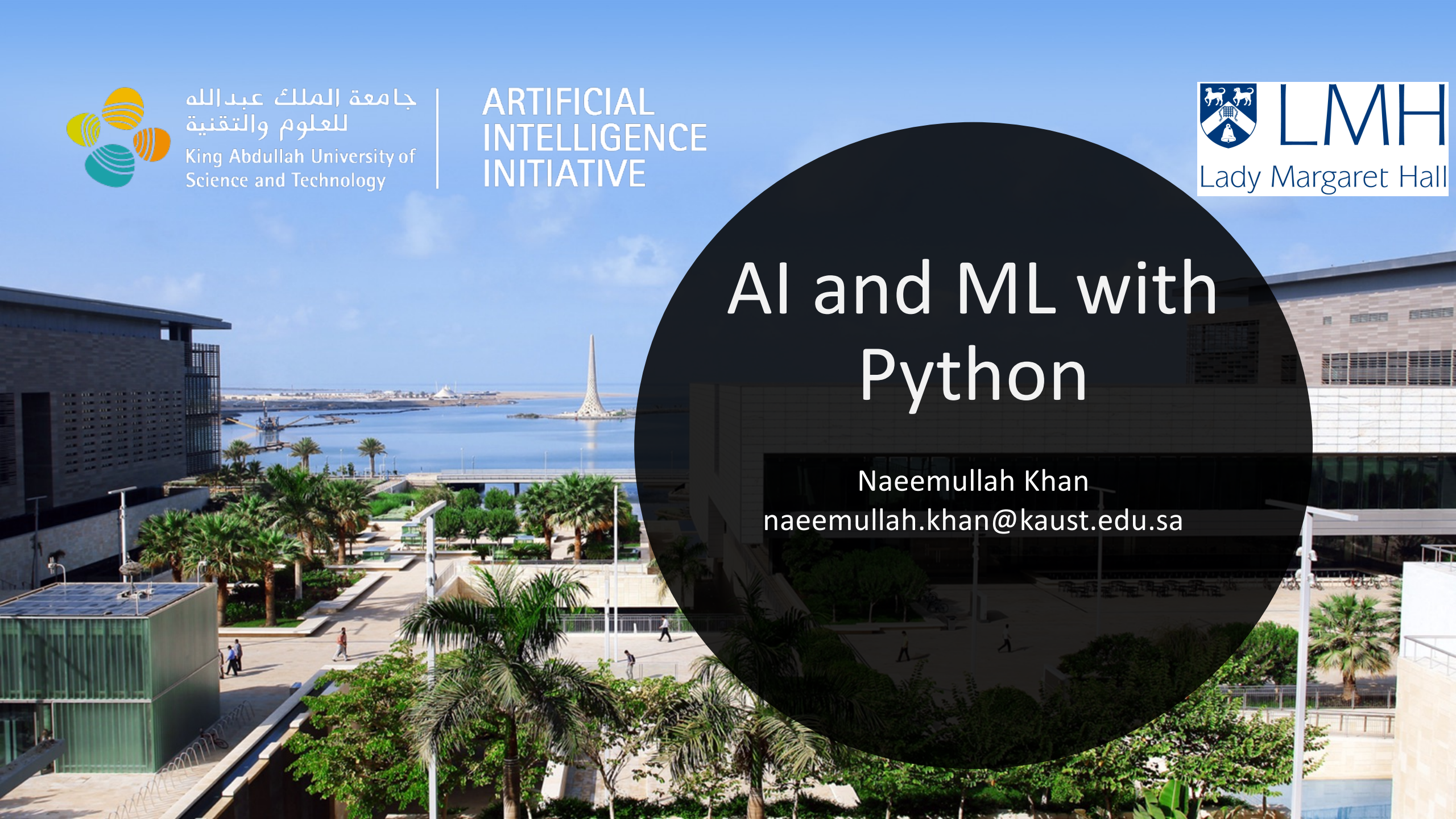

AI and ML with Python

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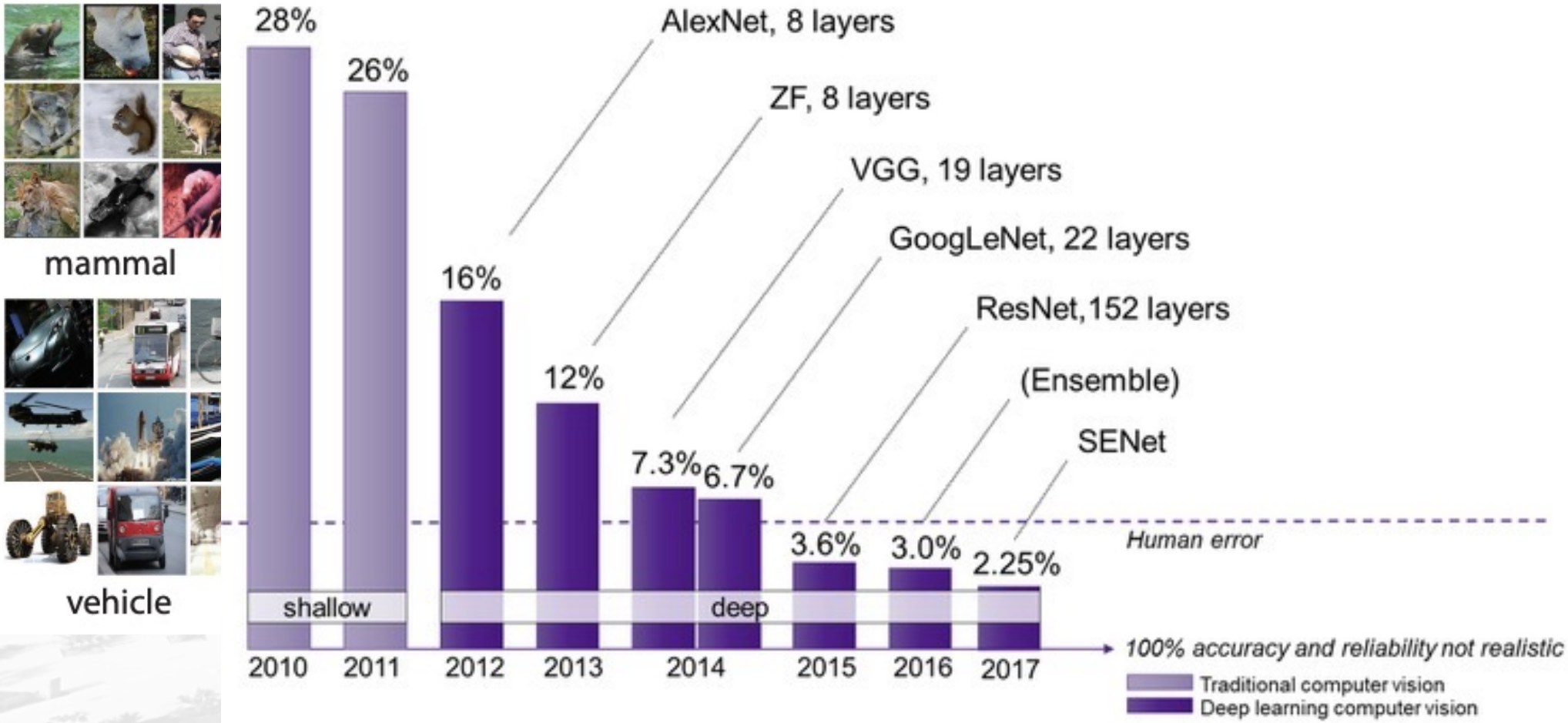
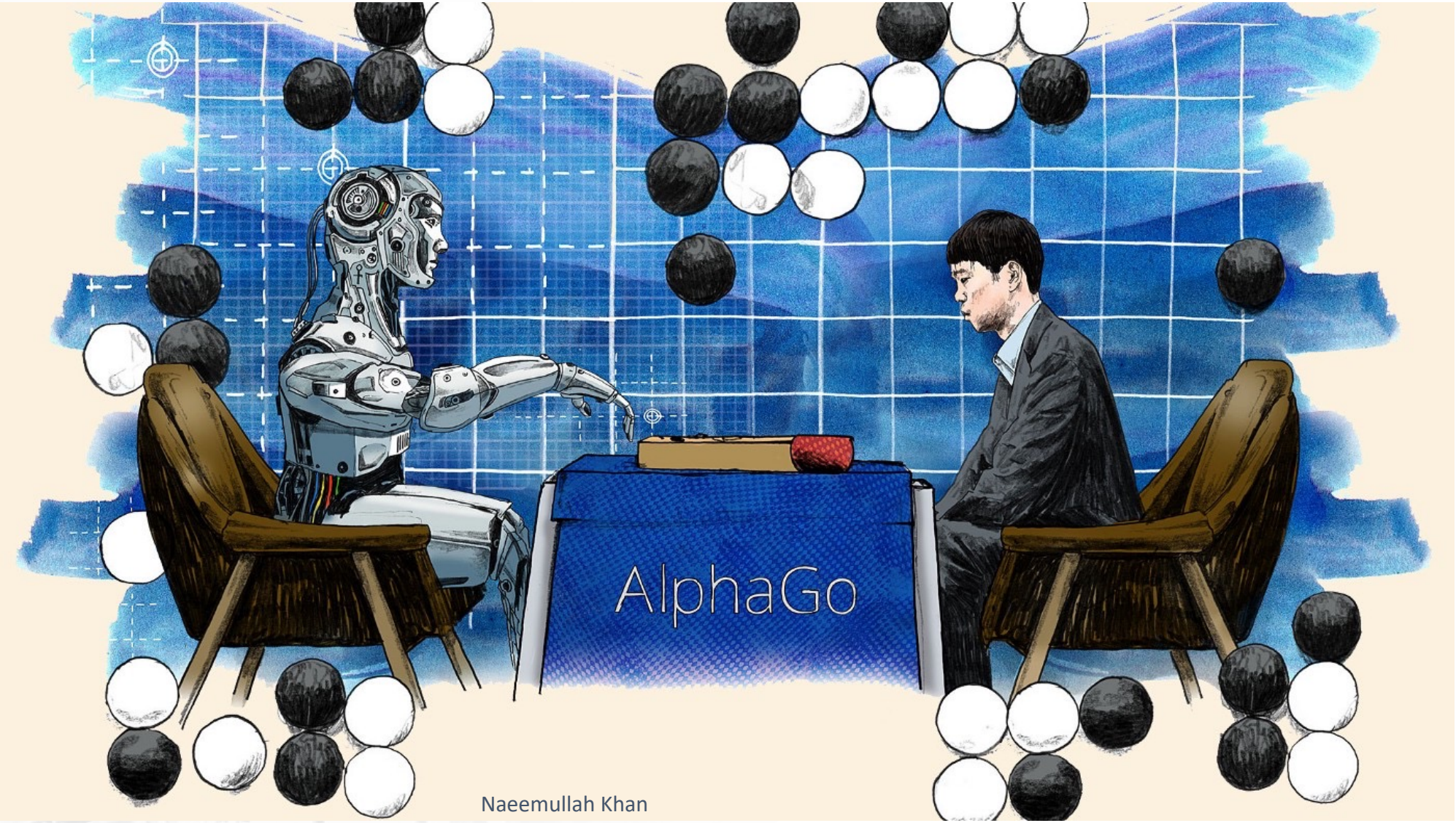
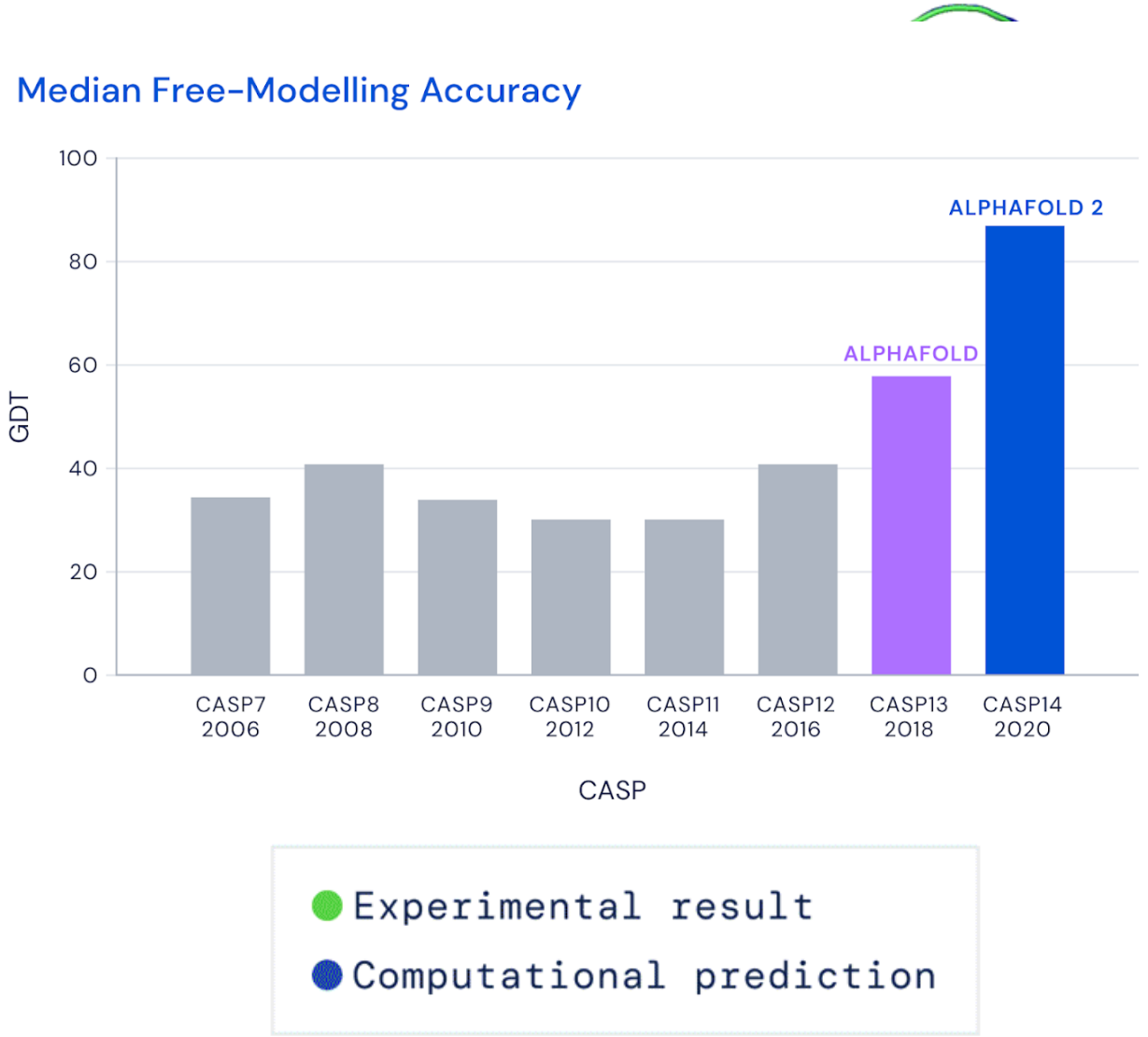
Object Recognition



Alpha GO



Alpha Fold


Median Free-Modelling Accuracy
100
80
60
40
20
0
GDT
ALPHAFOLD 2
ALPHAFOLD
CASP7 2006
CASP8 2008
CASP9 2010
CASP10 2012
CASP11 2014
CASP12 2016
CASP13 2018
CASP14 2020
CASP
Experimental result
Computational prediction

About this course

- We will look at Artificial Intelligence and Machine learning theory
- We will also look at practical implementation of AI and ML algorithms
- Some of the topics we will look into are:
  - Python Programming
  - Linear Regression
  - Logistic Regression
  - Neural Networks
  - Convolutional Neural Networks
  - Deep Learning
  - Practical Deep Learning

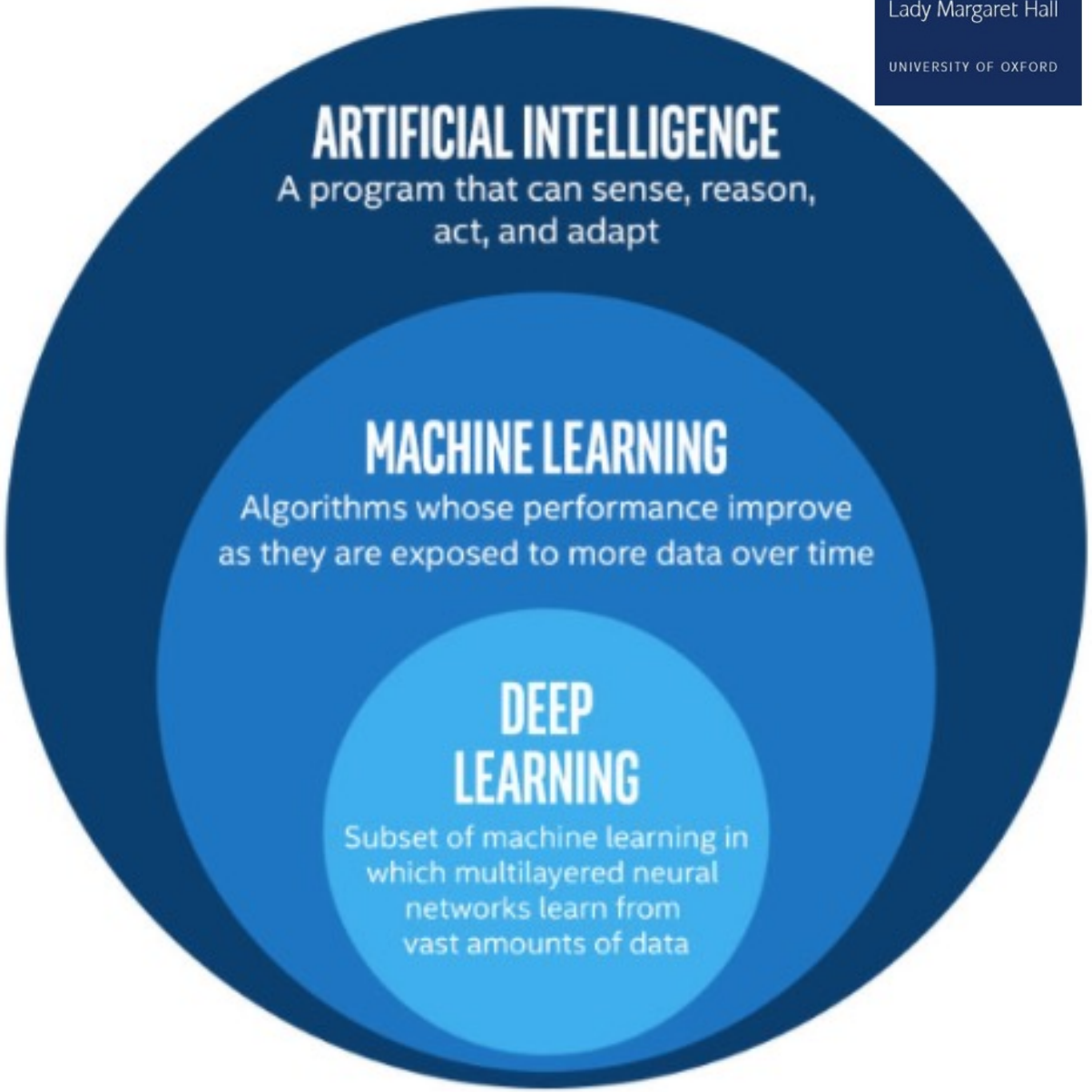
Lecture 1: Outline

- Course Outline
- Definitions Machine Learning, Artificial Intelligence and Deep Learning.
- Mathematics Review
- Python Programming Review

Instructor’s Contact

- email: naeemullah.khan@kaust.edu.sa
- linkdin link

What is AI, ML and DL?



Source: https://www.deeplearning-academy.com/p/ai-wiki-machine-learning-vs-deep-learning

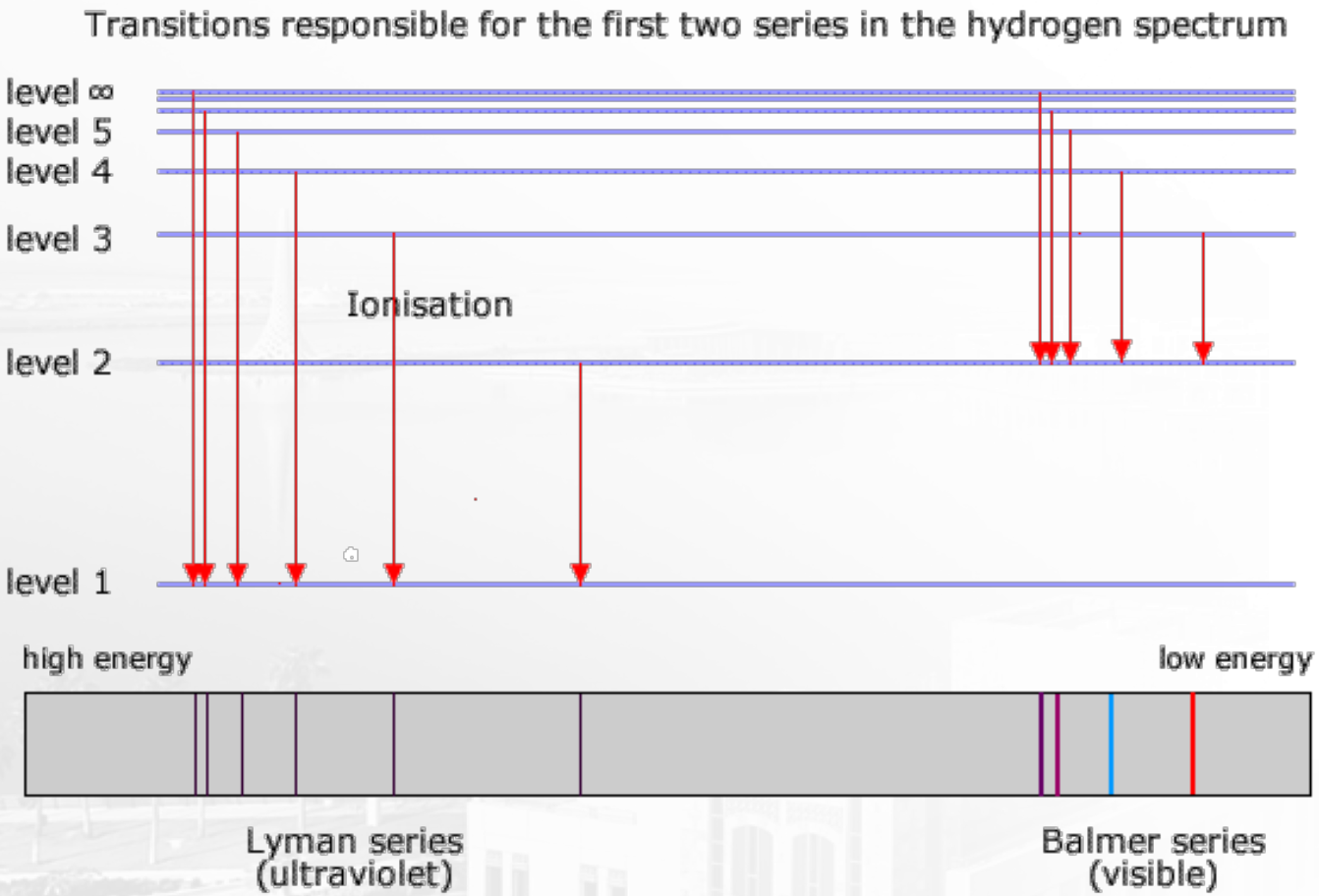
Model Based vs Data Driven

A model-based design

A data driven/ learned way

Newton’s Law of Universal Gravitation

Bohr's Atomic Model



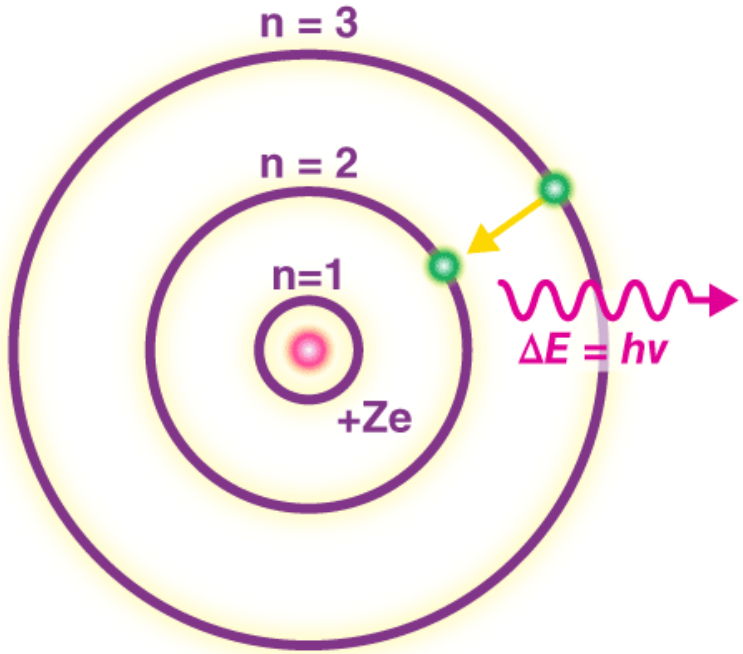


Image from: https://ibchem.com/IB16/01.33.htm

Machine Learning

Machine learning uses an algorithm to learn a function that maps input variables to the target output from training data:

$$Y = f(X)$$

- Specific model form is unknown

Model Based Approach

- Humans observe physical processes and produce mathematical models
- Limited by human capacity to process data

Machine Learning

- Feature selection is less important
- Requires fewer assumptions and can result in superior performance
- May require more training data
- Risk of overfitting, often more difficult to explain

Advancement of Machine Learning

1952	Arthur Samuel wrote the first computer learning program to play checkers that improved as it played.
1957	Frank Rosenblatt designed the first neural network.
1967	Nearest neighbor algorithm allowed computers to begin using basic pattern recognition.
1979	Students at Stanford University invent the “Stanford Cart” that navigated obstacles.
1981	Gerald Dejong introduced Explanation Based Learning (EBL), where a computer creates rules by discarding unimportant data.
1985	Terry Sejnowski invents NetTalk, which learns to pronounce words the same way a baby does.
1990s	Scientists begin creating algorithms to learn from large amounts of data.
1997	IBM’s Deep Blue beats the world champion at chess.
2006	Geoffrey Hinton coined “deep learning” algorithms that let computers distinguish objects and text in images and videos.
2010	Microsoft Kinect tracks 20 human features at 30x/sec, allowing interaction with the computer via movements and gestures.
2011	Google Brain is developed, and its deep neural network can learn to discover and categorize objects much the way a cat does.
2011	IBM’s Watson beats its human competitors at Jeopardy.
2012	Google’s X Lab develops an algorithm to browse YouTube videos to identify ones containing cats.
2014	Facebook develops DeepFace, that is able to recognize people in photos to the same level as humans can.
2015	Amazon launches its own machine learning platform.
2015	Microsoft created Distributed Machine Learning Toolkit, enabling distribution of problems across multiple computers.
2016	Google’s artificial intelligence algorithm beats Lee Sedol at the Chinese board game Go. (Update! Lee wins a game!)

Source: http://www.datasciencecentral.com/profiles/blogs/a-short-history-of-machine-learning

Why is machine learning is popular right now?

1. The field has matured both in terms of identity and in terms of methods and tools
2. There is an abundance of data available
3. There is an abundance of computation to run methods
4. There have been impressive results, increasing acceptance, respect, and competition

Resources + Ingredients + Tools + Desire = Popularity

Stanford's coursera machine learning course had more than 100,000 expressing interest in the first year. That is crazy!

Based on: http://machinelearningmastery.com/machine-learning-is-popular/?__s=yq1qzcnf67sfiuzmnvjf

Types of Learning

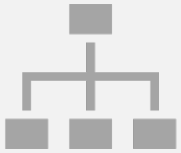
Supervised Learning

Unsupervised Learning

Reinforcement Learning

Supervised Learning

Regression



Classification

Mathematics Review

Python Programming Review