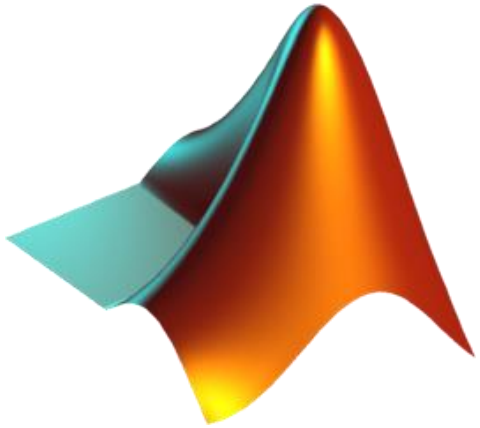
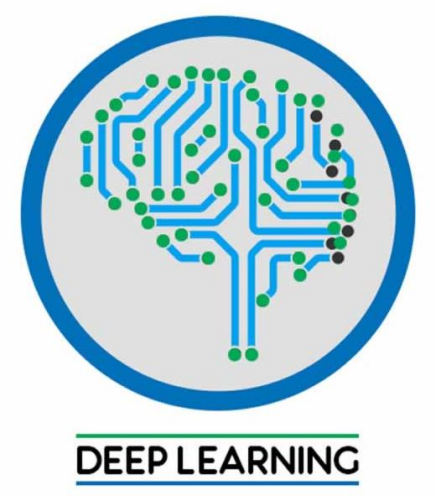
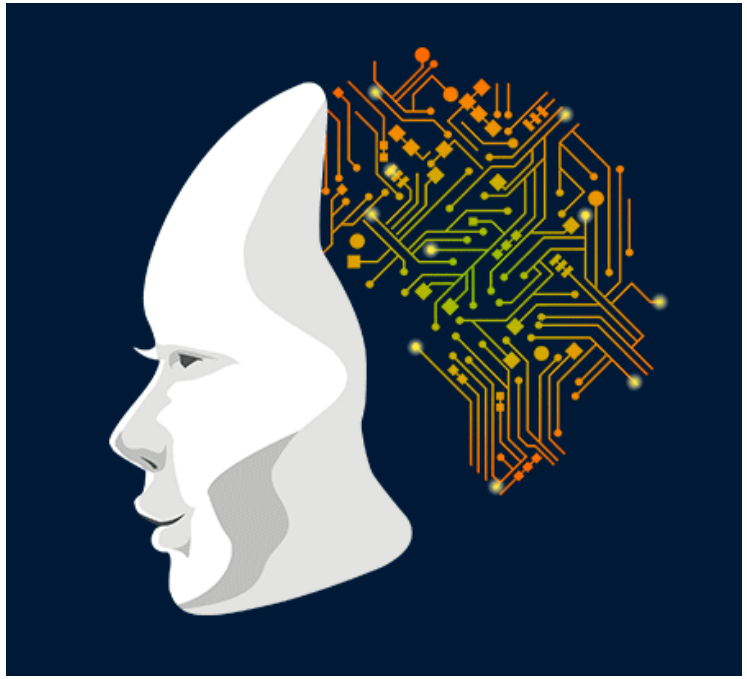






Mughees Asif

Y3 Aerospace Engineering

MATLAB/Simulink Student Ambassador

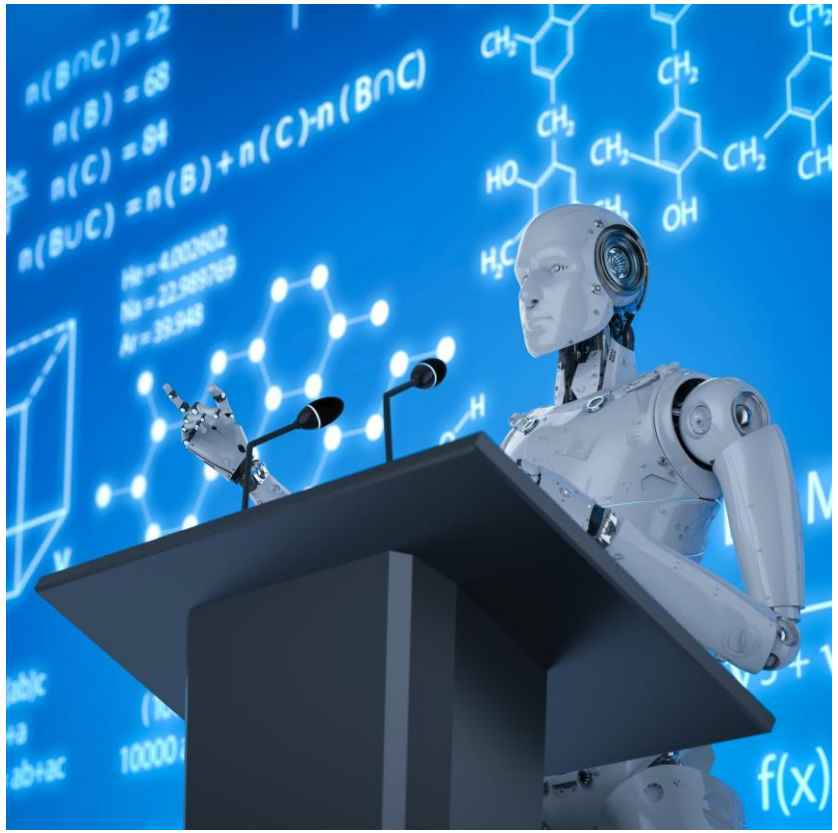
Outline

1. Artificial Intelligence
2. Machine Learning
3. Deep Learning
4. Live session
5. Resources
6. Quiz


GOOGLE AI
HAS FULL
CONVERSATIONS
TECH
INSIDER

What is Artificial Intelligence?

- The capability of a machine to imitate intelligent human behaviour.
- **270%** increase in the use of AI algorithms in the past 4 years.
- Revenue projected to hit **£100 billion** by 2025.
- Use cases involve modelling customer behaviour, streamlining repetitive tasks, and enabling predictive analysis.



What can I do with Artificial Intelligence?

Miso Robotics uses Deep Learning to train Flippy

Challenge

Automate repetitive tasks in the food industry.

Solution

A fully autonomous robotic kitchen assistant that uses cloud-based monitoring, thermal imaging and deep learning.

Results

- Improves cooking performance by studying the external environment and food temperature.

What can I do with Artificial Intelligence?

Uber uses Machine Learning

Challenge

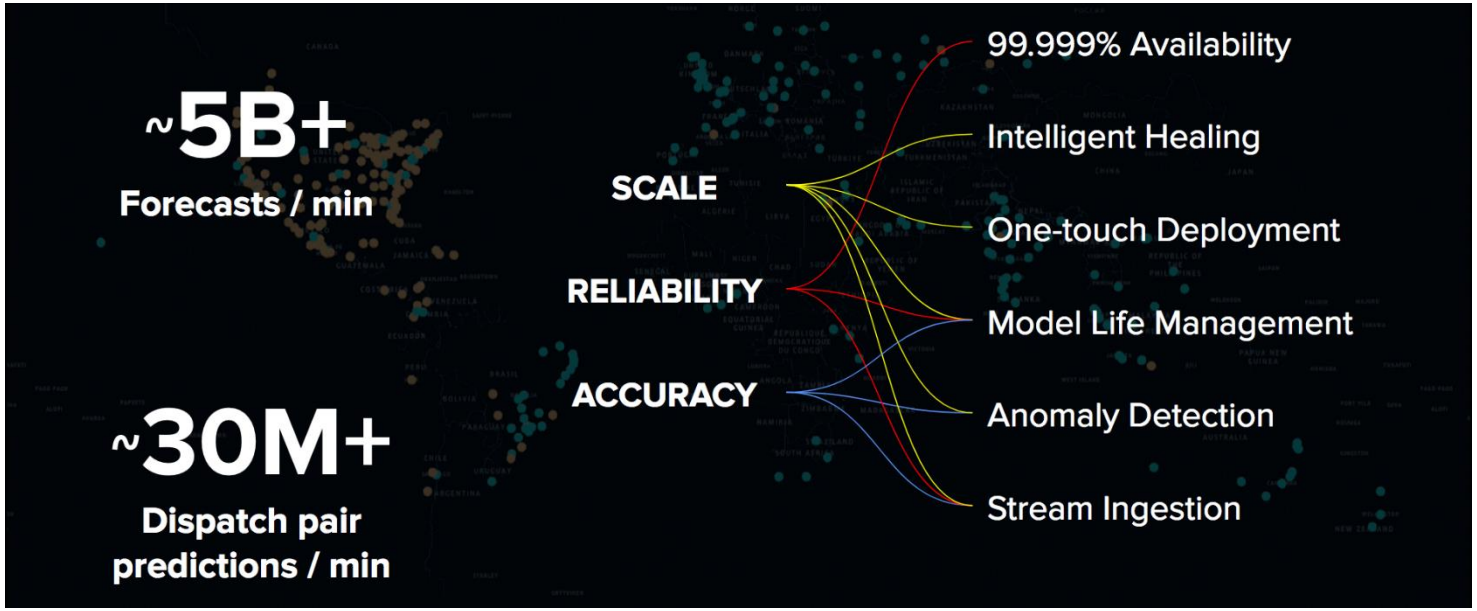
Handle production-scale user data.

Solution

Michelangelo real-time machine learning system.

Results

- Efficient ride-sharing marketplace, identify suspicious or fraudulent accounts, and suggest optimal pickup and drop-off points.



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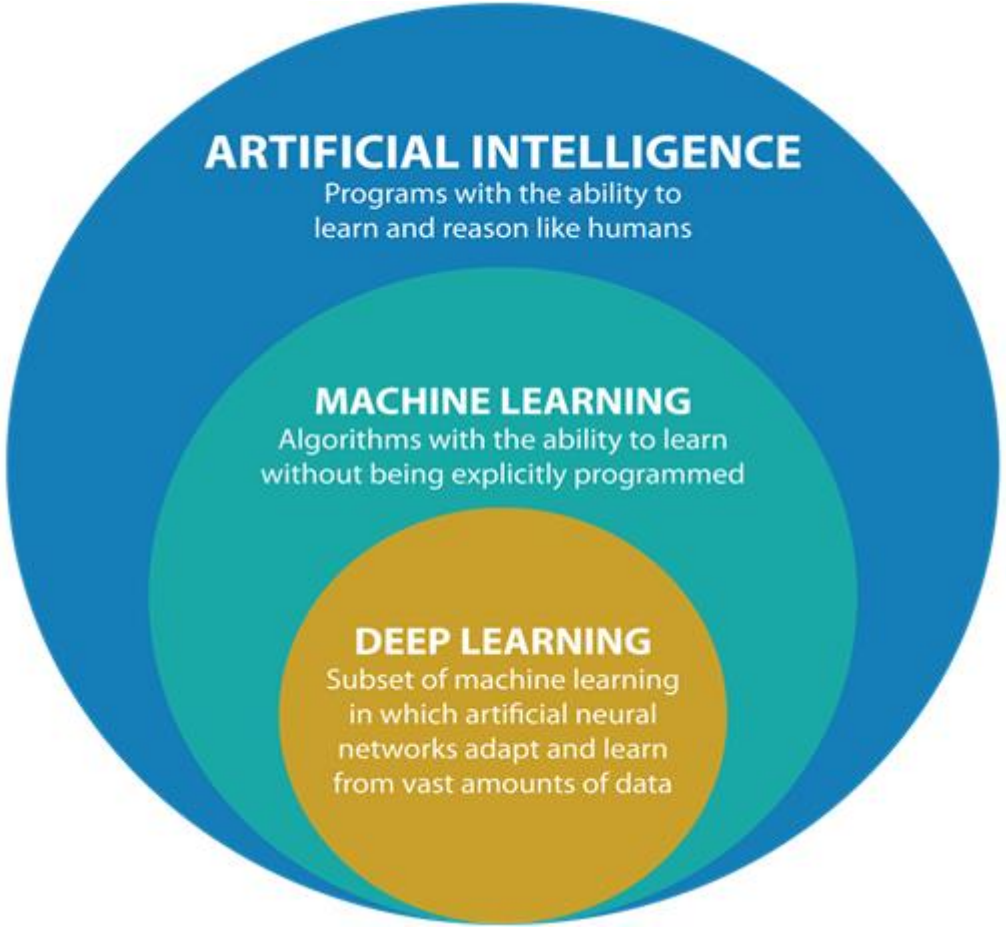
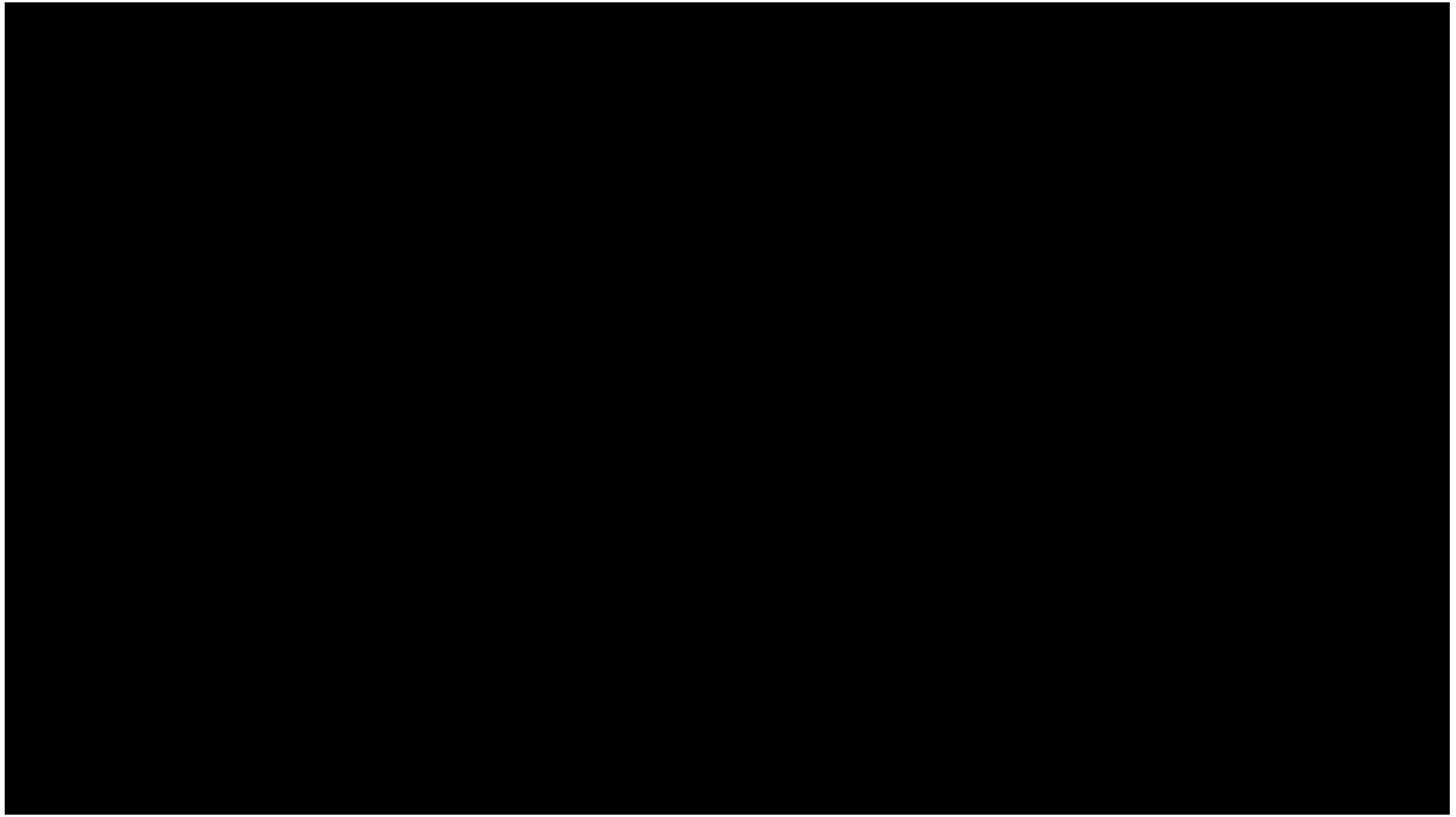
What is Machine Learning?

- Process in which a computer uses statistics to find patterns within data sets.
- The patterns found can be used to classify future data sets.
- Machine learning at work:
  - Unlocking a phone with facial or fingerprint recognition
  - Video streaming sites recommending similar videos
  - Social media filters knowing where faces are in a frame



Types of Machine Learning



What can I do with Machine Learning?

BMW Uses Machine Learning to Detect Oversteering

Challenge

Develop automated software for detecting oversteering, an unsafe condition in which rear tires lose their grip during a turn.

Solution

Use MATLAB to develop, train, and evaluate a variety of supervised machine learning classifier types, including KNN, SVM, and decision trees.

Results

- Oversteering identified with greater than 98% accuracy.
- Multiple machine learning classifiers trained automatically.
- Code generated and deployed to an ECU for real-time, in-vehicle testing.

A BMW M4 oversteering on a test track.

What can I do with Machine Learning?

University College of London Researcher Uses Machine Learning to Predict Epileptic Seizures from EEG Data

Challenge

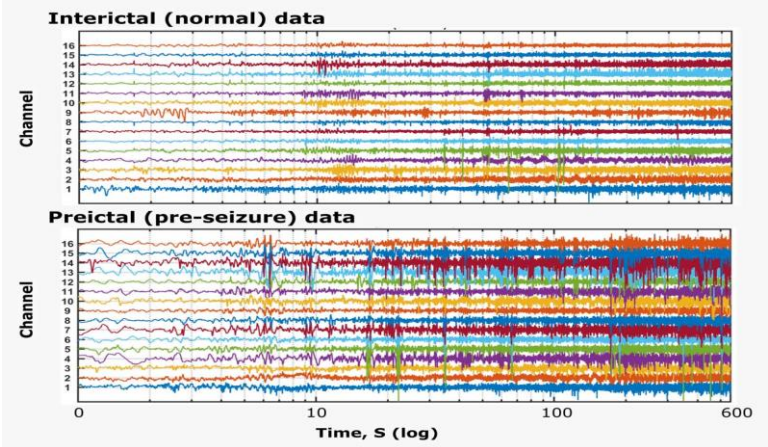
Develop algorithms that can predict the onset of epileptic seizures based on human intracranial electroencephalograph (EEG) recordings.

Solution

Use MATLAB to extract features from the data, identify the best classification models, and combine models to maximize prediction accuracy.

Results

- Created model for predicting epileptic seizure for multiple patients.
- Developed algorithms that won first place for individual participants and third place overall in a worldwide Kaggle competition.
- Halved computation time by simultaneously processing training and test data on multiple cores.



Intracranial EEG data analyzed with machine learning algorithms

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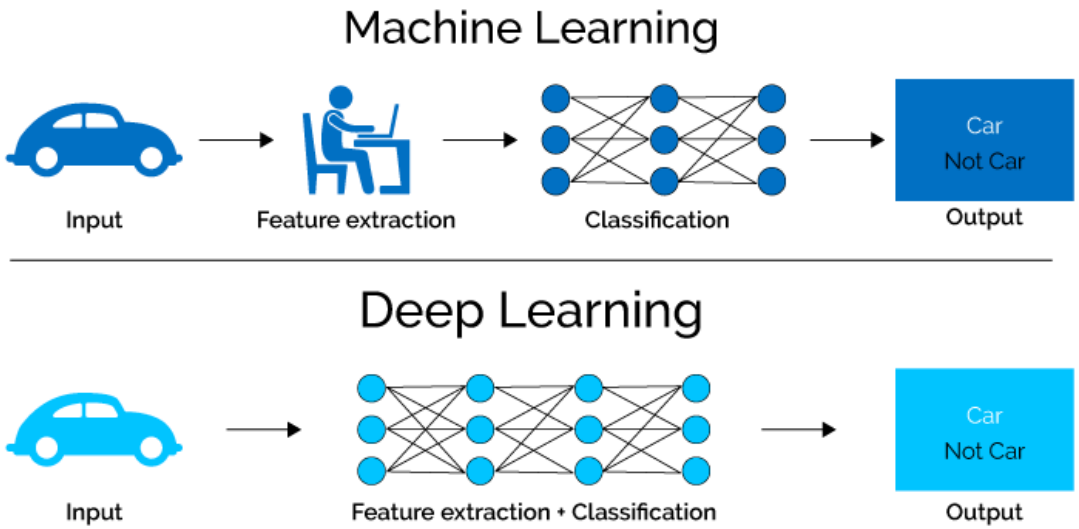
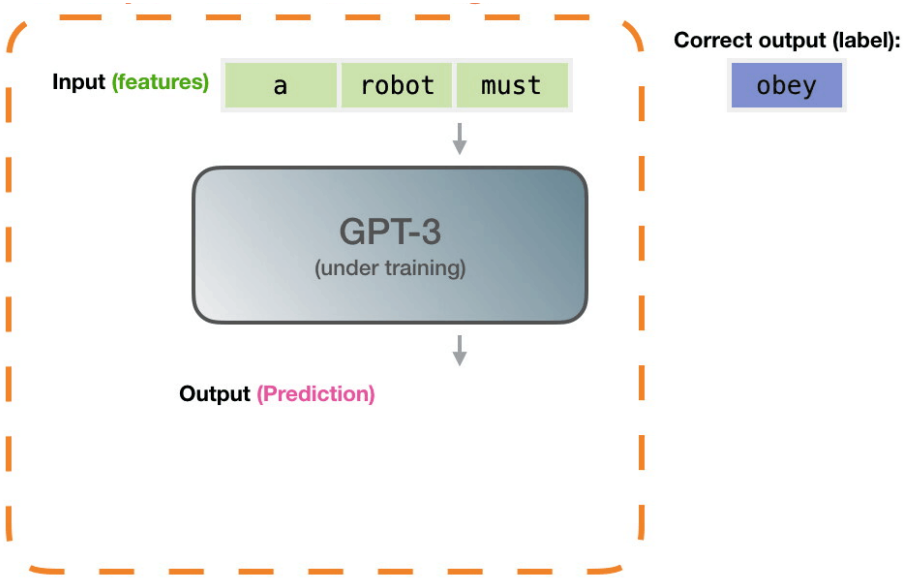
What is Deep Learning?

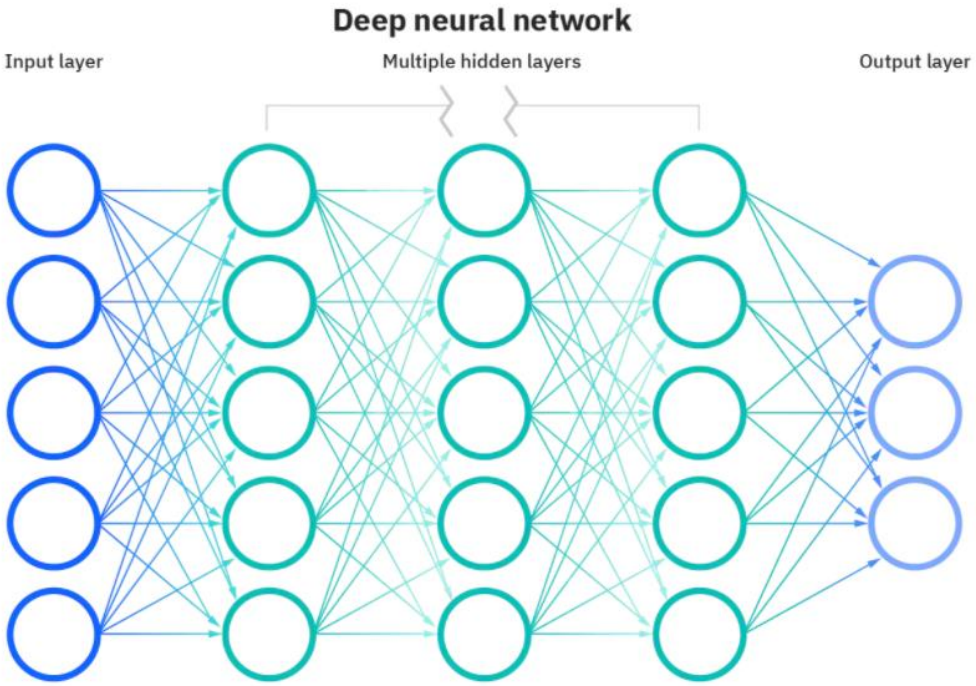
- A subset of machine learning that *imitates* the workings of the human brain in processing data and creating patterns for use in decision making.
- Deep learning at work:
  - Google: build powerful voice- and image-recognition algorithms.
  - Netflix and Amazon: recommendation engines.
  - Generative Pre-trained Transformer 3 (GPT-3): model for creating human-like text with deep learning technologies.



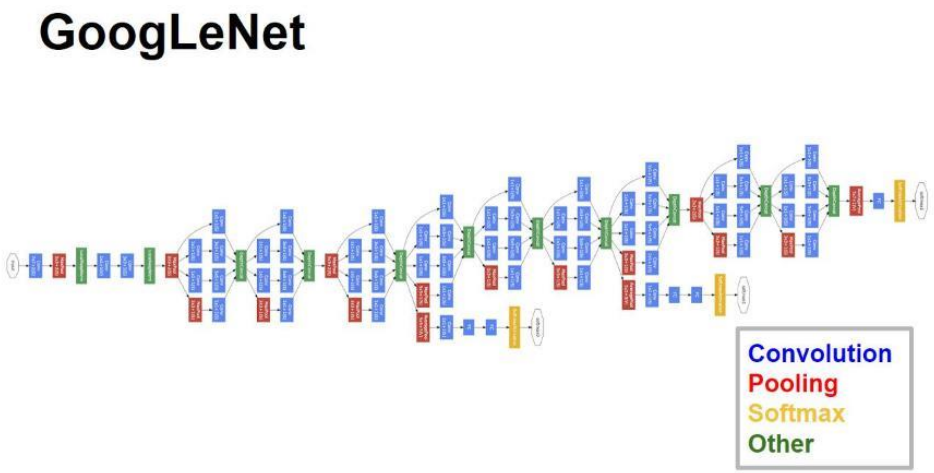


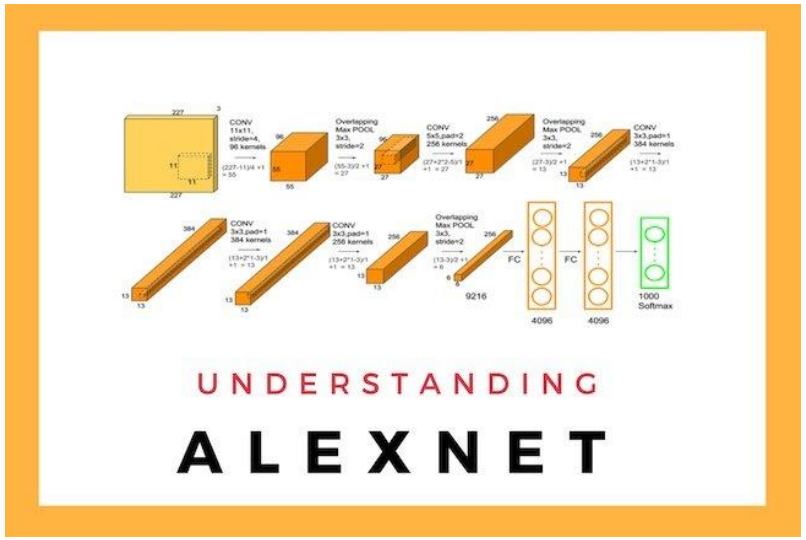
Neural Networks

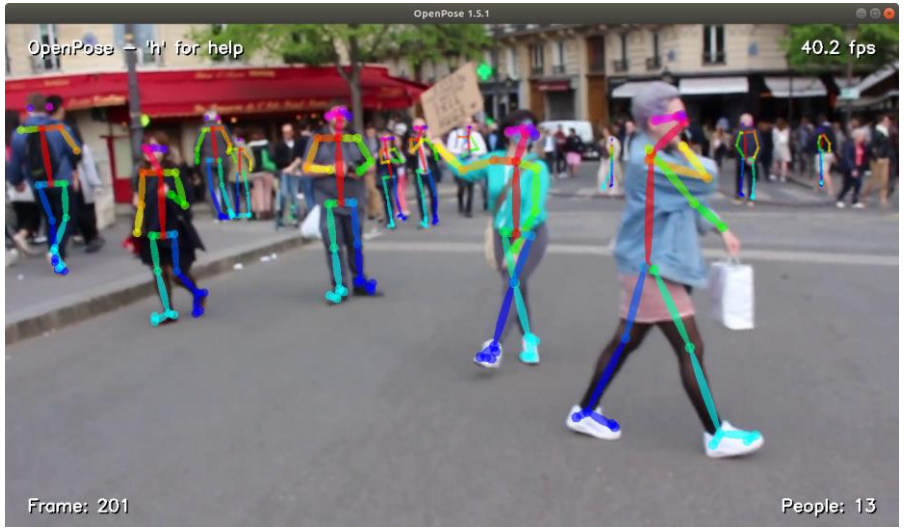
- Neural networks name and structure is inspired by the human brain, mimicking the way that biological neurons signal to one another.
- Deep Learning and neural networks tend to be used interchangeably in conversation, which can be confusing. As a result, it's worth noting that the "deep" in deep learning is just referring to the depth of layers in a neural network.
- Process:
  - Once an input layer is determined, weights are assigned.
  - All inputs are then multiplied by their respective weights and then summed.
  - Output is passed through an activation function, passing data to the next layer in the network.
  - This results in the output of one node becoming in the input of the next node. This process of passing data from one layer to the next layer defines this neural network as a **feedforward network**.



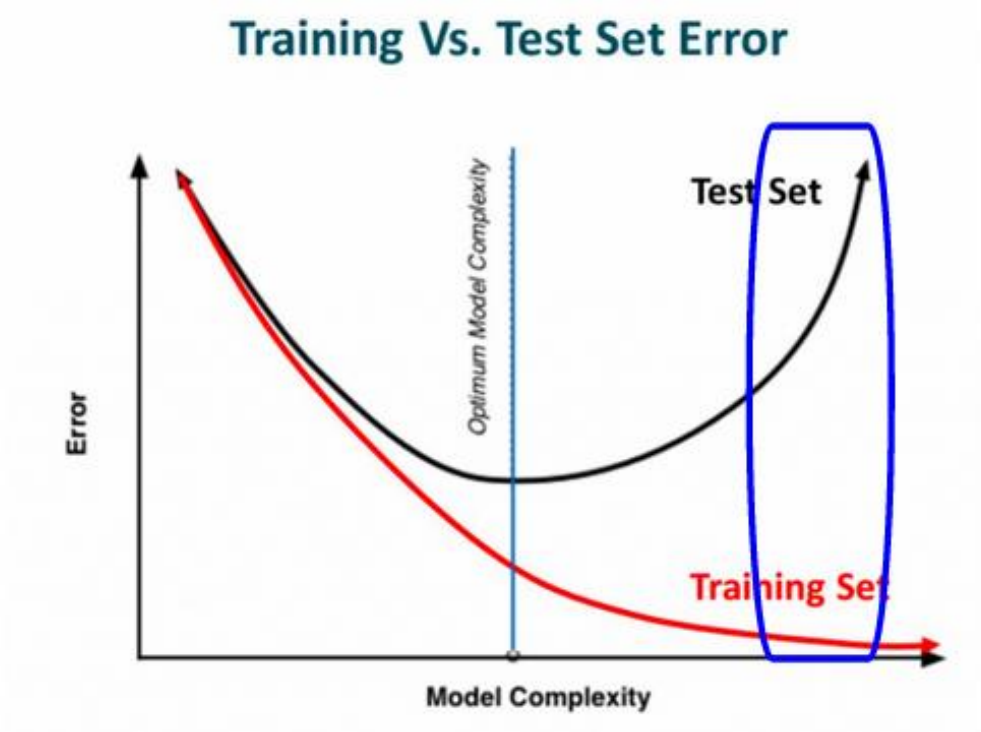
Examples of Pretrained Neural Networks

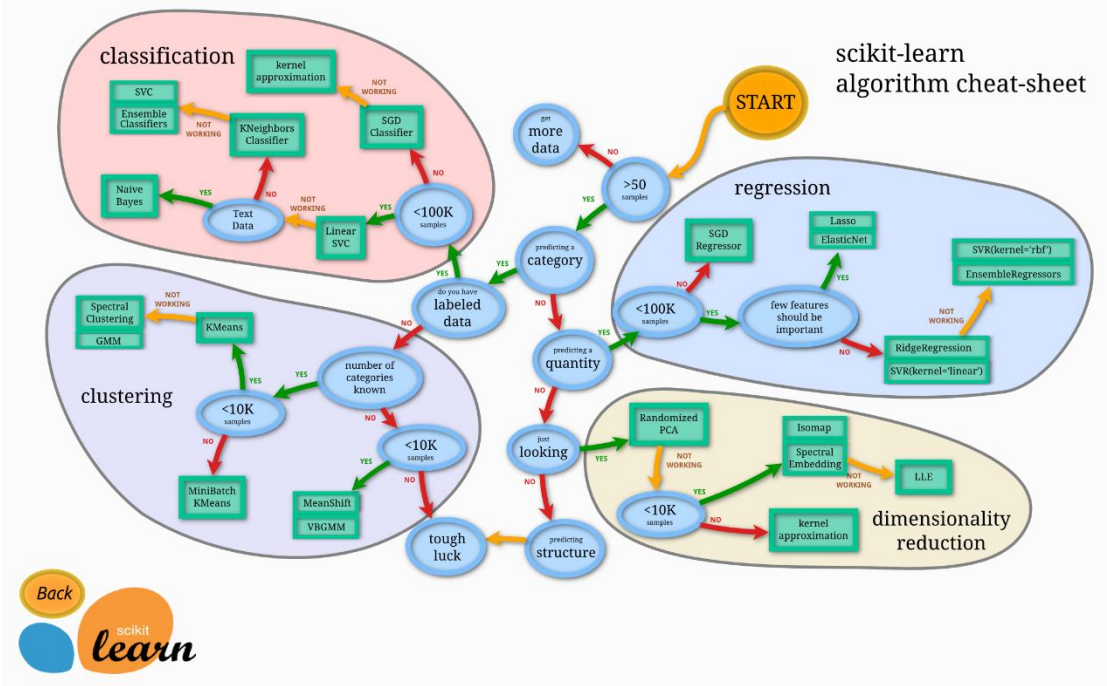






Improving accuracy





What can I do with Deep Learning?

Using Deep Learning for Complex Physical Processes

Challenge

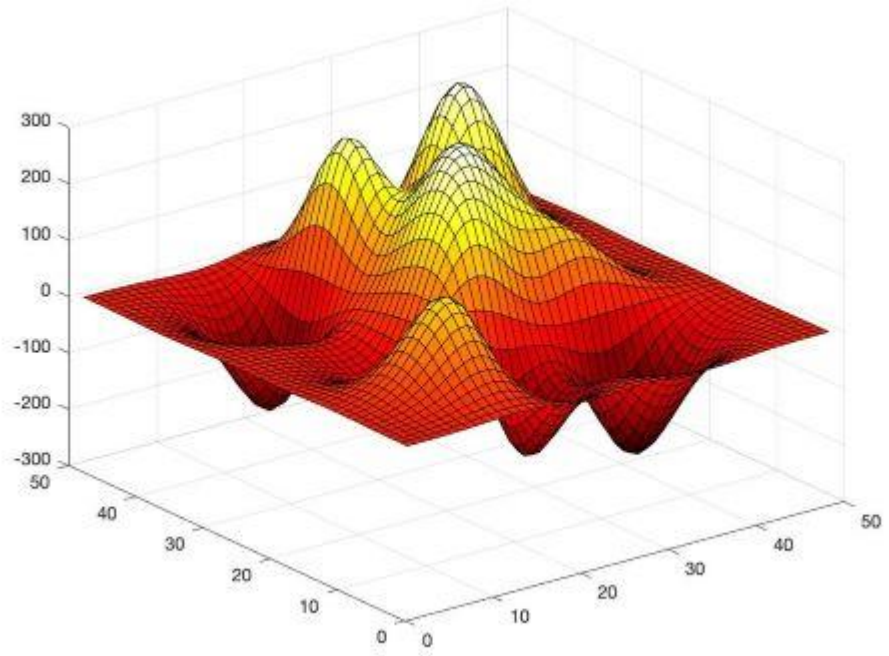
The data used to develop machine learning algorithms differs from scientific data in fundamental ways; as the scientific data is often high-dimensional, multimodal, complex, structured and/or sparse.

Solution

Use MATLAB to develop automatic machine learning (AutoML) methods for automating network design.

Results

- Scientific application of interest is fluid turbulence, which is a non-linear, non-local, multi-scale phenomenon.
- Provides a pathway to not only build robust neural networks suitable for applications to scientific datasets but can be used to better understand the network training evolution process.



What can I do with Deep Learning?

Using Deep Learning for Identifying Animals in Conservatories

Challenge

Identify endangered animals.

Solution

Use MATLAB and neural networks to train agent to identify various animals.

Results

- Deployed in various conservatories reducing cost overhead and manpower needs.

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Live session

Using Deep Learning for Detecting Types of Objects

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Machine Learning Onramp

TO DO

- Go to https://matlabacademy.mathworks.com/
- Log in to your MathWorks account
- Launch Machine Learning Onramp

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Quiz

Please navigate to: **https://www.kahoot.it**

First: **£25** Amazon Gift Voucher

Second: **£15** Amazon Gift Voucher

Third: **£10** Amazon Gift Voucher

Thank you!