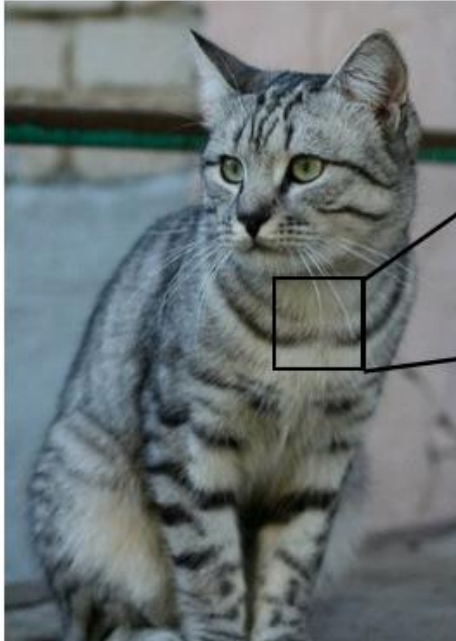
- Faster and simpler LSTM
- Fewer weight
- Two gates
- Update gates - maintain info.
- Reset gates - flush info.

# Deep Learning

## Computer Vision

- Is a field of computer science that works on enabling computer see, identify and process images. CV is linked with AI as computer must interpret what it sees and perform necessary analysis.

### The Problem: Semantic Gap



This image by Nikita is  
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[[105 112 100 111 104 99 106 99 96 103 112 119 104 97 93 87]  
[ 91 98 102 106 104 79 98 103 99 105 123 136 110 105 94 85]  
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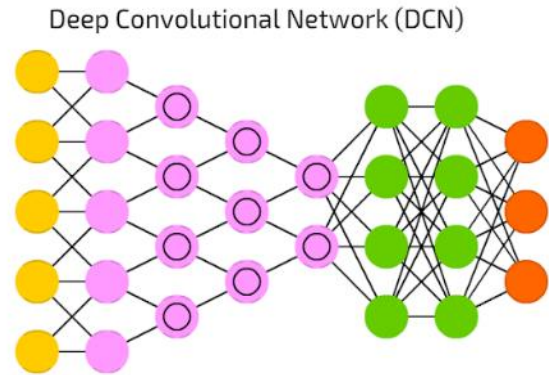
What the computer sees

An image is just a big grid of numbers between [0, 255]:

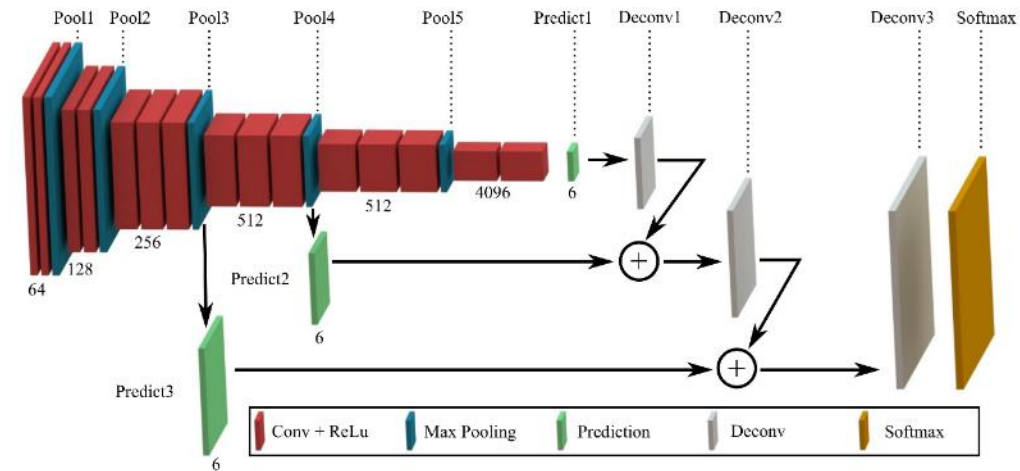
e.g. 800 x 600 x 3  
(3 channels RGB)

# Deep Learning

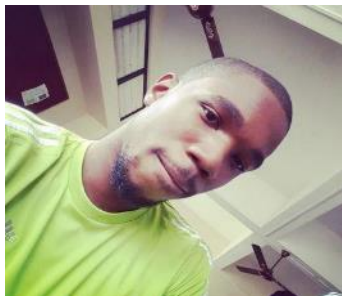
## Computer Vision- Architectures



- Inspired by the brain visual cortex
- High Image processing application
- Learn higher-order features in data via **convolution**.



**Convolve** the filter/kernel with the i.e  
“slide over the image spatially  
computing dot products”



+



=



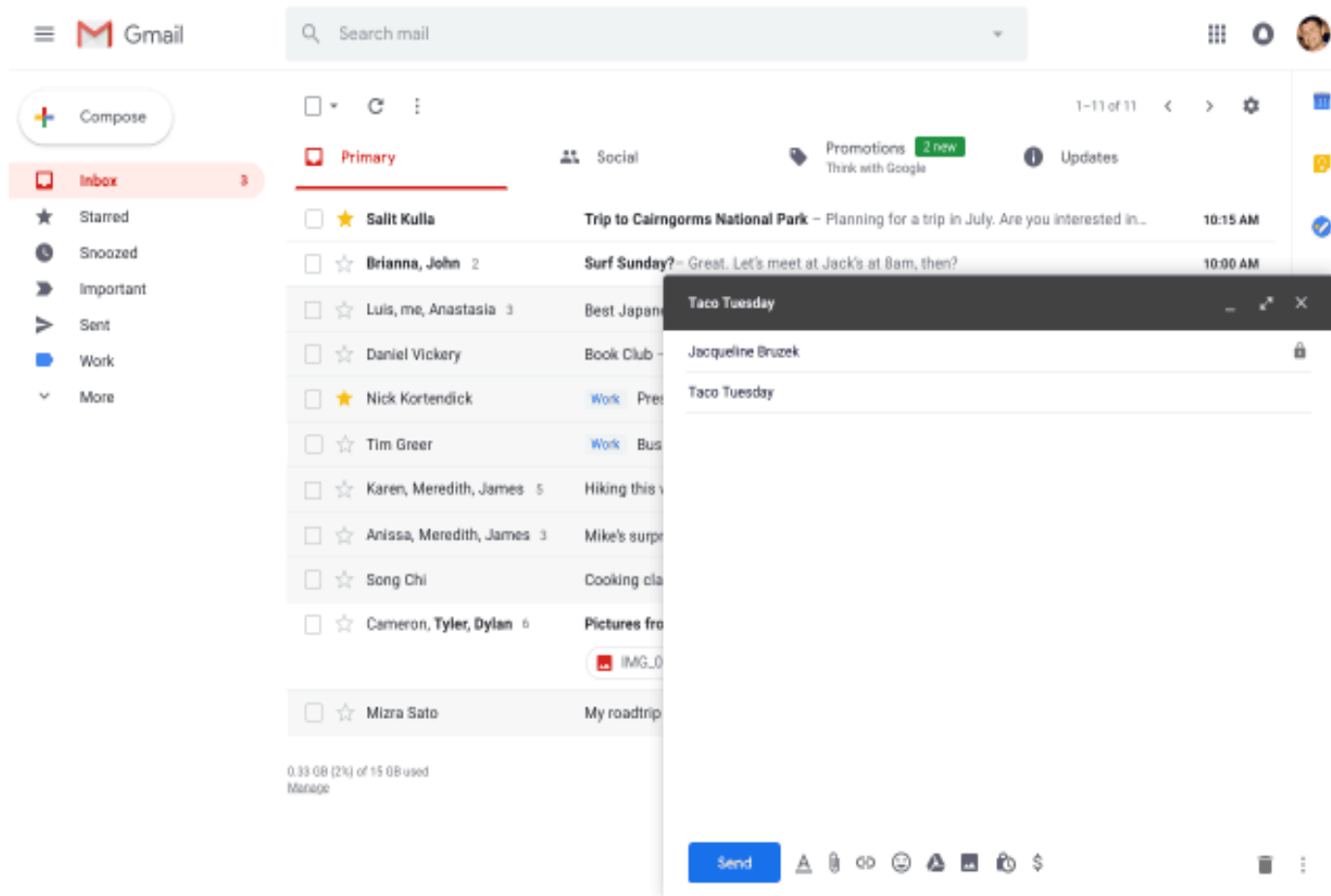
Style Transfer



## EVERYDAY APPLICATIONS OF AI



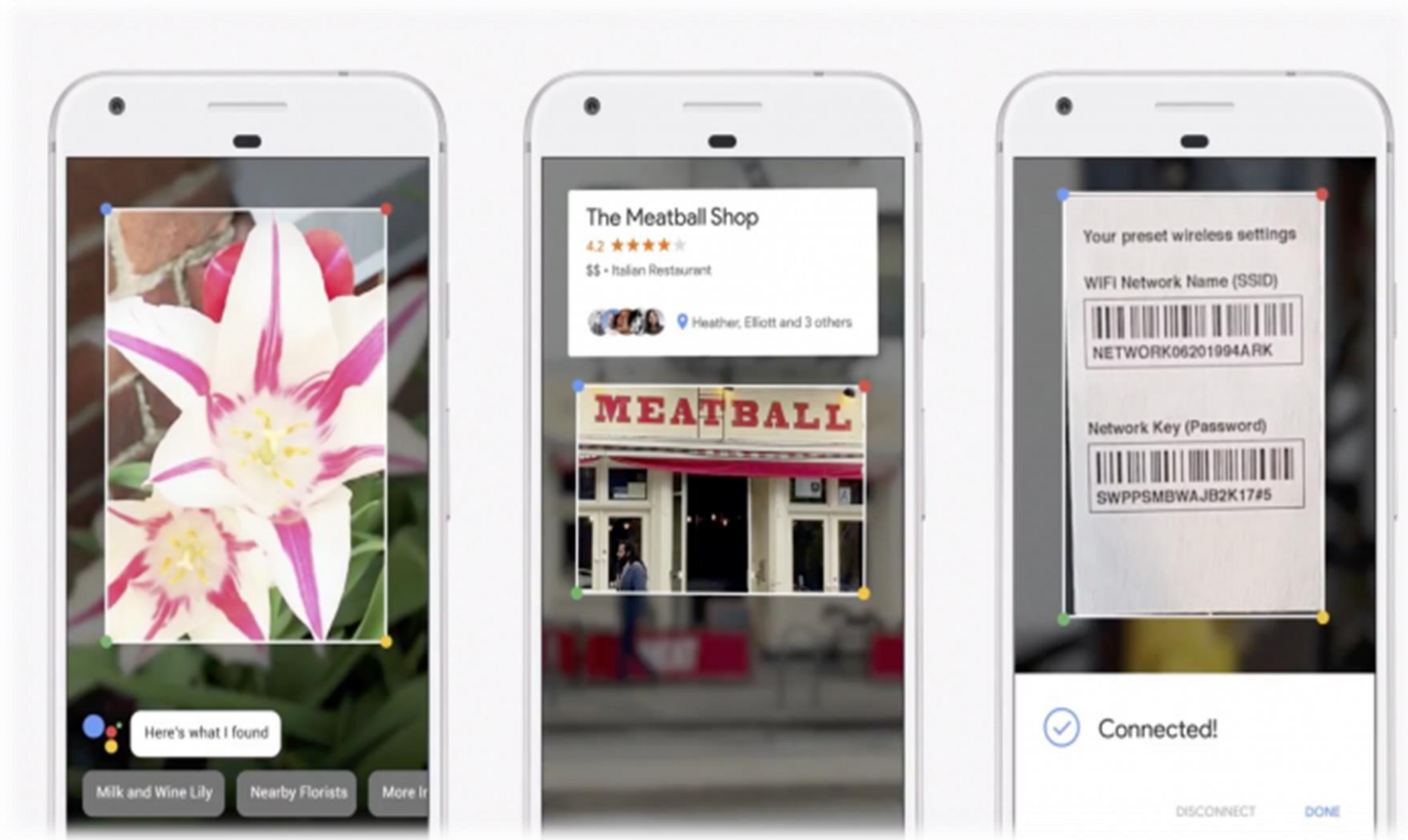
# Gmail - Smart Compose



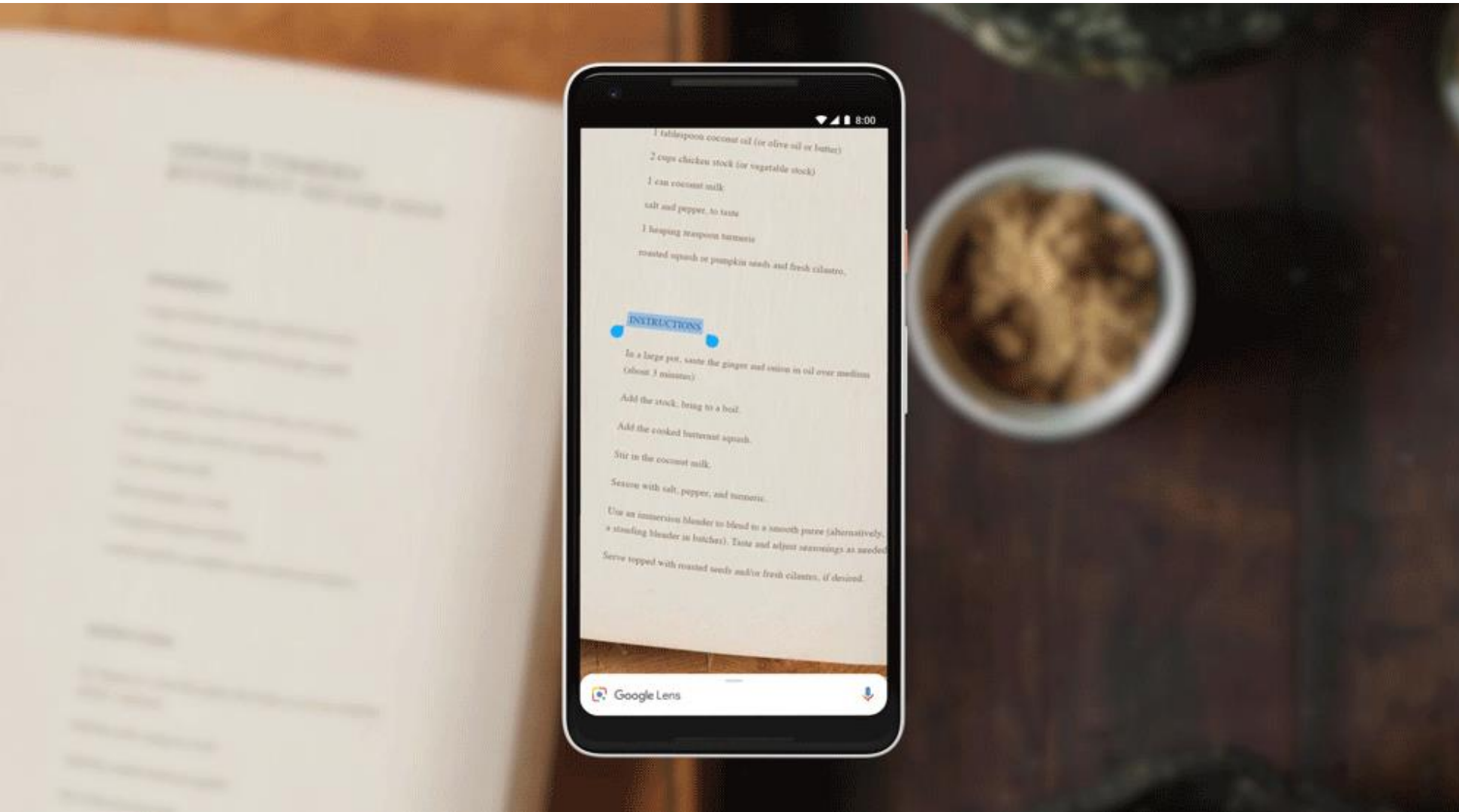
Typical language generation models, such as [ngram](#), [neural bag-of-words \(BoW\)](#) and [RNN language \(RNN-LM\)](#) models, learn to predict the next word conditioned on the prefix word sequence.



# Google Len



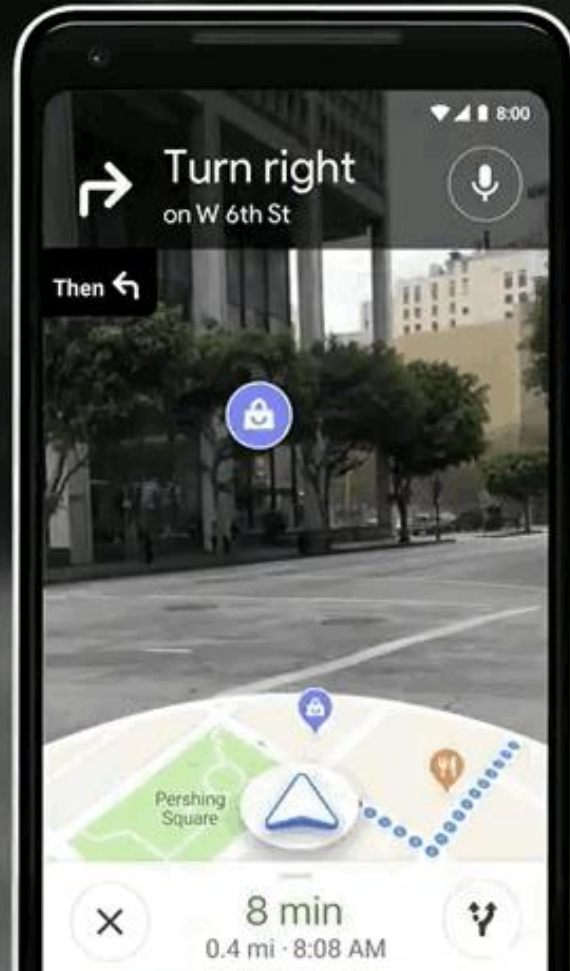
# Google Len - Text Selection



Google leveraged on digitization of books around the world.

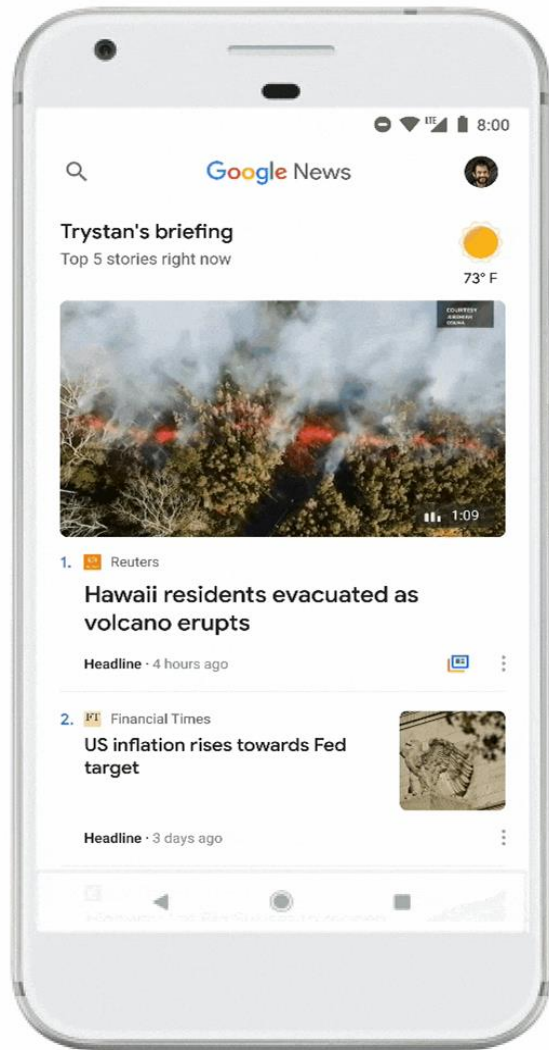


# Google Map



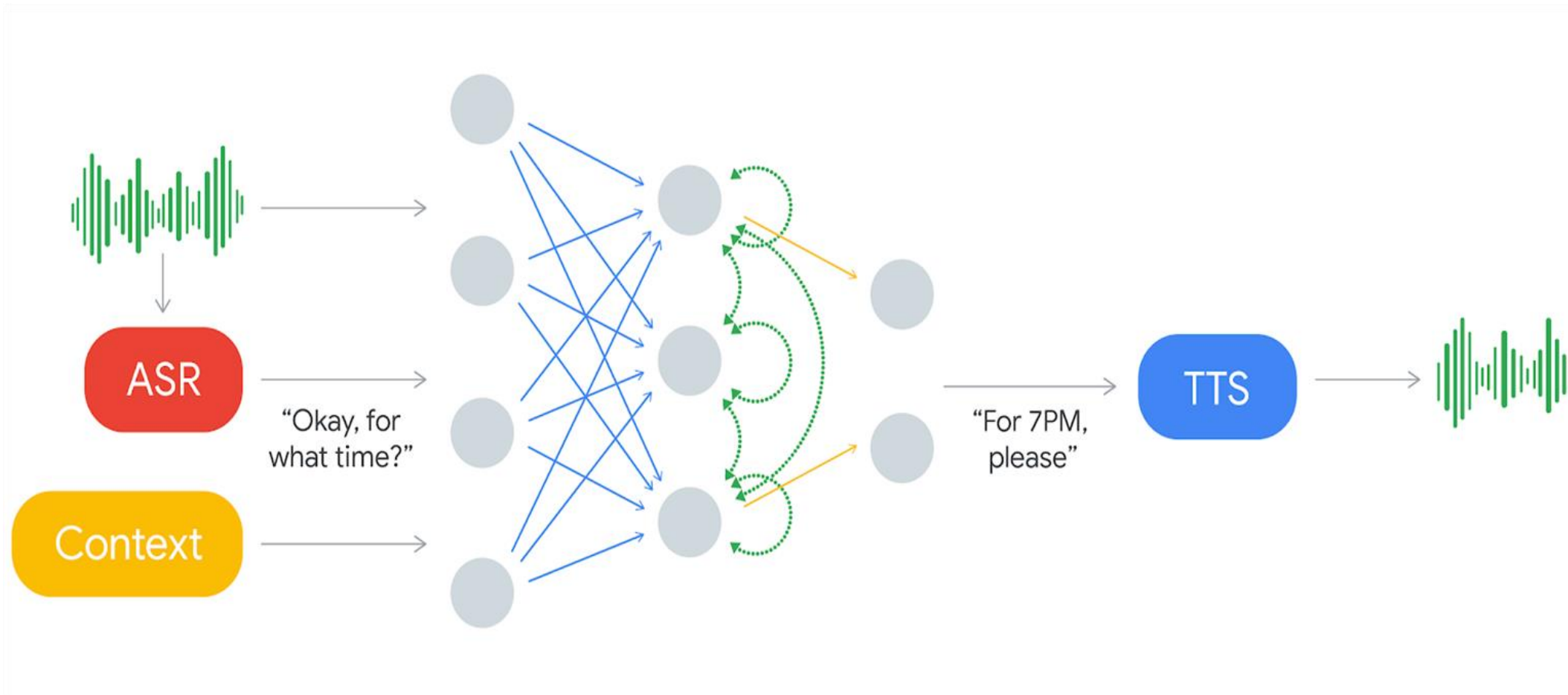
Google leveraged on geo-location mapping.

# Google News



- Clustering
- Recommender System
- Topic modelling

# Google Assistant - WaveNet

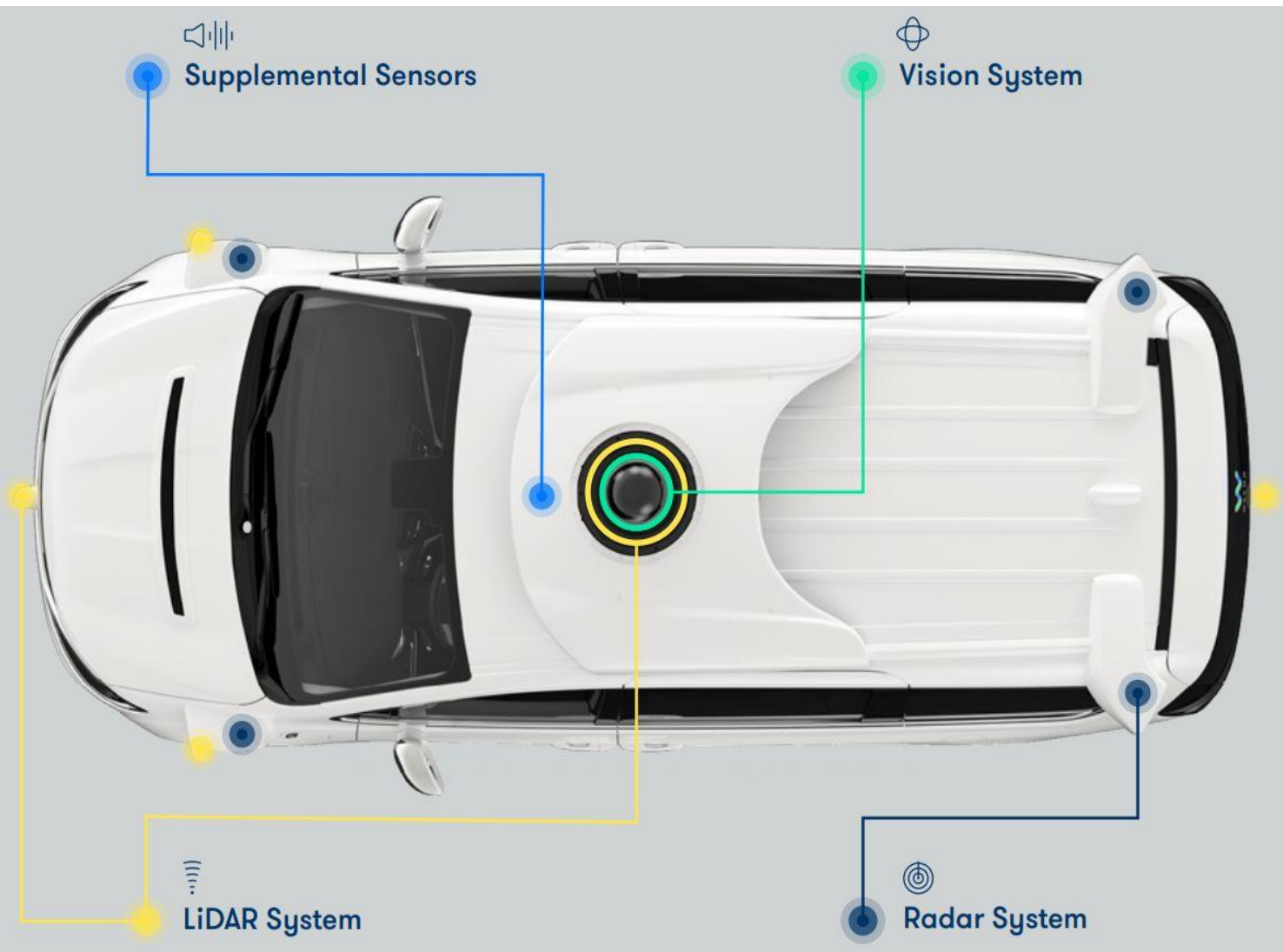


The ability of computers to understand natural speech has been revolutionised in the last few years by the application of deep neural networks (e.g., [Google Voice Search](#)). However, generating speech with computers — a process usually referred to as [speech synthesis](#) or text-to-speech (TTS).

# Waymo



# Waymo



**Radar:** a device that sends radio wave to find out the position and speed of moving object.

**Lidar:** like radar, but instead of sending out radio waves it emits pulses of infrared light—aka lasers invisible to the human eye.

**Vision:** High end camera for real-time object detection.

Sensor fusion and deep learning.



# Generative Adversarial Networks

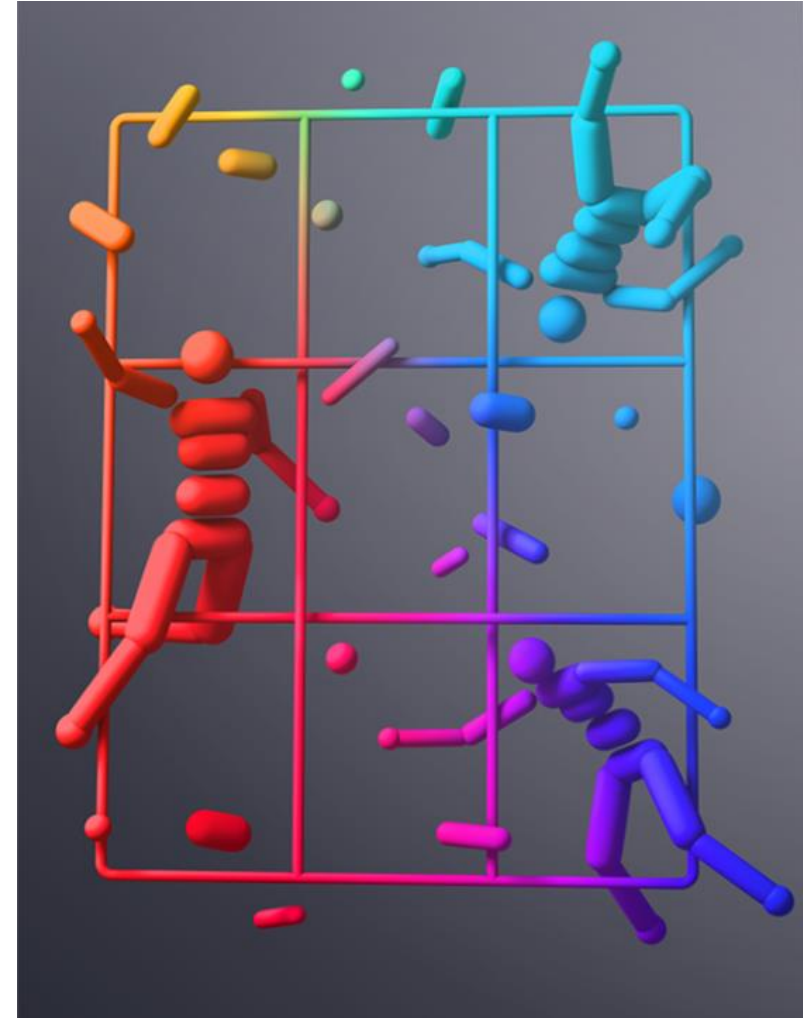
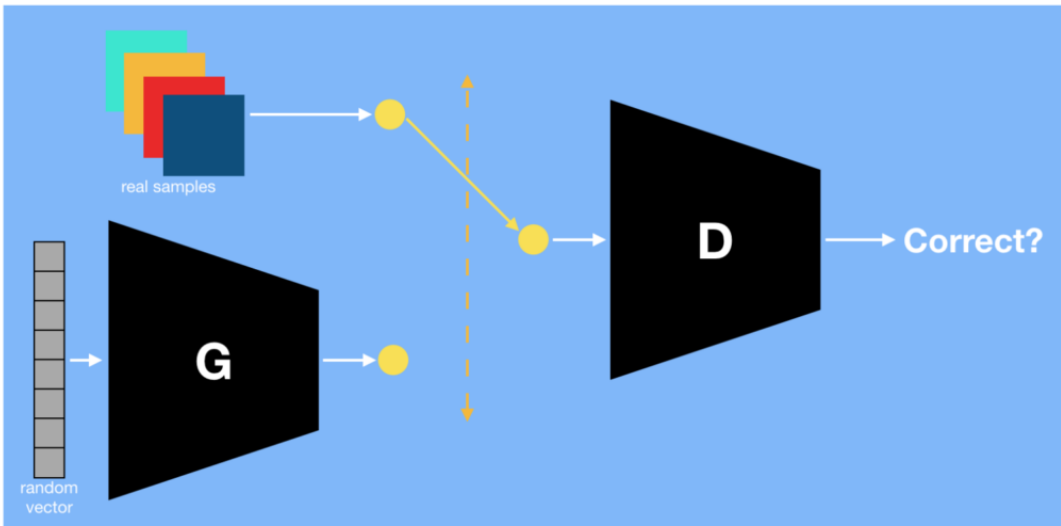


The Bleeding  
Edges of AI

# GANs

A generative Adversarial Network is a class of machine learning system invented by Ian Goodfellow and his colleagues in 2014.

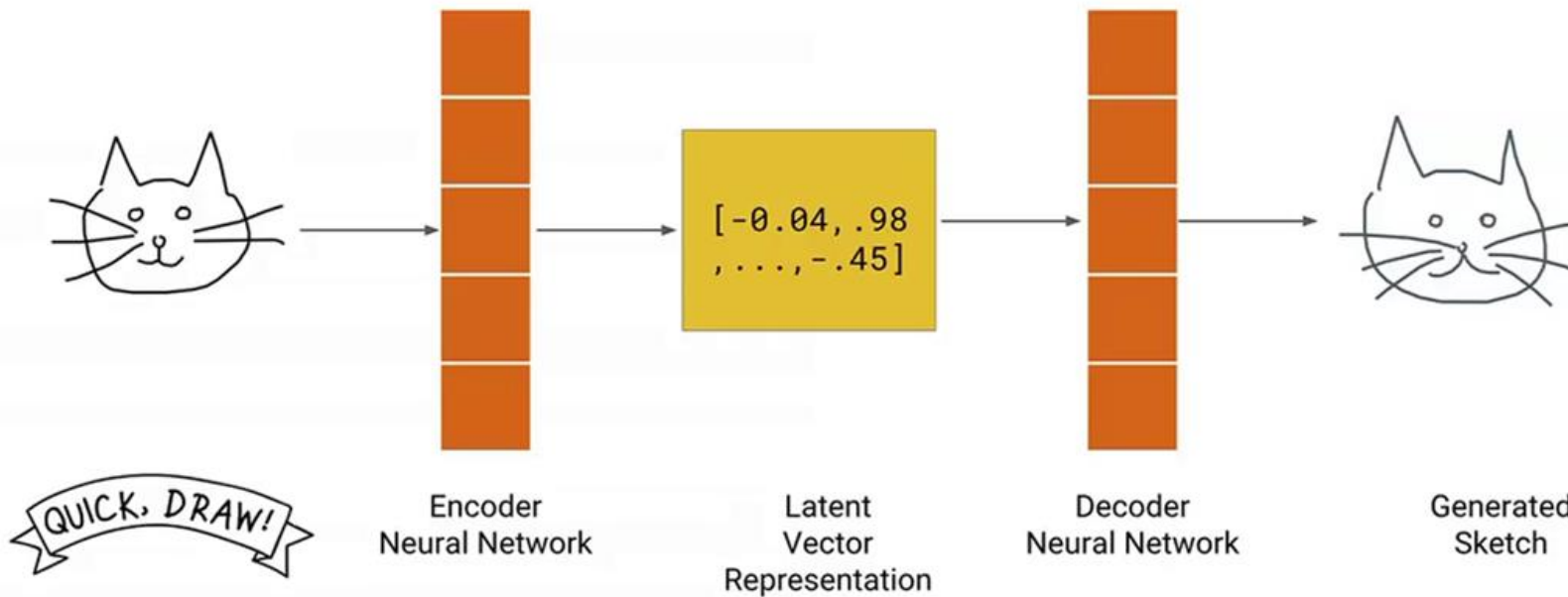
Two neural networks contest with each other in a game.





# GANs - Application

## A Latent Vector Space for Drawing

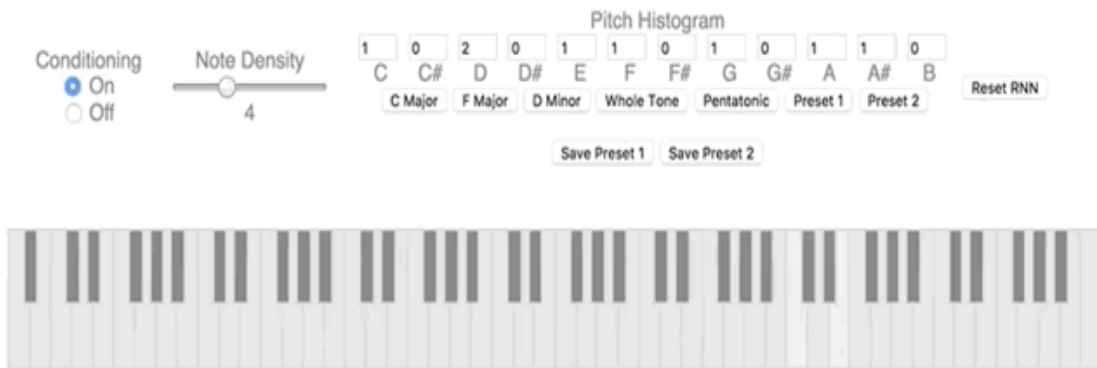


A Neural Representation of Sketch Drawings  
David Ha and Douglas Eck

# GANs - Application



## Performance RNN



Generation of music



Generation of Art



# Common Myths Around AI



Jay Shah, MS Computer Science & Machine Learning, Arizona State University  
(2020)

Answered May 11

A lot of people looking to get started in machine learning usually are concerned for,

*"I can't get into machine learning until..."*

- I get a degree or higher degree.
- I complete a course.
- I am good at linear algebra.
- I know statistics and probability theory.
- I have mastered this library or that tool.

But these are not true in all contexts.

Which of them do you think is correct?



# Starter Kit

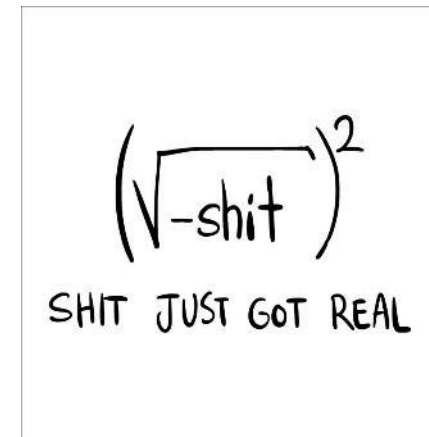


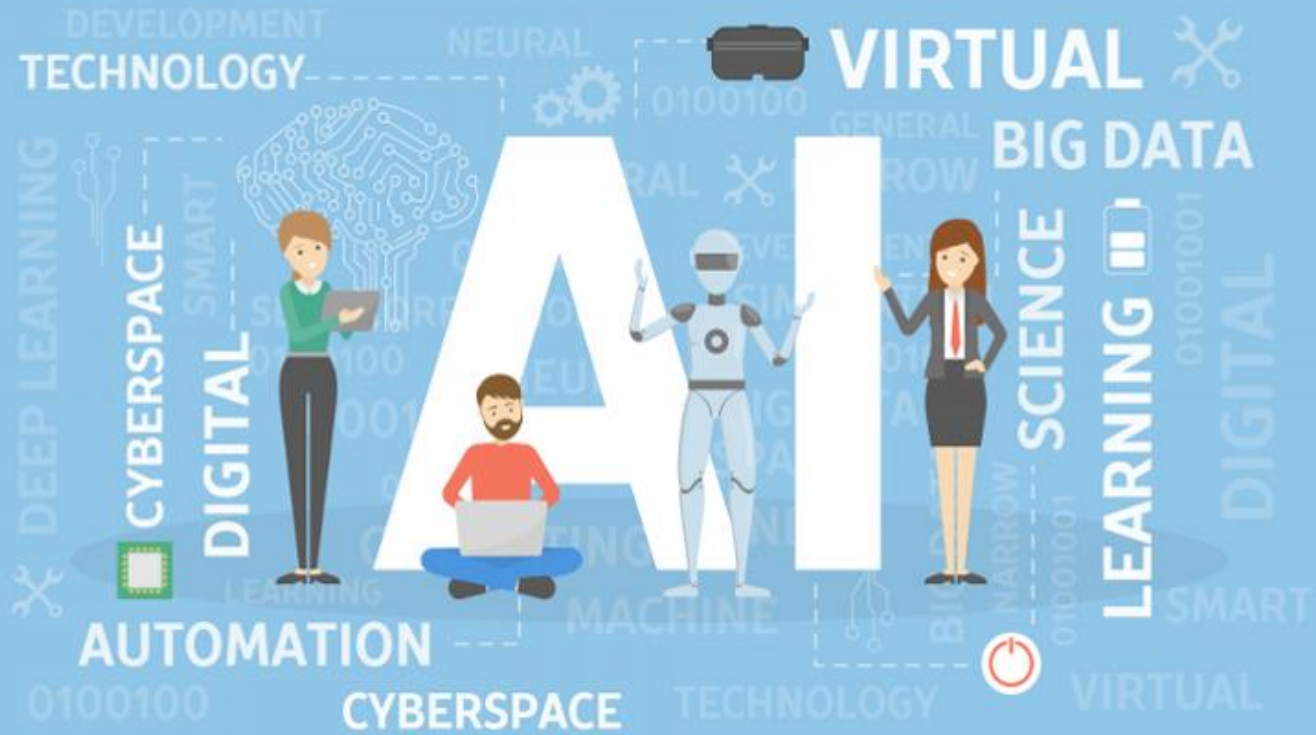
Google™ Is Your Best Friend ...

## Curiosity ( Ok with failure)



## Self-Education





*“AI will digitally disrupt all industries.  
Don’t be left behind”*

- Dave Waters

**Anything you can do,  
AI can do better**

