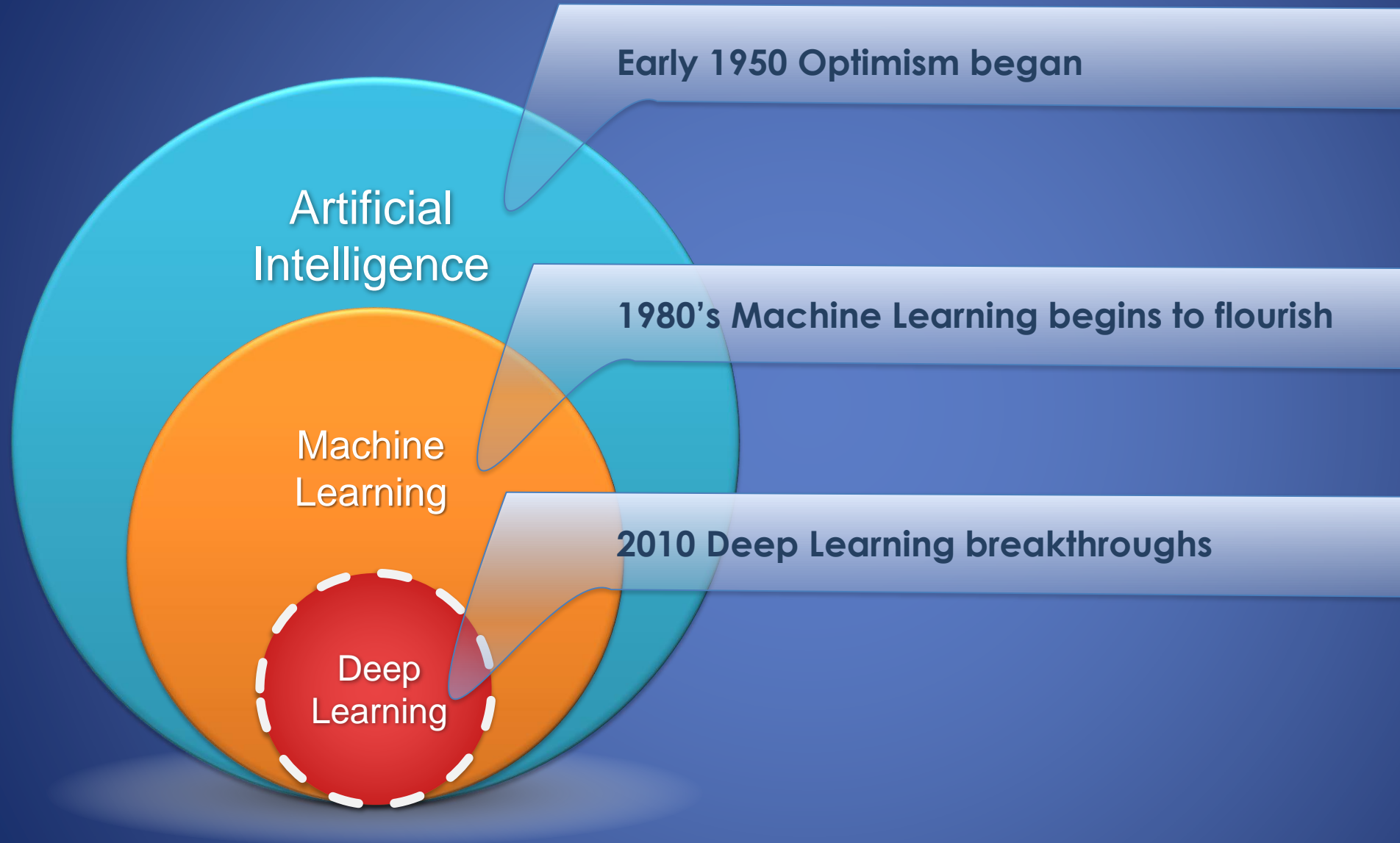


AN INTRODUCTION TO
MACHINE LEARNING



Level of Product





Machine learning is a field of computer science that gives computers the ability to learn without being explicitly programmed.

—Arthur Samuel, 1959

“Classical” decision making

(explicit instructions)

Feature	Input	Procedure	Output
F0	[0.8]	if F1 > 0.5 and F2 * F3 < 0.3: if (F4 – F5) / F6 < 1: do A else: if F7 * F0 < 0.3: do B else: do C else: do D	“A”
F1	[0.2]		
F2	[0.9]		“B”
F3	[0.2]		
F4	[0.0]		“C”
F5	[0.4]		
F6	[0.3]		“D”
F7	[0.1]		

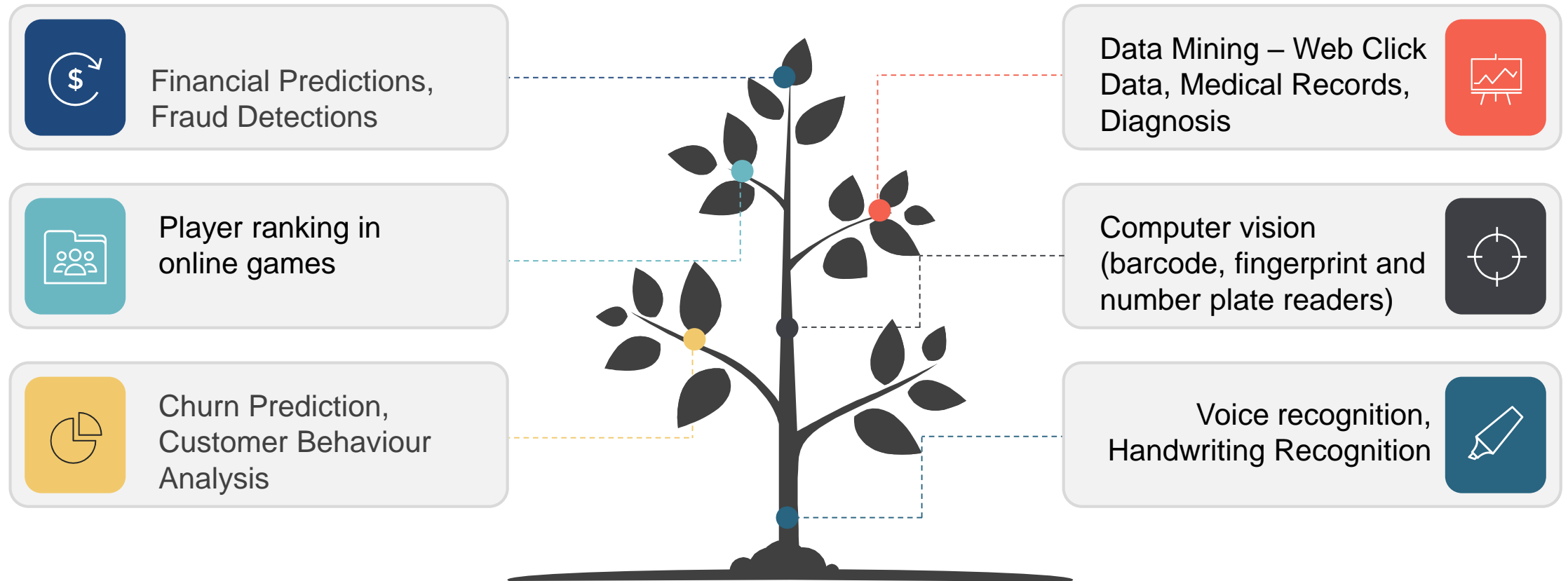
Requires a priori knowledge

Anshu Pandey

ML decision making

Feature	Input	Procedure	Output
F0	[0.8]	$\text{Output} = \text{MATRIX} * \text{Input}$ <p>(Linear Regression)</p> $\text{Output} = g(\text{M2} * f(\text{M1} * \text{Input}))$ <p>(Neural Network with one hidden layer)</p>	"A"
F1	[0.2]		
F2	[0.9]		"B"
F3	[0.2]		
F4	[0.0]		"C"
F5	[0.4]		
F6	[0.3]		"D"
F7	[0.1]		

Applications of Machine Learning



What Machine Learning Can Do

A simple way to think about supervised learning.

INPUT A	RESPONSE B	APPLICATION
Picture	Are there human faces? (0 or 1)	Photo tagging
Loan application	Will they repay the loan? (0 or 1)	Loan approvals
Ad plus user information	Will user click on ad? (0 or 1)	Targeted online ads
Audio clip	Transcript of audio clip	Speech recognition
English sentence	French sentence	Language translation
Sensors from hard disk, plane engine, etc.	Is it about to fail?	Preventive maintenance
Car camera and other sensors	Position of other cars	Self-driving cars

Source – ANDREW NG



Point your camera at the menu during your next trip to Taiwan and the restaurant's selections will magically appear in English via the Google Translate app.

Google Translate overlaying English translations on a drink menu in real time using convolutional neural networks.





MIT USES DEEP LEARNING TO HELP GUIDE DECISIONS IN ICU

“The ICU is a high-stakes, high-demand environment, and doctors can spend only a limited amount of time with each patient,” said Suresh a doctoral student at MIT.

“When doctors are dealing with many data sources and data types, computational tools can make a difference.”

If put into practice, ICU Intervene could help doctors more quickly choose the right treatment for each patient, Suresh said. It could also avoid unnecessary treatments.

Anshu Pandey

Source: <https://blogs.nvidia.com/blog/2017/10/02/the-ai-will-icu-now-deep-learning-helps-guide-decisions-in-intensive-care/>



How machine learning is helping Virgin boost its frequent flyer business

Virgin Australia is looking to build models that can predict the types of people that are more likely to travel, the types of travel people are likely to undertake, the prices that travellers are willing to pay, the importance of accommodation relative to travel, and the importance of experience compared to travel.

- Predictive maintenance or condition monitoring
- Warranty reserve estimation
- Propensity to buy
- Demand forecasting
- Process optimization
- Telematics

Manufacturing



- Predictive inventory planning
- Recommendation engines
- Upsell and cross-channel marketing
- Market segmentation and targeting
- Customer ROI and lifetime value

Retail



- Alerts and diagnostics from real-time patient data
- Disease identification and risk stratification
- Patient triage optimization
- Proactive health management
- Healthcare provider sentiment analysis

Healthcare and Life Sciences



- Aircraft scheduling
- Dynamic pricing
- Social media – consumer feedback and interaction analysis
- Customer complaint resolution
- Traffic patterns and congestion management

Travel and Hospitality



- Risk analytics and regulation
- Customer Segmentation
- Cross-selling and up-selling
- Sales and marketing campaign management
- Credit worthiness evaluation

Financial Services



- Power usage analytics
- Seismic data processing
- Carbon emissions and trading
- Customer-specific pricing
- Smart grid management
- Energy demand and supply optimization

Energy, Feedstock, and Utilities



Machine Learning Cloud Platforms -

Microsoft Azure ML Studio

<https://azure.microsoft.com/en-us/services/machine-learning-studio/>

Amazon Machine Learning

<https://aws.amazon.com/ml/>

SAP Leonardo Machine Learning

<https://www.sap.com/india/products/leonardo/machine-learning.html>

Google ML Platform

<https://cloud.google.com/products/machine-learning/>

IBM Machine Learning

<https://www.ibm.com/analytics/data-science/machine-learning>



What to learn in machine Learning?

Programming and Tools

Python/R, spark etc.

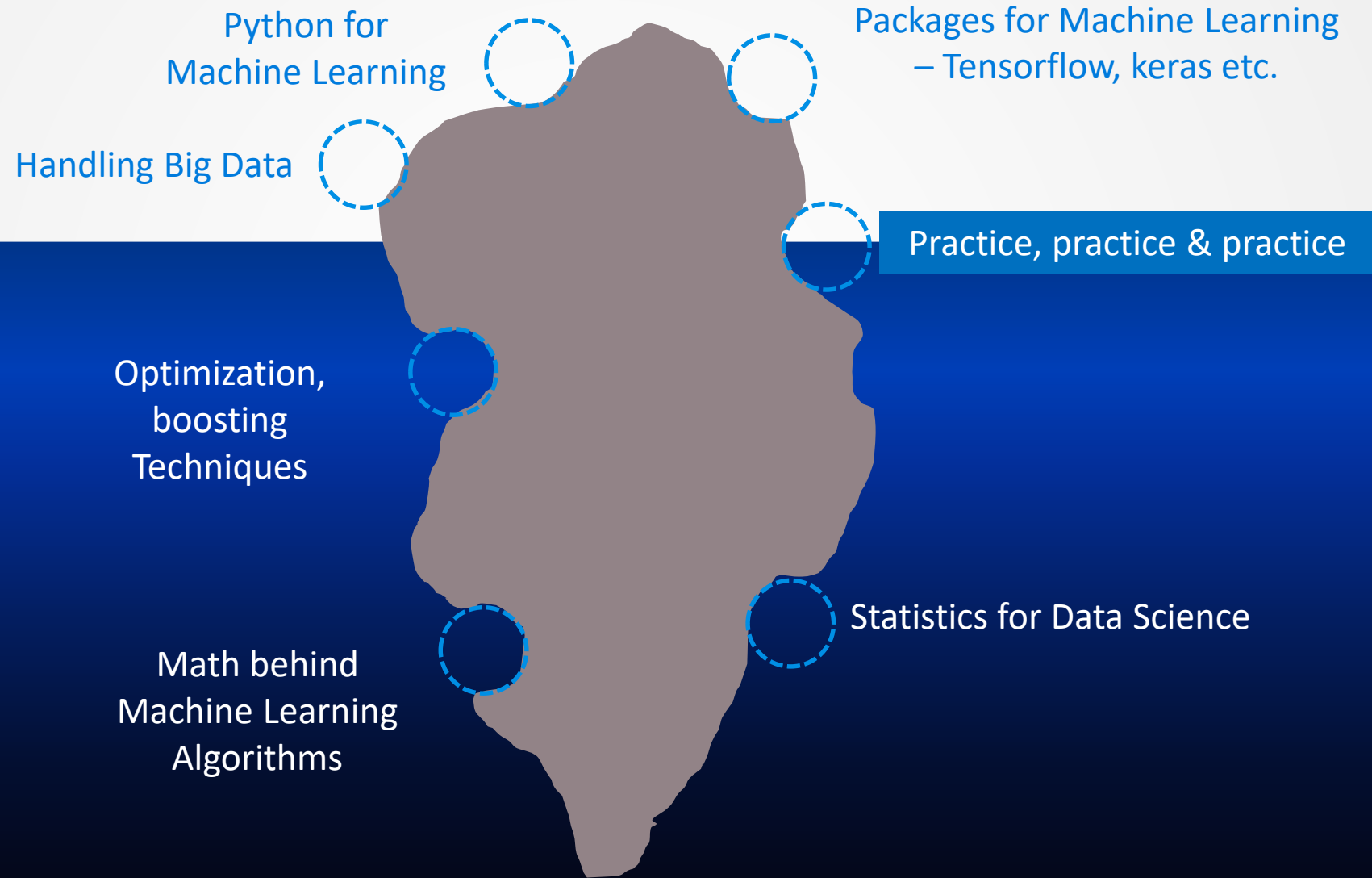
30%

The Math behind Machine Learning

Probabilistic
Theory, Statistics
and Linear Algebra

70%

What to learn in Machine Learning?



Objective of a Machine Learning Algorithm

Getting better at a task through practice



The act of remembering:
data / experience



Generalisation, similarity
and new inputs



Learning and
flexibility: adaptation



Supervised Learning

Learning with a labeled training set.
Email spam detector with training set of already labeled emails.

Unsupervised Learning

Discovering patterns in unlabeled data.
Cluster similar documents based on the text content.

Reinforcement Learning

Learning based on feedback or reward.
Learn to play chess by winning or losing.



SUPERVISED LEARNING

We **know what we are trying to predict**. We use some examples that we (and the model) know the answer to, to “train” our model. It can then generate predictions to examples we don’t know the answer to.

Examples: Predict the price a house will sell at. Identify the gender of someone based on a photograph.

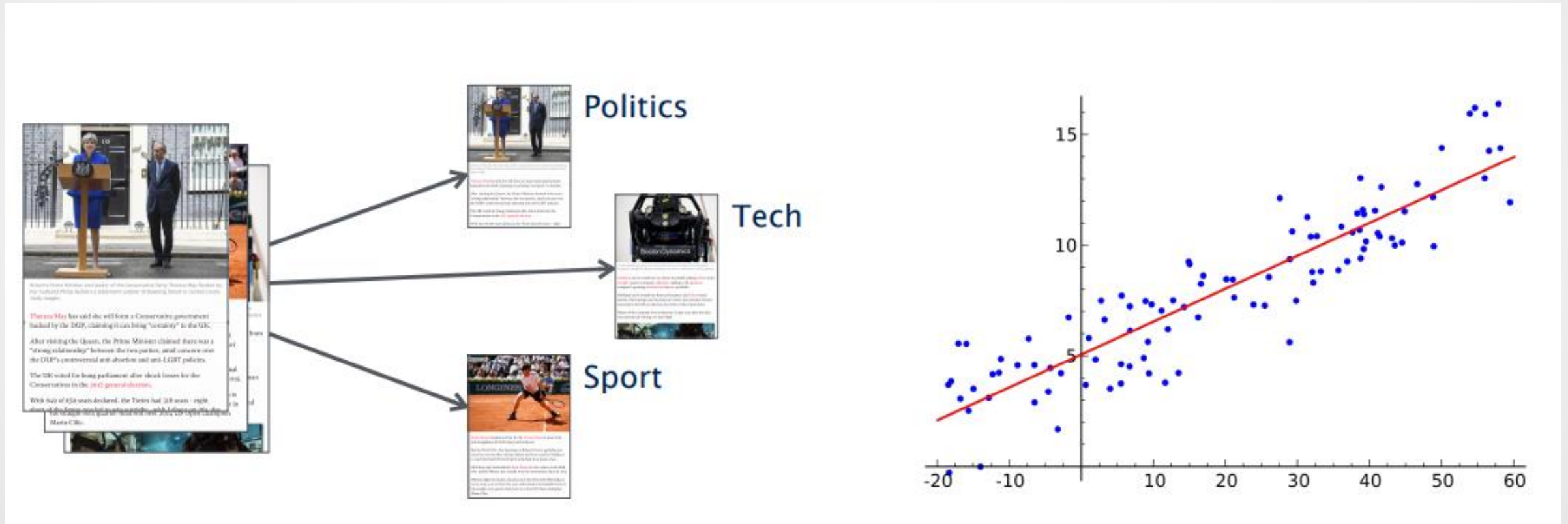


UNSUPERVISED LEARNING

We **don't know what we are trying to predict**. We are trying to identify some naturally occurring patterns in the data which may be informative.

Examples: Try to identify “clusters” of customers based on data we have on them

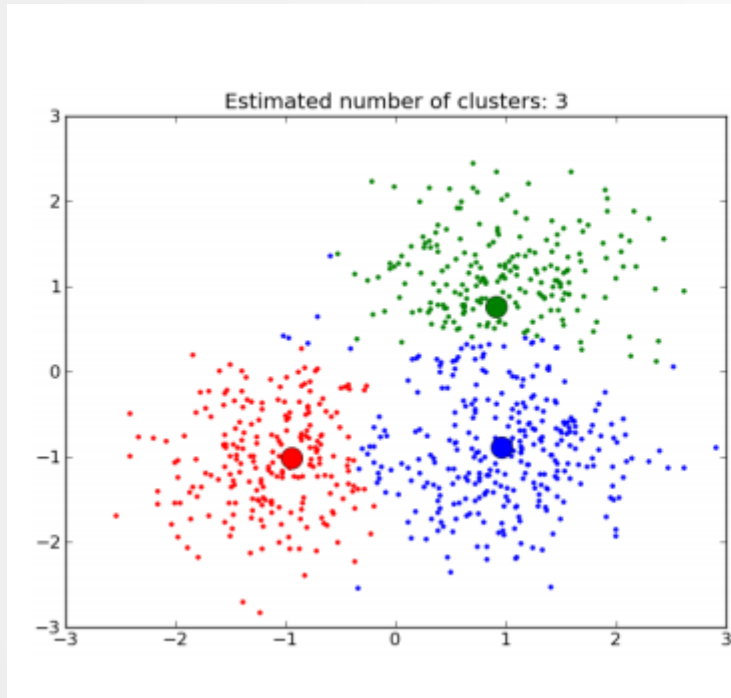
Types of Problems in Machine Learning -



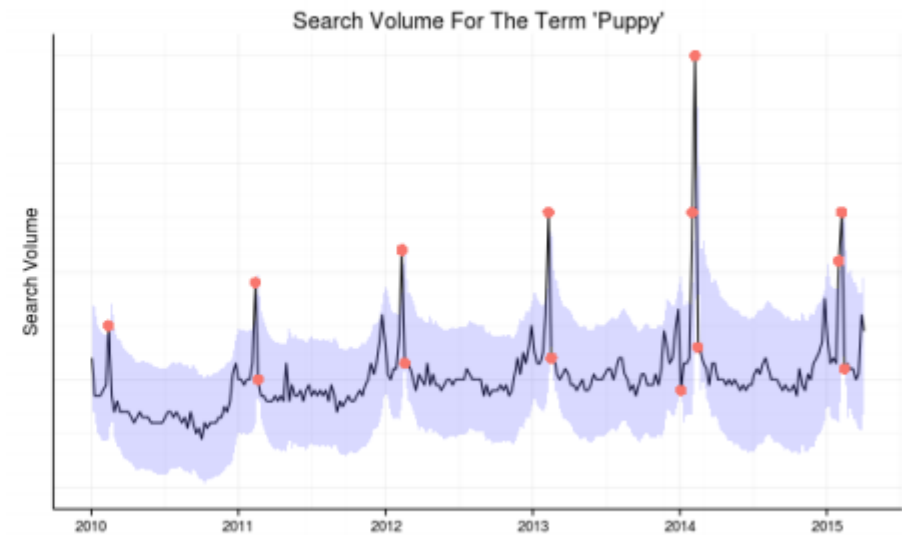
Classification

Regression

Types of Problems in Machine Learning -

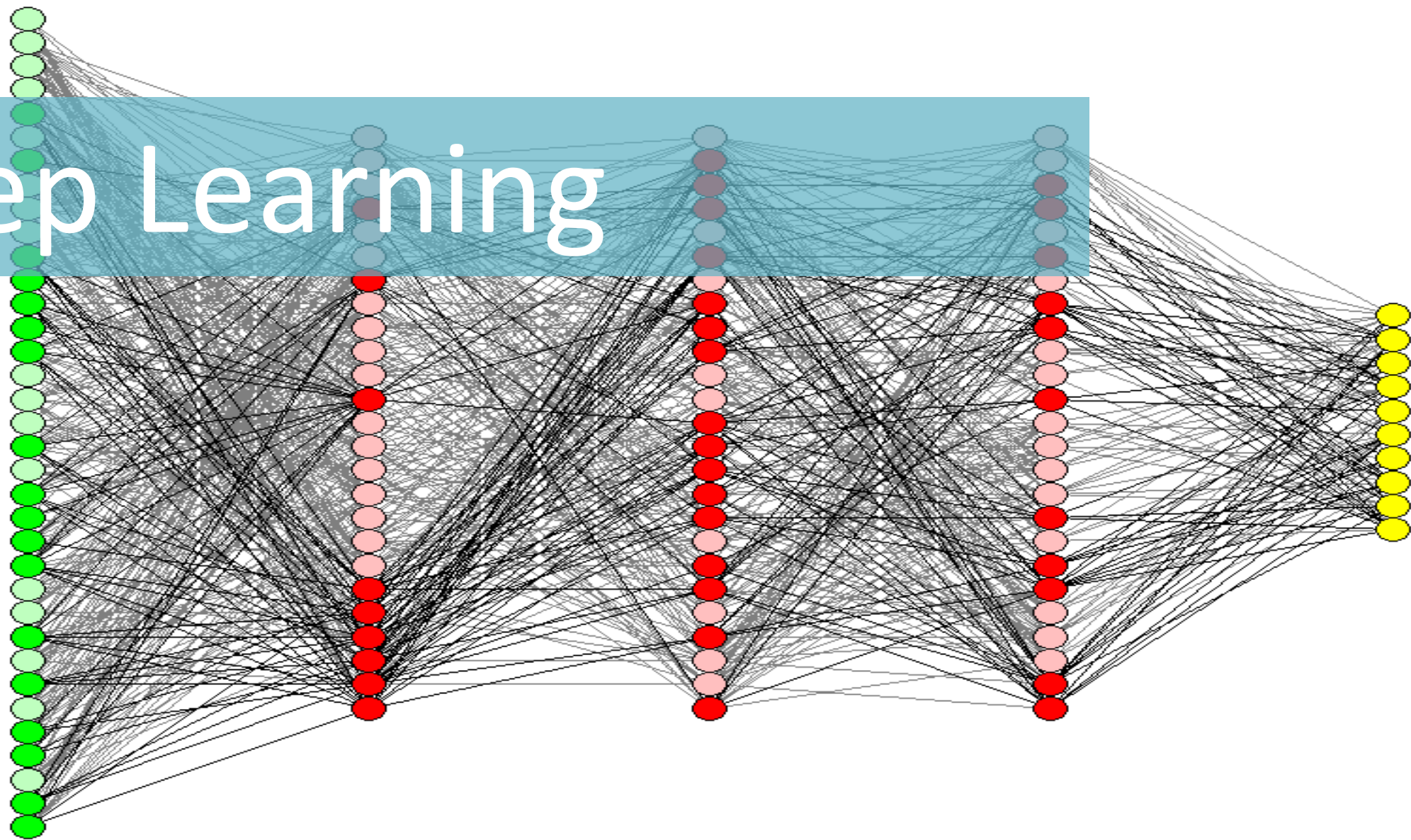


Clustering



Anomaly Detection

Deep Learning



Deep Learning

Deep Learning is part of the machine learning field of learning representations of data. Exceptional effective at learning patterns.



Happy Learning!

Stay Tuned for next exciting sessions on diving deeper into
Supervised Learning
