

INTRODUCTION TO DATA SCIENCE

By Faris Hassan (farisology)

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BRIEF INTRO

DATA SCIENTIST - FAVE ASIA

- Bachelor in artificial intelligence
- Had few publications in automatically diagnosing tuberculosis using chest radiographs.
- Worked in corporate investment firm before quitting to join the startup world.
- Lead data scientist in a small startup called POD.
- Nvidia (of US) Certified Trainer -to be- from DLI.
- Certified consultant by Ministry of human resources Malaysia.
- Listed trainer in the HRDF portal Malaysia.



AGENDA OF THE DAY

TOPICS TO DISCUSS

The big 3 Ai, machine learning & data science

Machine learning overview

Data & Statistics

Solving problems with Machine Learning

Q&A

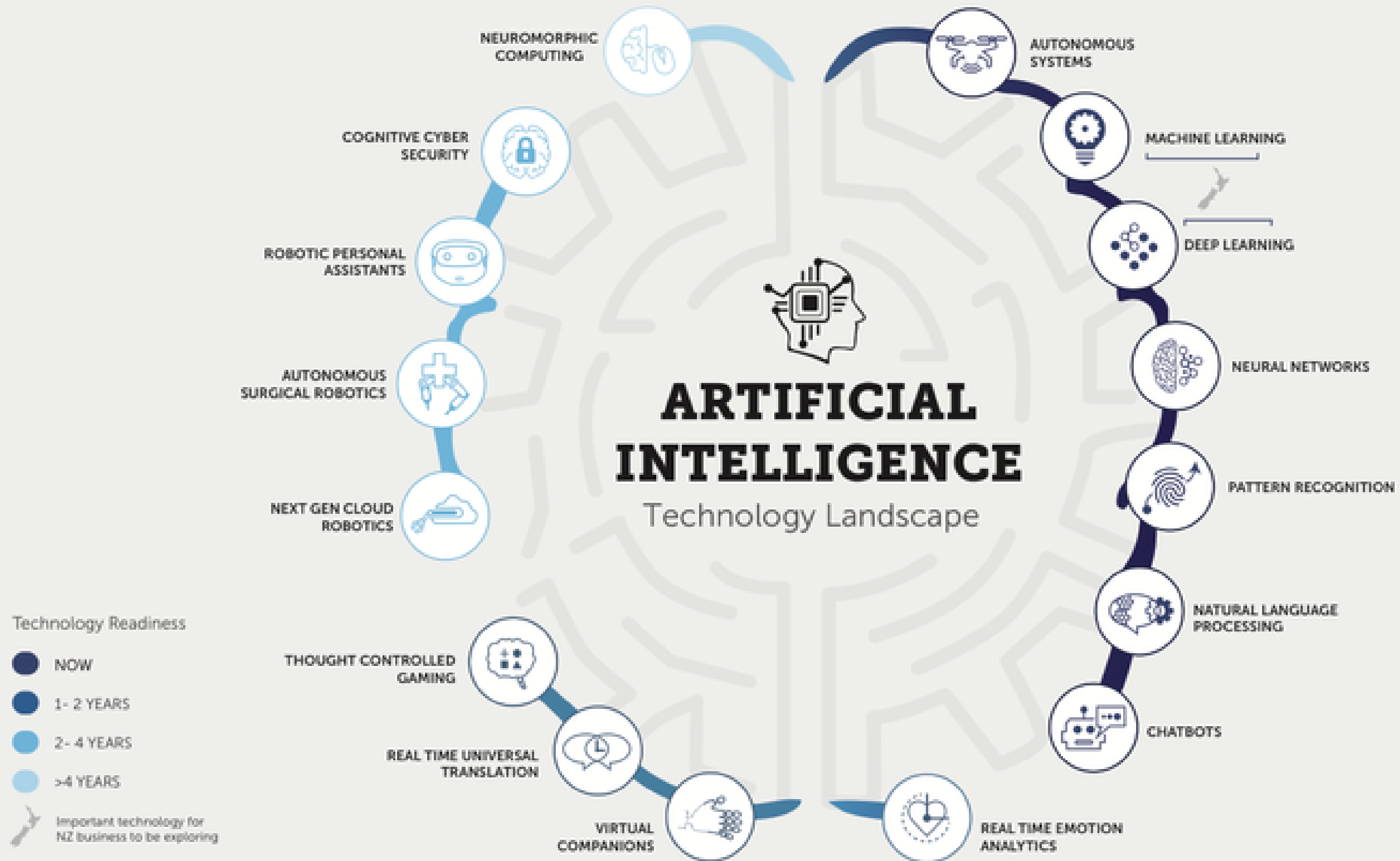
WHAT IS THE DIFFERENCE BETWEEN AI, ML, AND DS?

NEVER GET CONFUSED

INTELLIGENCE PHILOSOPHY

A branch of computer science that aims to create intelligent machines that work and react like humans.

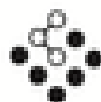
- TECHOPEDIA



Artificial Intelligence Portfolio



Artificial intelligence is computer systems that exhibit human like intelligence. It is a group of science fields and technologies concerned with creating machines take intelligent actions based on inputs.



DEEP LEARNING

A high powered type of Machine learning algorithms that uses a cascade of many computing layers. Each layer uses the input from the previous later as input.

Enabled by Neural networks. Given big data sets, Deep Learning algorithms are great at pattern recognition, and enable things like, speech recognition, image recognition, natural language processing. The combination of neural networks (enabled by the cloud), machine learning technology, and massive data sets (the internet), has made Deep Learning one of the most exciting AI sub-fields recently.

EXAMPLES: Google's DeepMind beating the best human at the game "Go"



MACHINE LEARNING

Algorithms that can learn from and make predictions on data. Overlaps with Computational Statistics. Overlaps with Bayesian Statistics. Underpins Predictive Analytics. Underpins Data-Mining.

Three subgroups:
• Supervised learning the system is presented with example inputs and known desired outputs and learns how to map inputs to outputs
• Unsupervised learning The system finds patterns without requiring example inputs and outputs.
• Reinforcement learning The system is "rewarded" when it gets something right and learns as a result.

EXAMPLES: Recommender systems (like NZ's own Movie which recommends movies)

Xero uses Machine Learning for automated processes (like automated cost-coding)

WEXA at the University of Waikato

JV between Goat Ventures and Minter Ellison for legal AI



AUTONOMOUS SYSTEMS

Autonomous robots, self-driving vehicles, drones, all enabled by AI.

EXAMPLES: HMI Technologies (trial at Christ Airport)



PATTERN RECOGNITION

A branch of Machine Learning and Deep Learning which focusses on recognition of patterns in data.

EXAMPLES: DeepFace, (Facebook)



NATURAL LANGUAGE PROCESSING

Technologies that enable computer systems to interact seamlessly with human languages.

Includes:
• from written language and speech recognition),
• sentiment analysis (understanding the sentiment underneath what is being said)
• translation
• understanding meaning within text/speech
• language generation

Note- experts believe that another technological breakthrough is required before systems can truly interact seamlessly with human languages.

EXAMPLES: Siri, Alexa, Cortana

NZer Mark Sagar's new company Soul Machines

NZ company Entopia (Natural Language Processing consultancy)

NZ Company Booktrack



THOUGHT CONTROLLED GAMING

The application of AI, wearable technology, and brain computing interface technology to enable seamless interaction with social gaming environments in real-time, through avatars without the need for joystick type devices.

EXAMPLES: Emotic, Games Research Lab (Columbia Uni)



VIRTUAL COMPANIONS

Cloud connected, Virtual Reality based avatars powered by AI engines that can behave and interact just as a human would.

EXAMPLES: Digital companions that provide caregiving companionship for the elderly.



REAL TIME EMOTION ANALYTICS

The application of AI to analyse brain signals, voice and facial expression to detect human emotions.

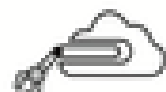
EXAMPLES: Emotiv



REAL TIME UNIVERSAL TRANSLATION

The application of Natural Language Processing to enable two humans (with no common language) to understand each other in real-time

EXAMPLES: Microsoft Translator



NEXT GEN CLOUD ROBOTICS

Convergence of AI, Big Data, Cloud and the as-a-Service model will enable a cloud based robotic brain that robots can use for high powered intelligent and intuitive collaboration with humans

EXAMPLES: Cloud Minds



AUTONOMOUS SURGICAL ROBOTICS

Cloud based AI platforms can help robotic surgeons to perform precise surgeries by learning from large historical surgical data sets (like video)

EXAMPLES: Imperial College of London, MIT



COGNITIVE CYBER SECURITY

Cloud-based AI systems trained on historical cyber threat data, capable of mitigating real-time cyber threats

EXAMPLES: Deep Instinct



ROBOTIC PERSONAL ASSISTANTS

Cloud base AI learns from Big Data to enable human-like social robots that can perform usefully as personal assistants

EXAMPLES: Kuka Robotics Boston Dynamics



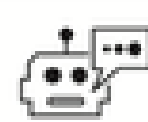
NEUROMORPHIC COMPUTING

Future generation computing hardware that mimics the function of the human brain in silicon chips.

EXAMPLES: The Human Brain Project

IBM's TrueNorth processor chip

NZ's Professor Simon Brown at University of Canterbury

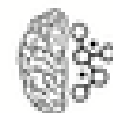


CHATBOTS

A software robot that interacts with humans online, receiving and sending conversational text with the aim of emulating the way a human communicates. An example of Natural Language Processing.

EXAMPLES: Kiwi start-up Jude.ai (an AI based financial advisor)

Kiwi company Wine Searcher



NEURAL NETWORKS

Computing systems that organise the computing elements in a layered way that is loosely modelled on the human brain. Enables Deep Learning.

EXAMPLES: The computing system that sits behind Baby X at Auckland Uni

NZ's Professor Kasabov at AUT (Neucube)

SOURCES:
Front & Sullivan "Artificial Intelligence - R&D and Applications Road Map" (Dec 2016), Harvard Business Review- "The competitive landscape for Machine Intelligence (Nov 2016), Driven Zills and James Chan "The State of Machine Intelligence, 2006" (2016), Stanford University, "Artificial Intelligence and Life in 2030" (2016), https://en.wikipedia.org/wiki/Artificial_intelligence (2017)

MACHINE LEARNING

**The field of study that gives
computers the ability to learn
without being
explicitly programmed.**

- ARTHUR SAMUEL 1959

DATA SCIENCE

Interdisciplinary field -of computer science (machine learning), statistics, and mathematics- that uses scientific methods, processes and algorithms to extract knowledge and insights from data.

- WIKIPEDIA



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TECHNOLOGY TODAY

HISTORY



COMPUTING POWER

Computers today are far more powerful than any time in the past.



STORAGE

10 years ago you cannot afford 500gb hard disk, today 1tb is the normal capacity.



DATA

As we transformed to the digital space all our data and interaction is recorded.



KNOW HOW

Someone have started it all and the revolution begun.



PROVEN USE CASES

Monitization of ideas got everyone excited.



Artificial Intelligence Applications



HEALTH CARE

Automatic diagnoses.

Drug discovery.

Wearable devices monitoring.

Optimising clinic operations.



FINTECH

Credit risk scoring.

Fraud detection and prevention.

Customer retention.

Asset management.



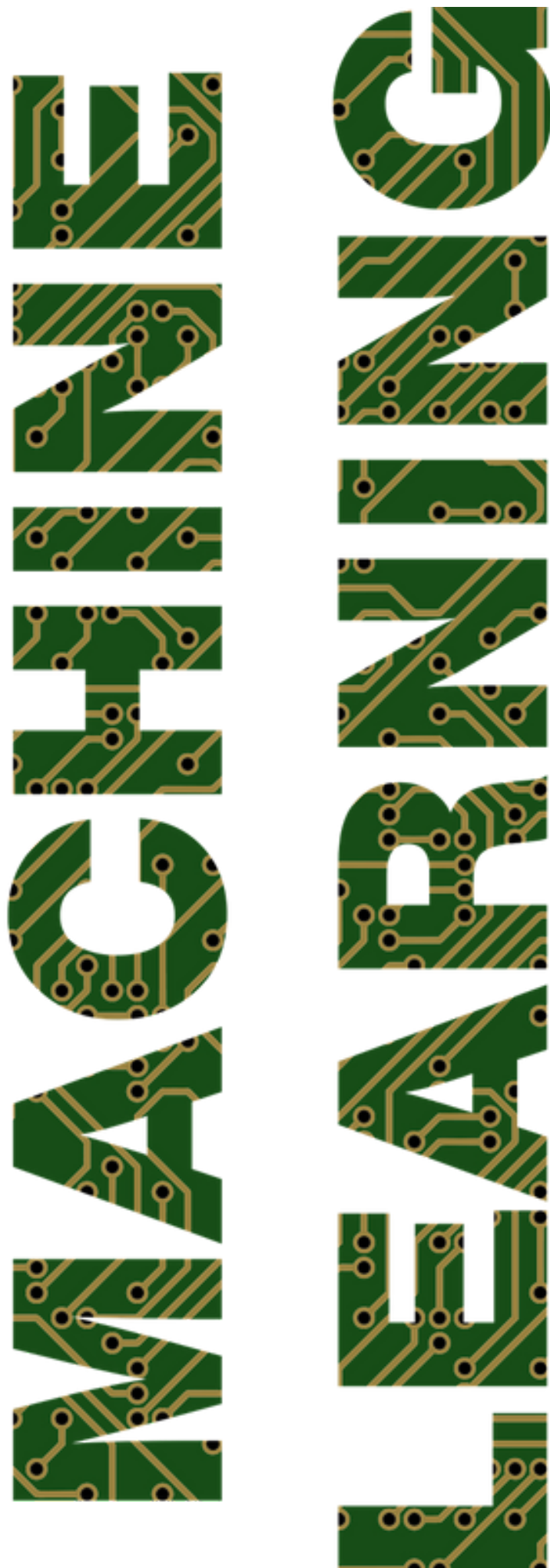
BUSINESS

Churn prediction.

Intelligent marketing.

Predicting customer lifetime value.

Enhance decision making.



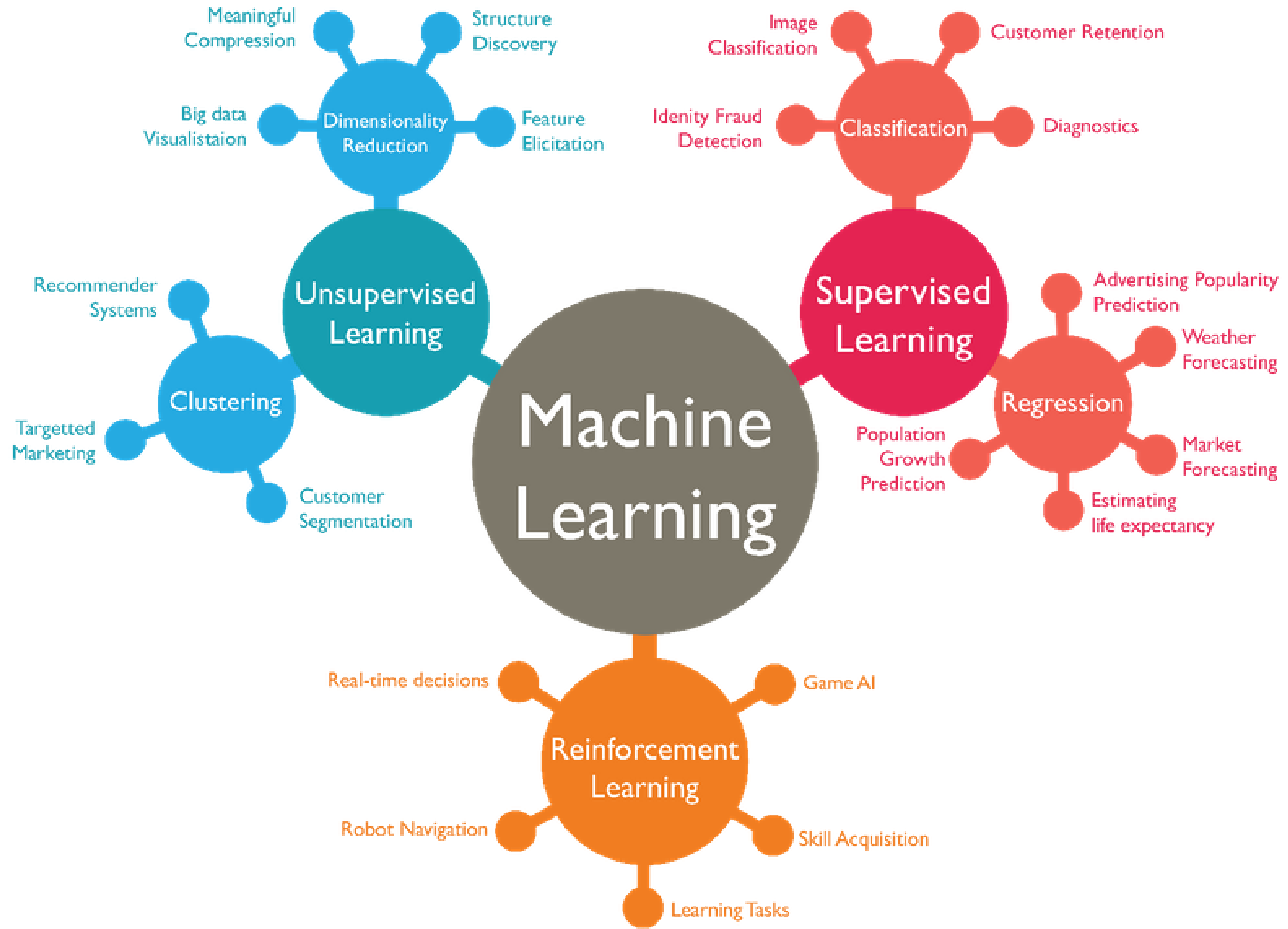
CAN MACHINE THINK

- ALAN TURING

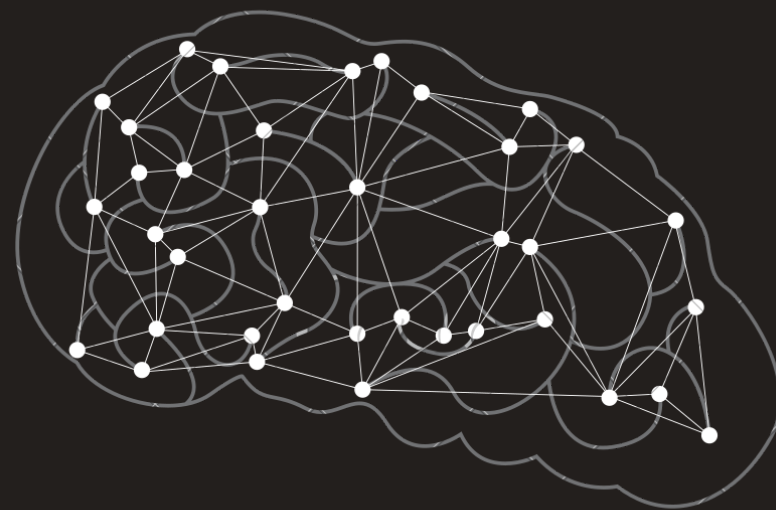
Have you asked yourself how to simulate learning
for machines?

What is learning?

How do we humans learn?



Types of ML algorithms



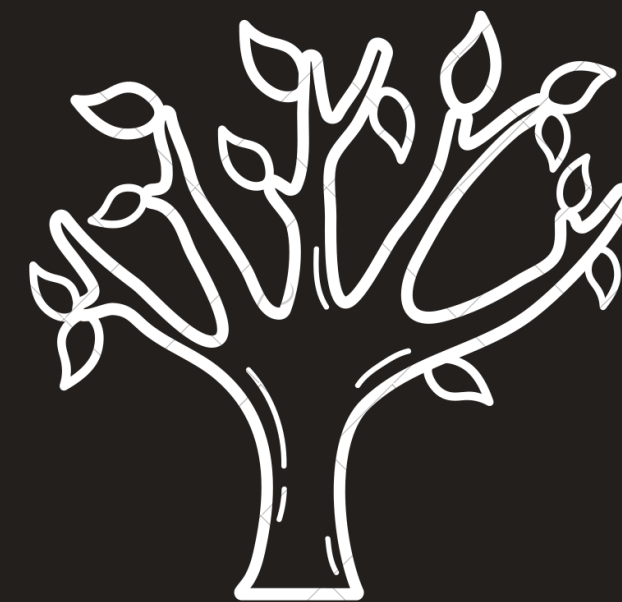
BIO INSPIRED

Neural Network
Genetic Algorithm



DISTANCE BASED

KNN
Distance Classifier



TREE BASED

Decision Tree
Random Forest



LET'S TALK DATA

DATA IS THE NEW OIL

WHAT IS DATA?

HELPING YOU STAY CONNECTED

Information, especially facts or numbers, collected to be examined and considered and used to help decision-making, or information in an electronic form that can be stored and used by a computer:





QUANTITATIVE



Continuous

Discreet

CATEGORICAL

Ordinal

Nominal





DESCRIPTIVE STATISTICS

Categorical data is analysed and described in the aspect of counts and distribution. Measuring the number of people falling into each category.



Measure of **Center**.



Measure of **Spread**.



The shape of the data.



Outliers.



PROBLEM SOLVING

MACHINE LEARNING AS A TOOL FOR AUTOMATION

UNDERSTAND THE PROBLEM

WHAT IS THE PROBLEM?

WHAT IS THE GOAL OF THE PROJECT?

Research and product are two different goals.

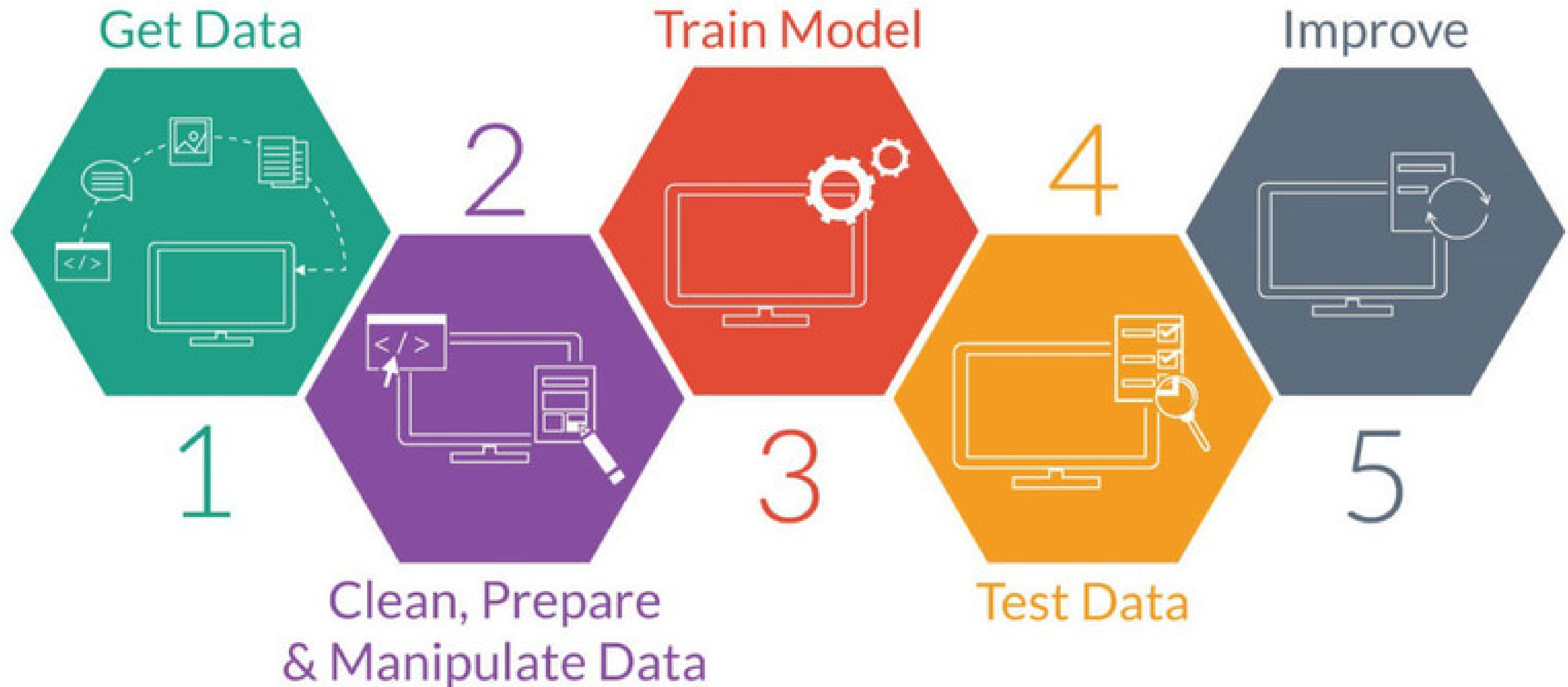
ANALYSE THE PROBLEM

SOMETIMES WE CAN EASILY MISUNDERSTAND THE ISSUE

If we are to use machine learning something magical could happen. Like having the best theoretical solution, or solving the uncalled for issue, or even doing something that can be easily solved with a simple technical solution.



Machine Learning Workflow



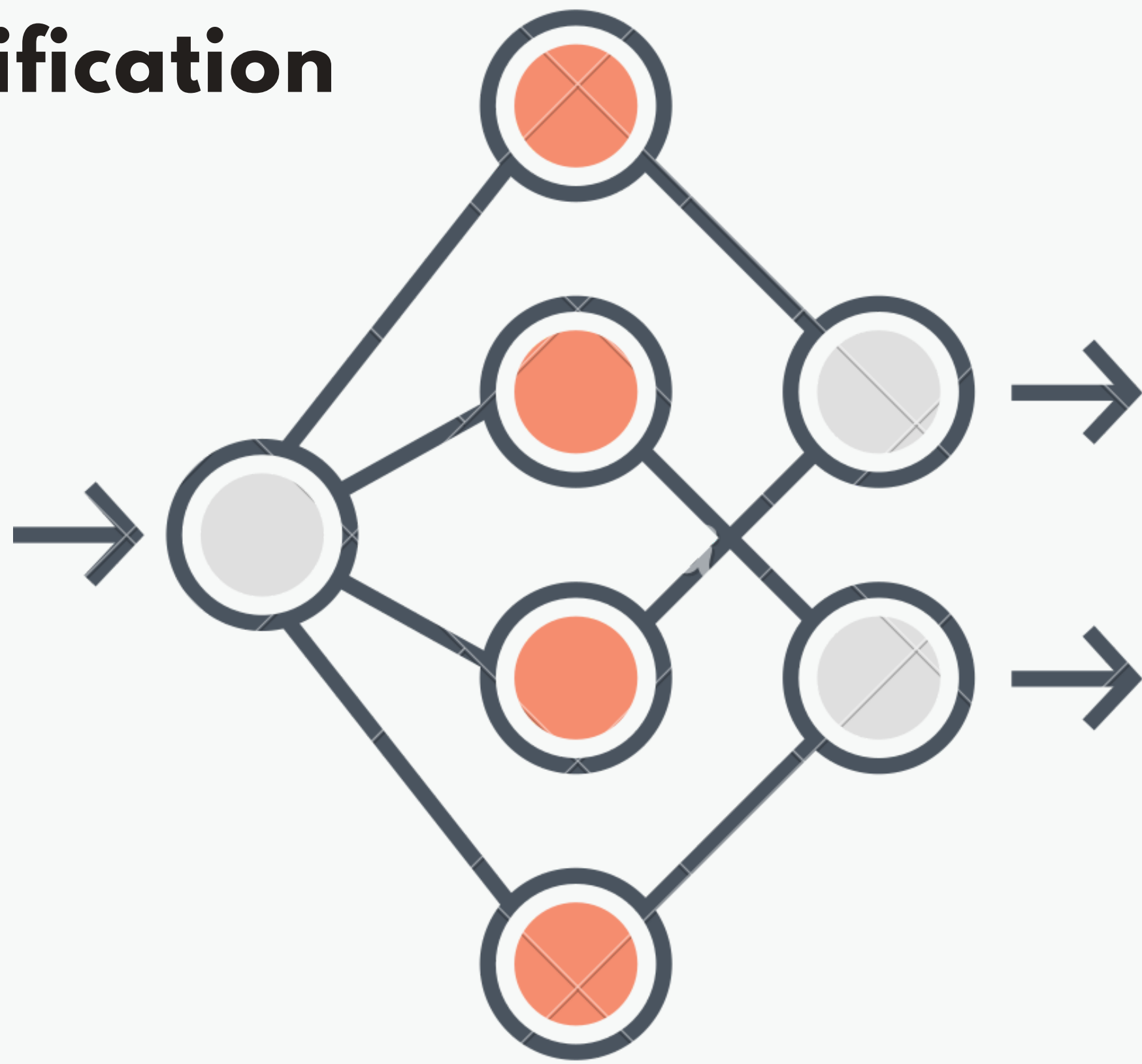
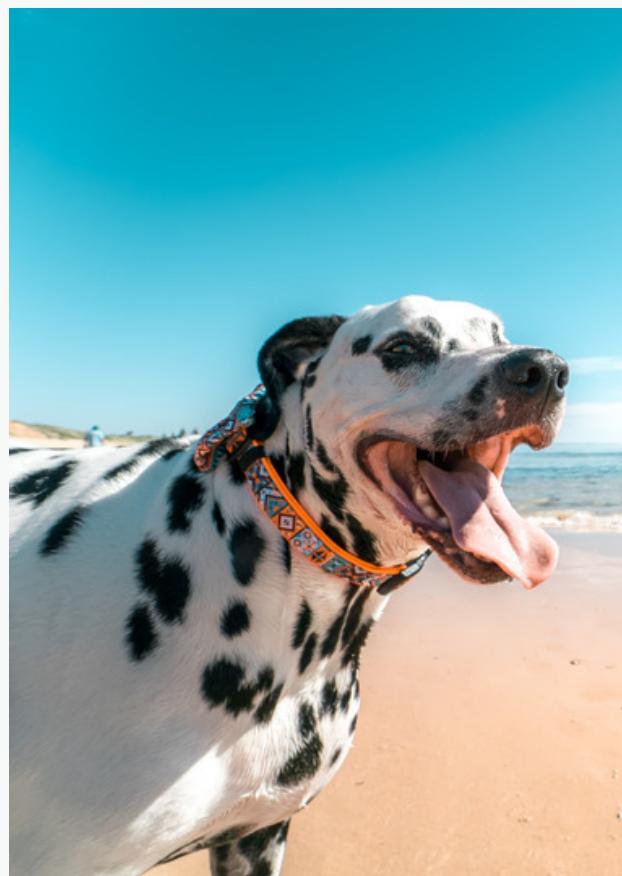
Object Classification

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HOW DOES A NEURAL NETWORK LEARN FROM THESE IMAGES?

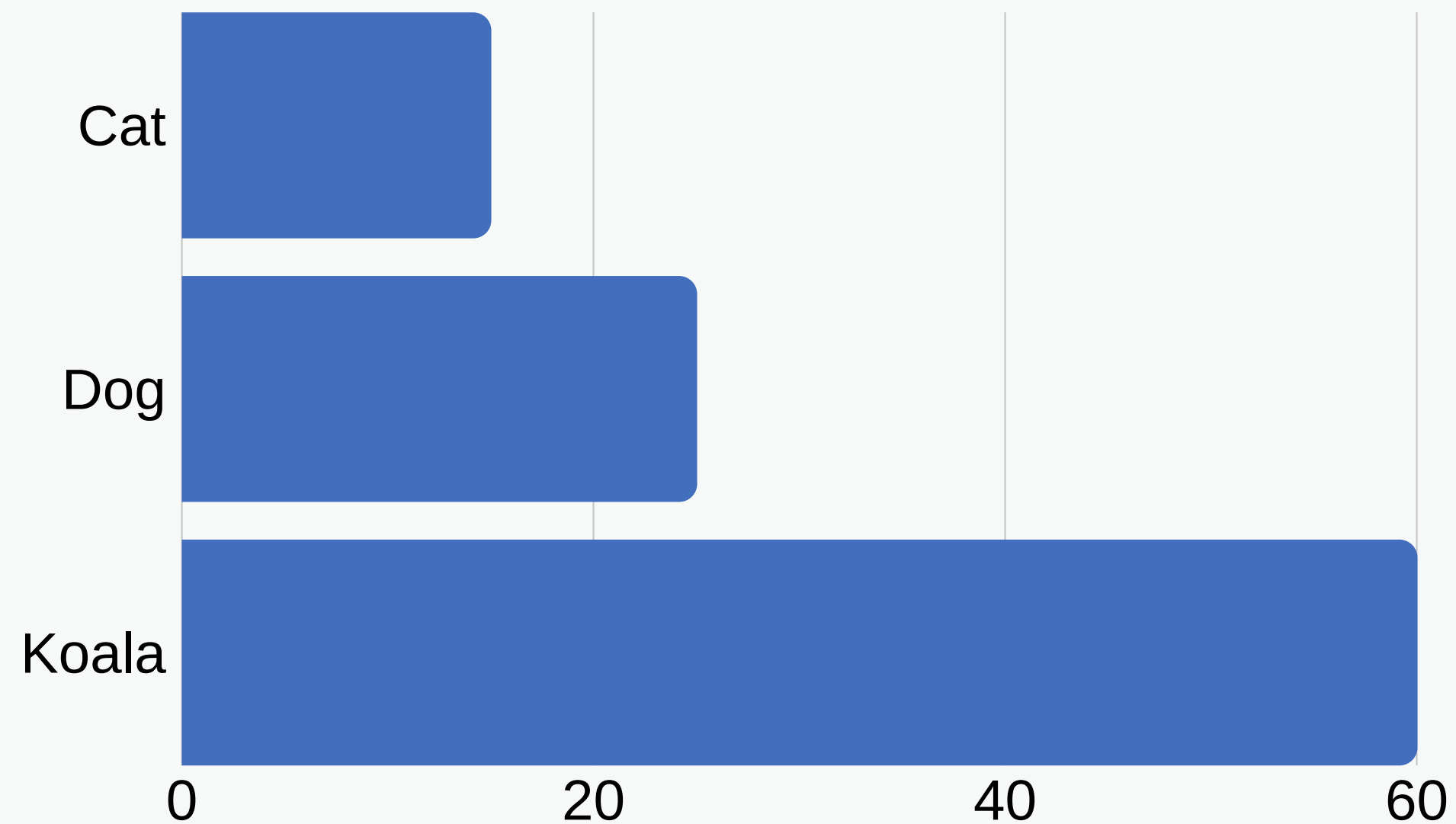
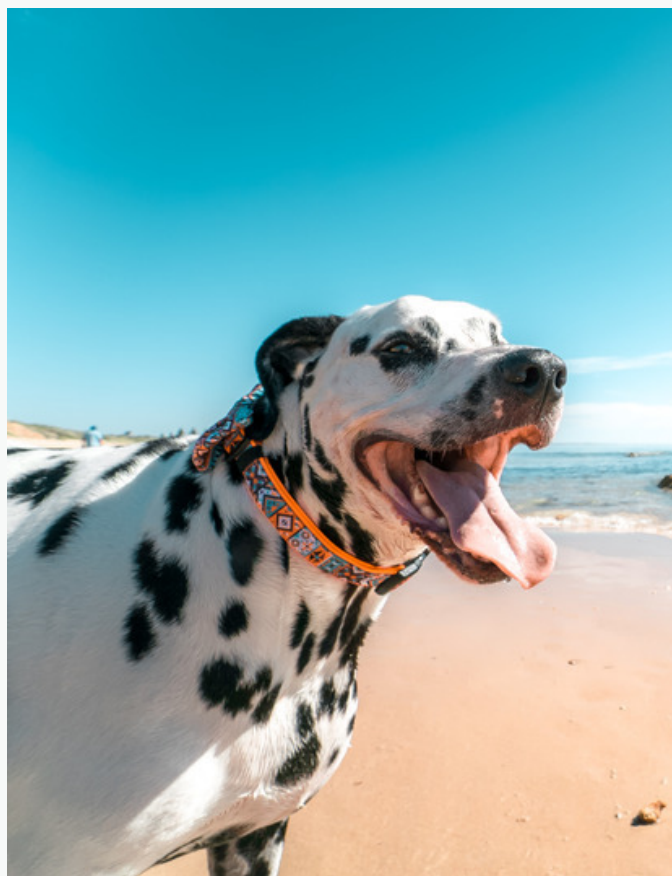
Object Classification



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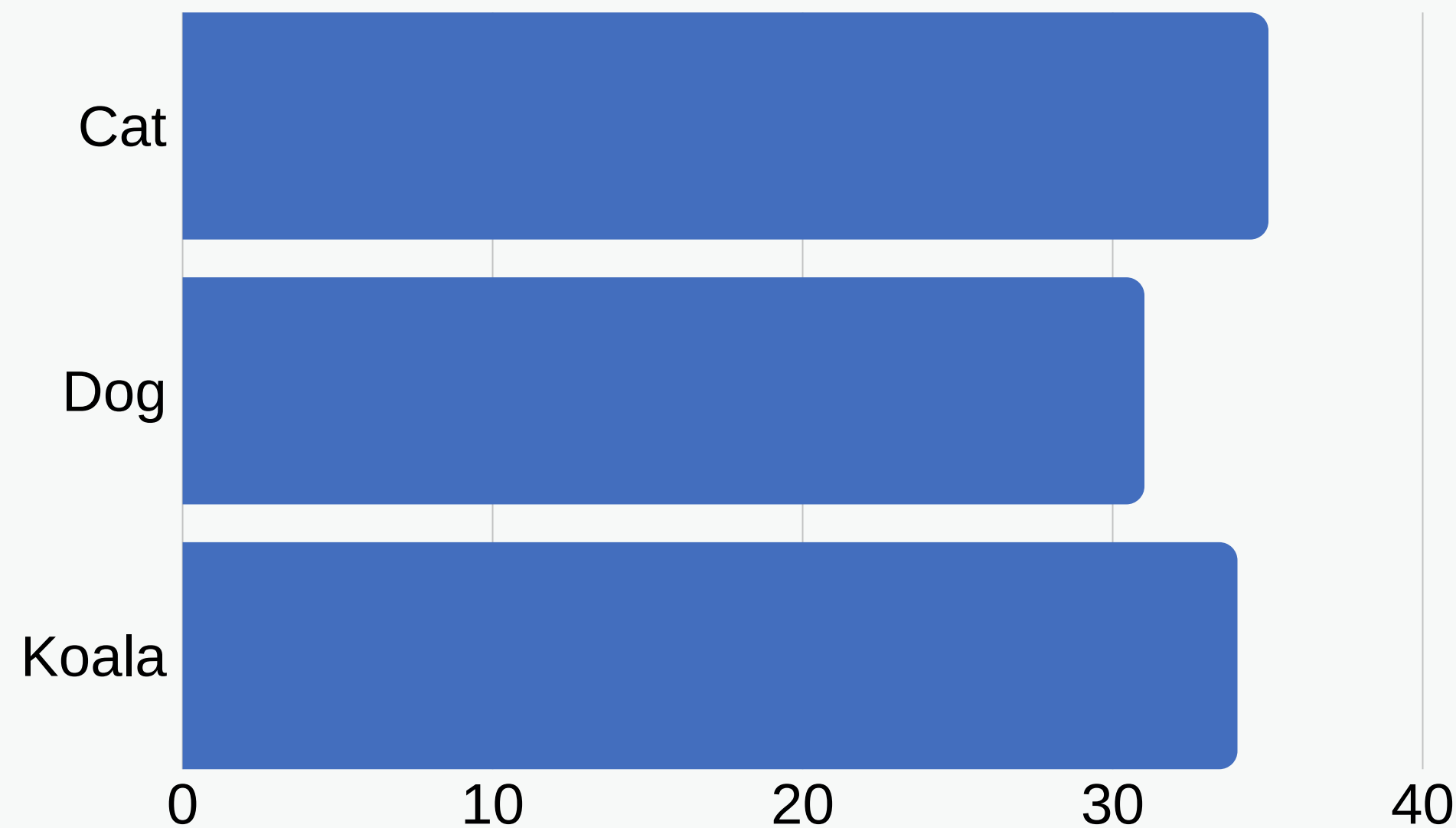
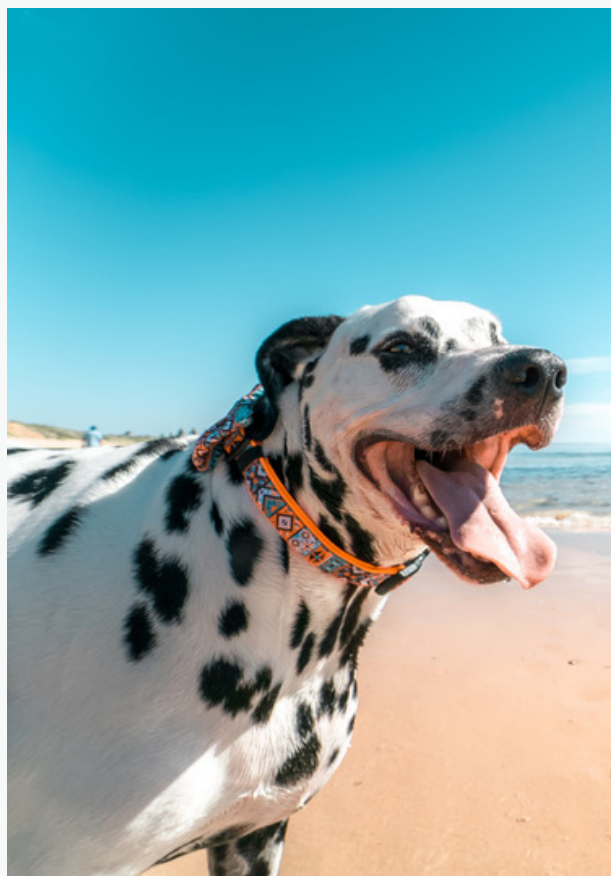


Object Classification



Progress indicator: 6 circles, the 6th is filled.

Object Classification



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To get into the industry



EXPERIENCE

Internship is your key enter the industry and learn about the real world.

PORTFOLIO

Nothing proves your skills more than side projects that you have worked on.

LEARNING

Real learning, expand your knowledge and acquire skills that matters.



NEED TO REACH ME?

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