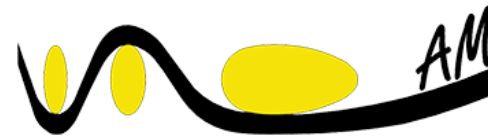


LECTURE 1. INTRODUCTION

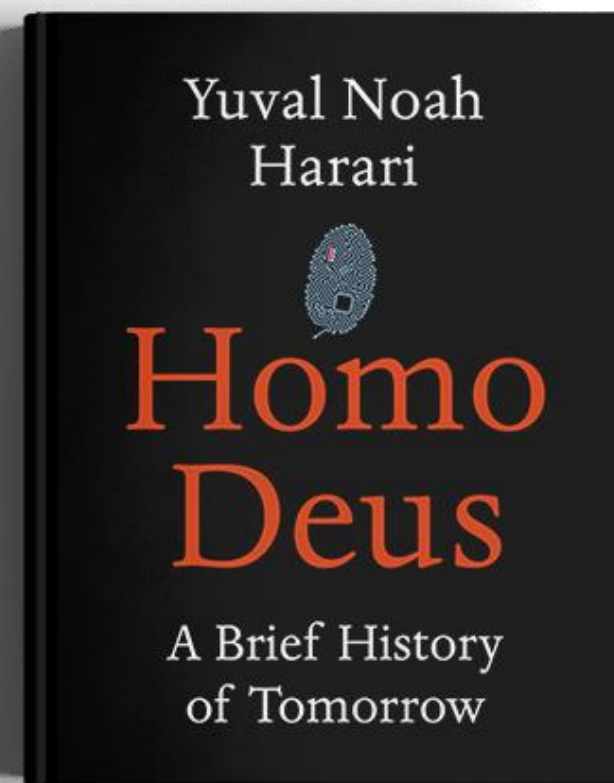
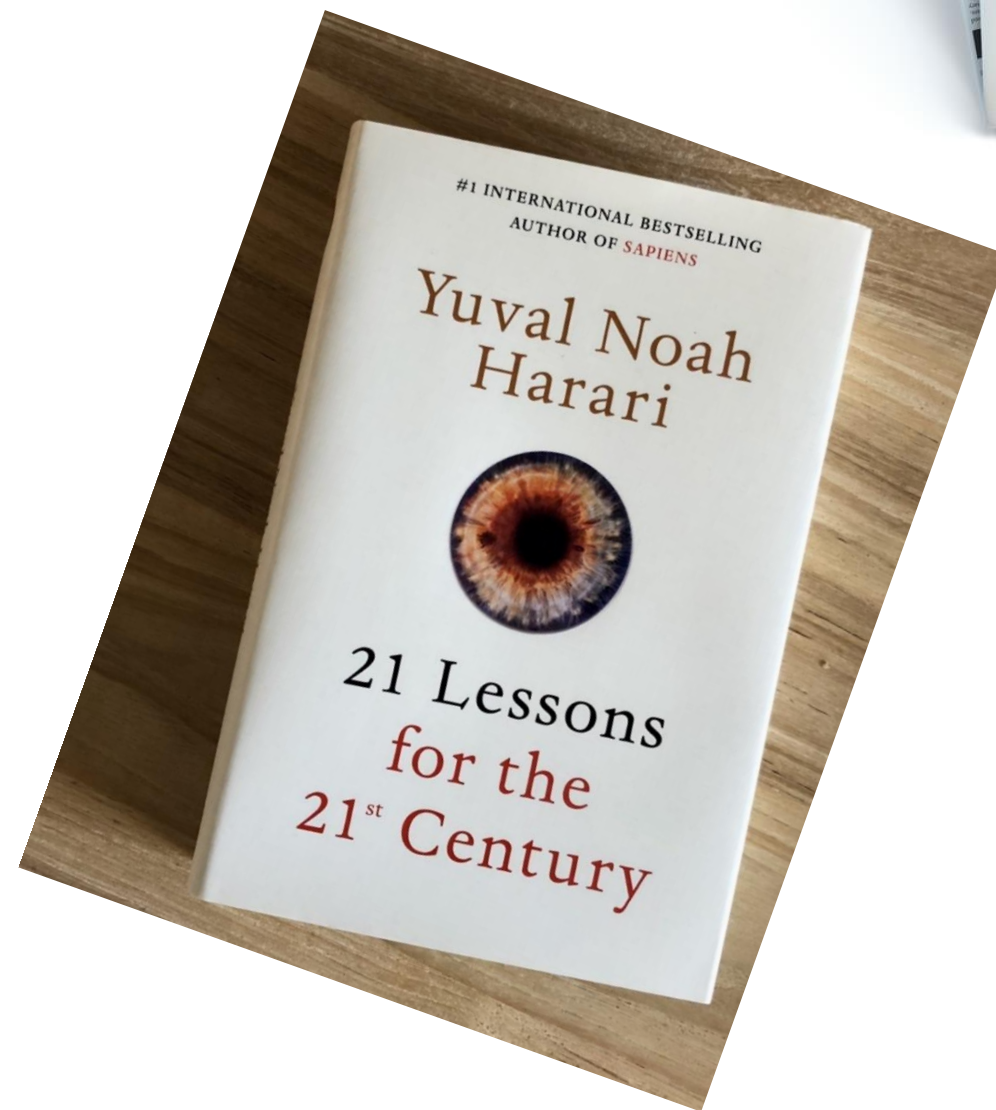
AI & ML, Applications in Manufacturing (MANU 465)

Ahmad Mohammadpanah

Ph.D., P.Eng.



AIntelligentManufacturing.com



A Short In-Class-Activity

Q1. Estimate the length of one minute.

40 Sec

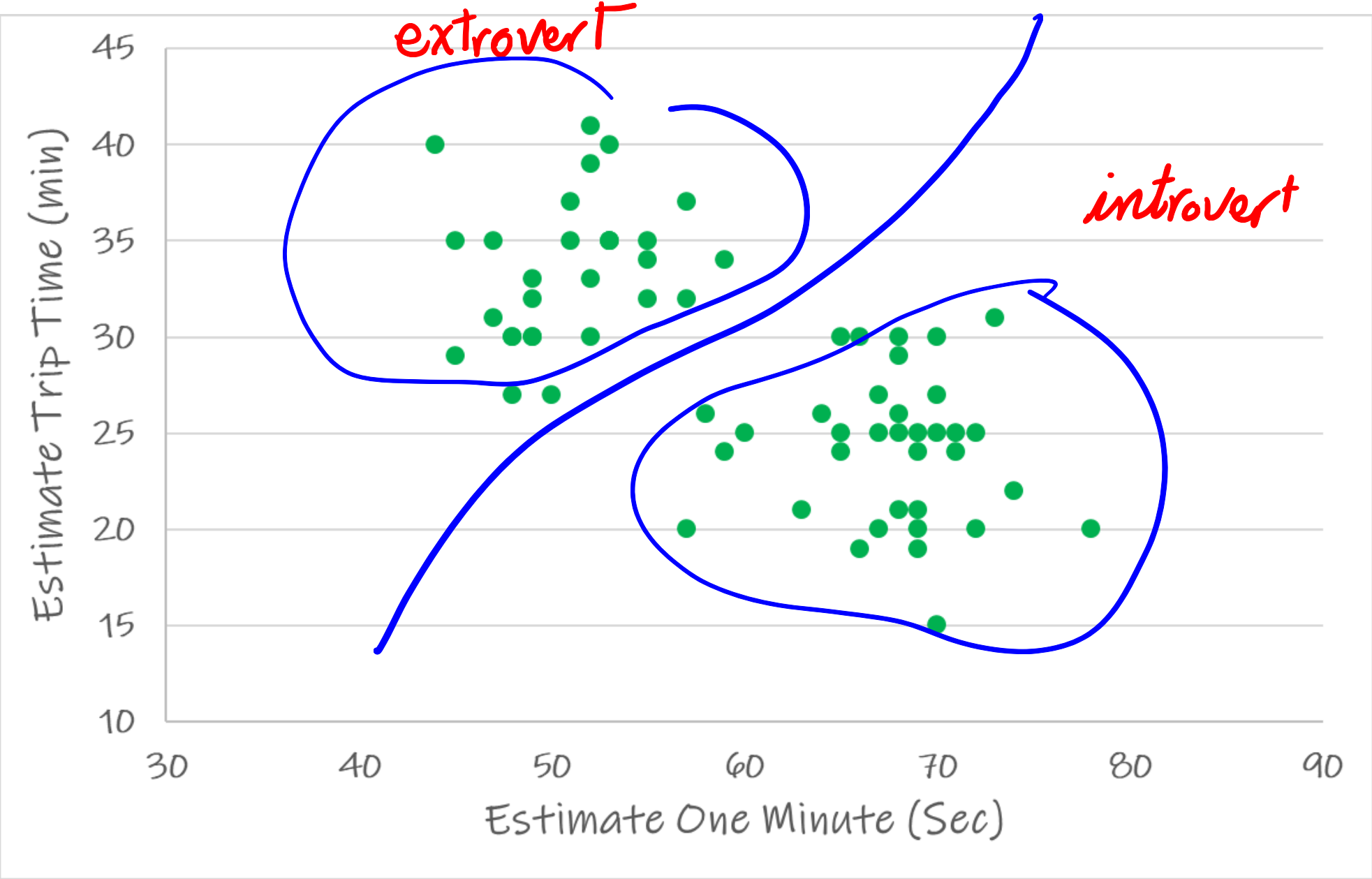
On you Stopwatch, hit start, then close you eyes, and when you feel 1 minute passed, open your eyes and record the time that your stopwatch shows (in seconds).

Q2. Estimate a short trip time.

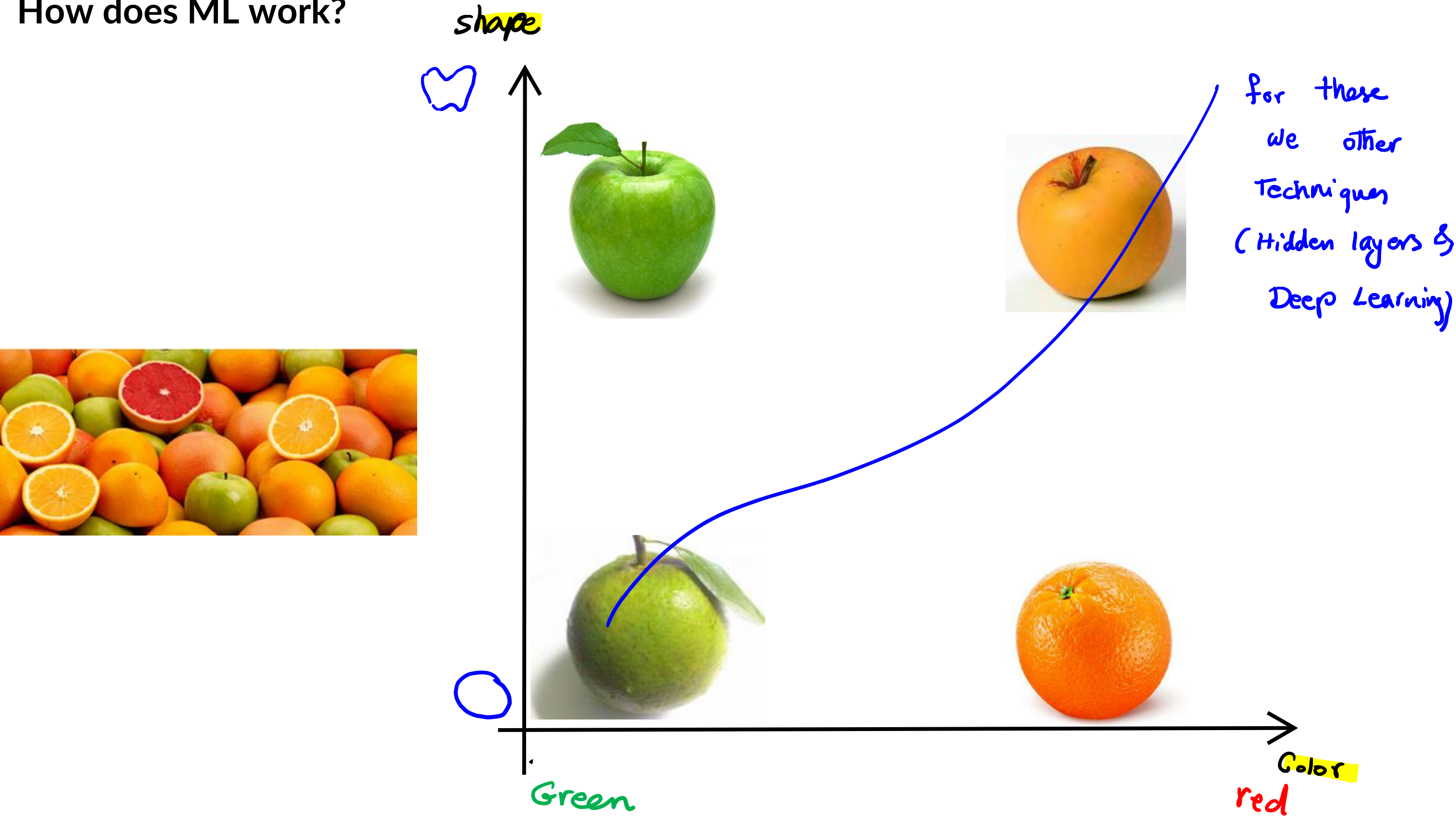
Imagine, you have an important interview in Downtown. Suppose you drive. Estimate the time it takes to get to Downtown from UBC (the traffic is normal). Record the time in minutes.

60 min

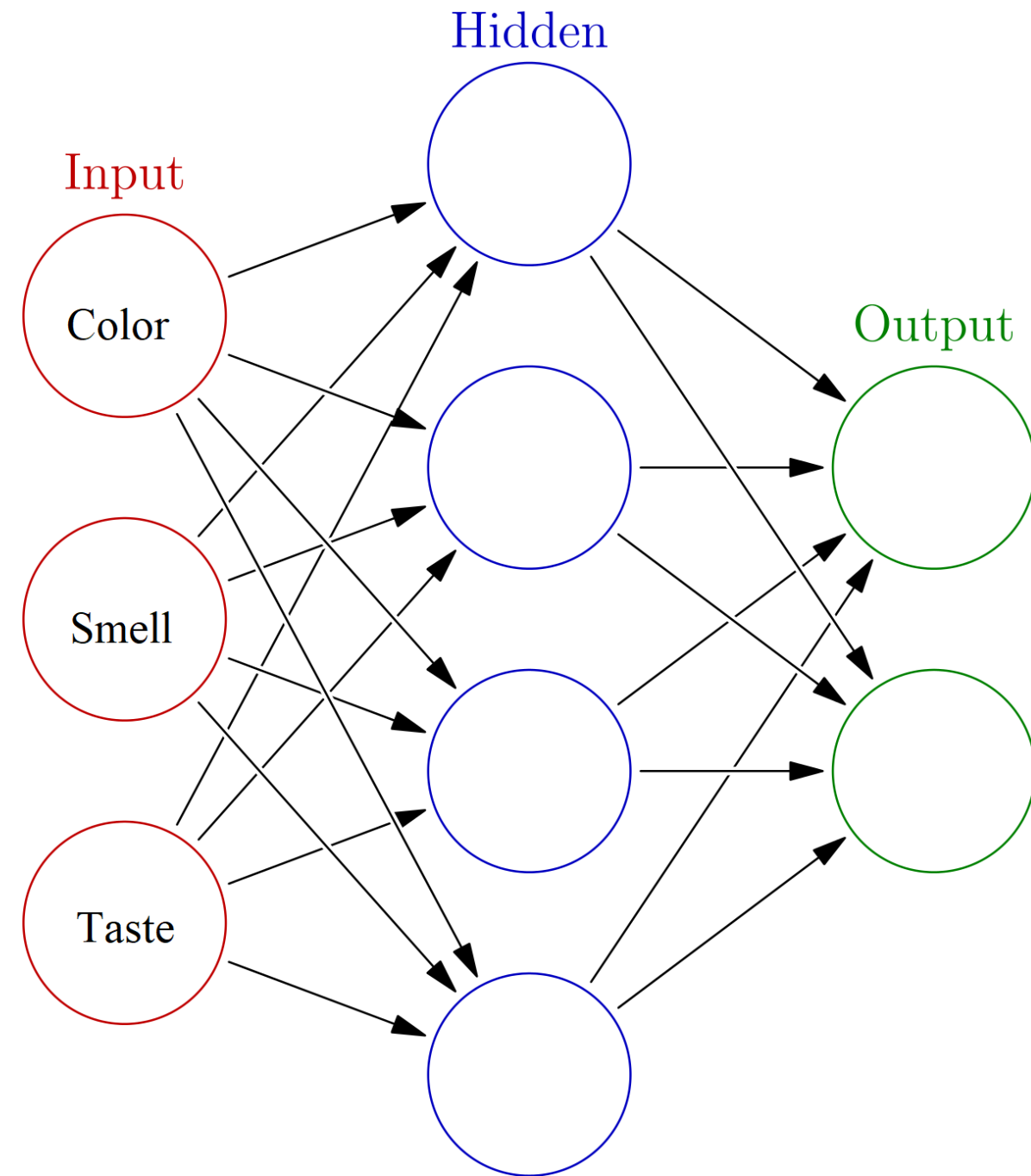
Put a dot on this coordinate based on your answer to Q1 & Q2.



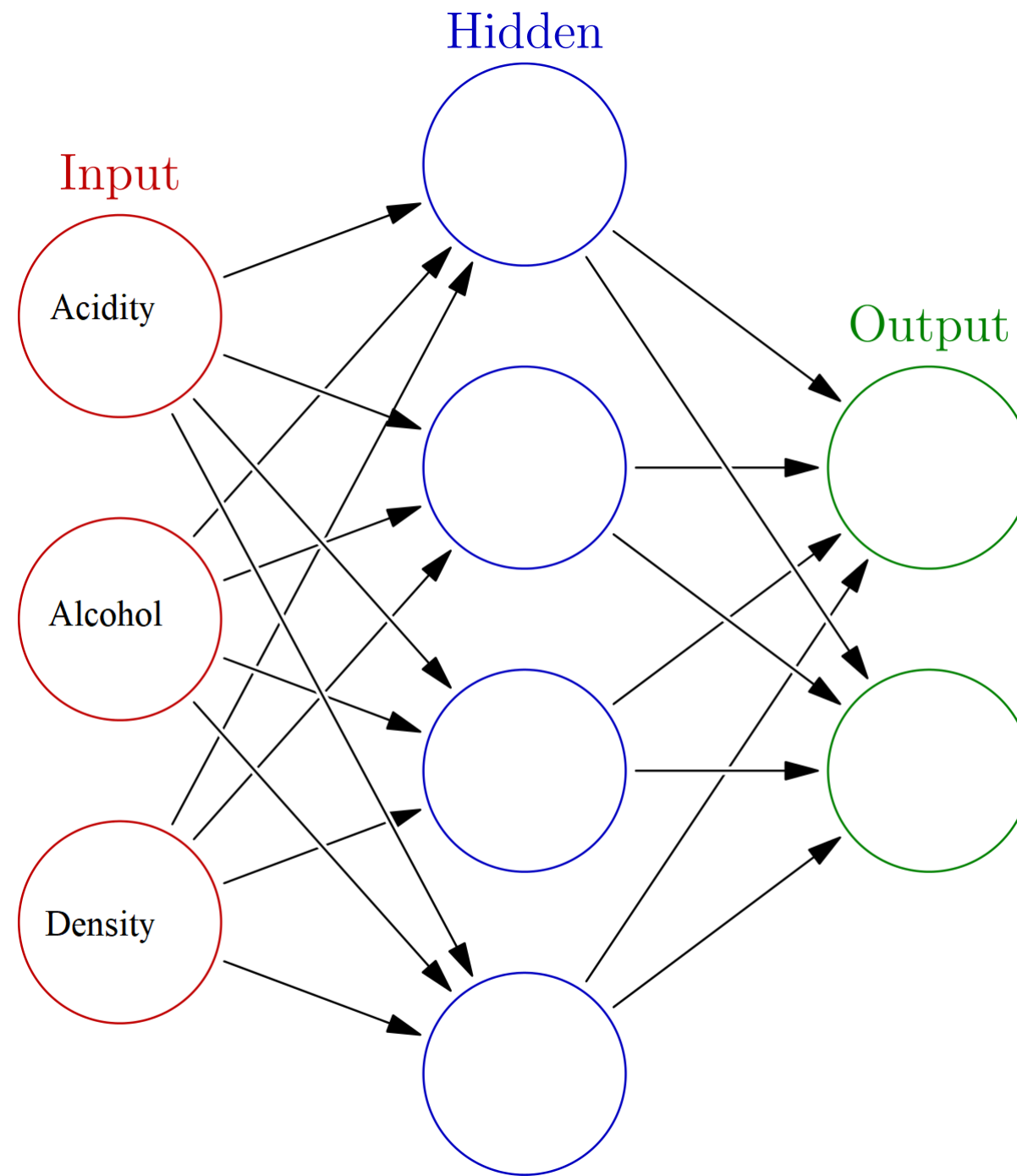
How does ML work?



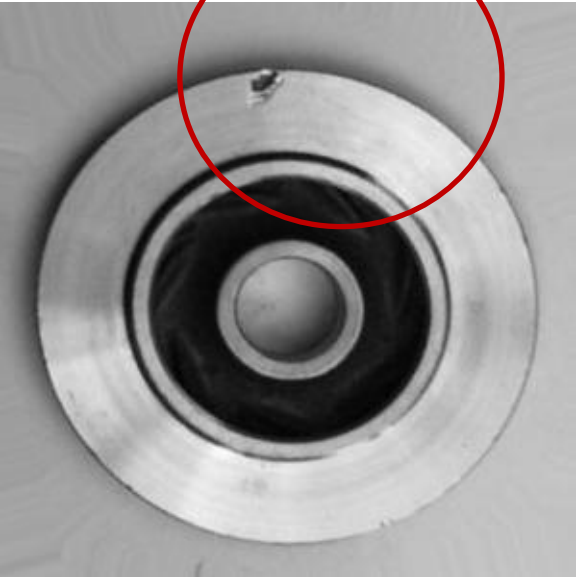
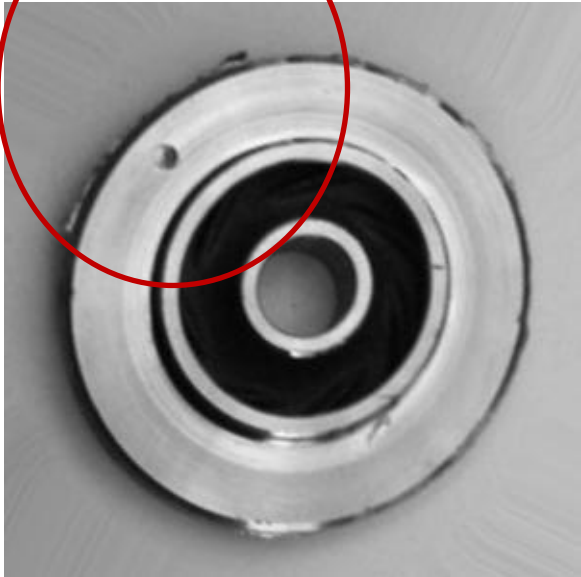
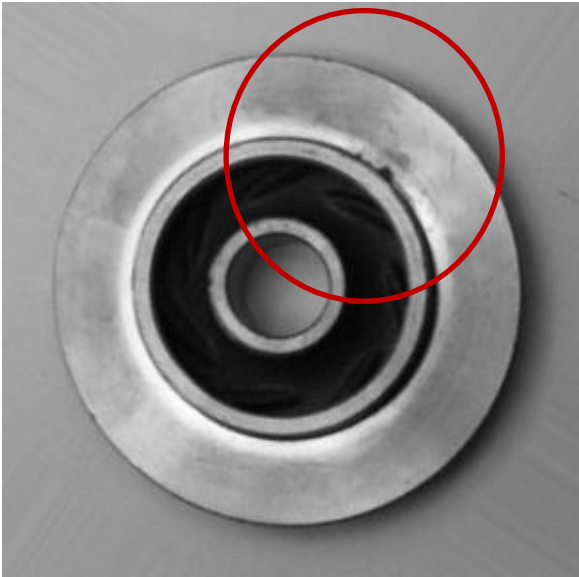
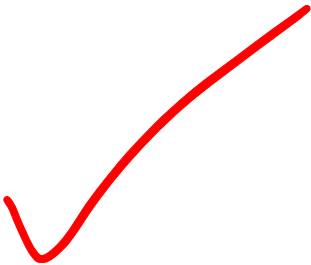
How does ML work?



And, the same approach for wine quality check



Or, in Manufacturing ...

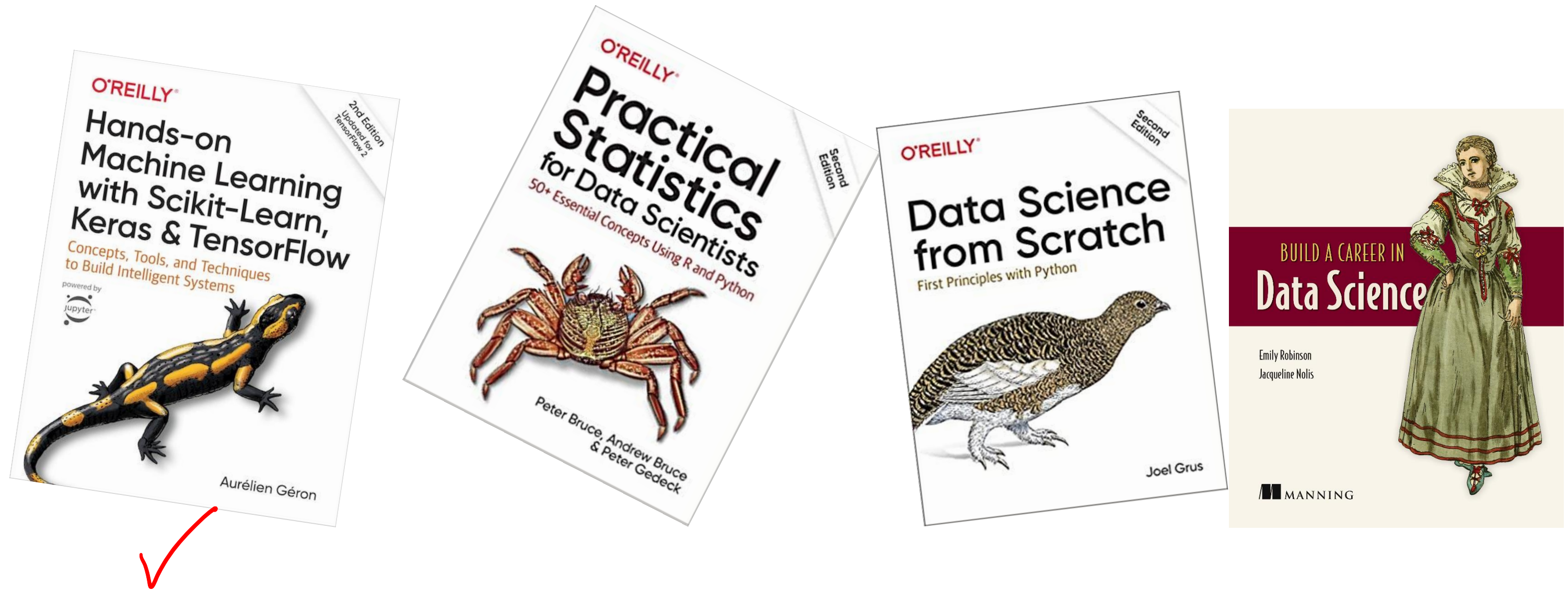


Basic Terminologies:

- **Machine learning (ML)** is an application that provides systems the ability to learn from experience.
- **Artificial Intelligence (AI)** applies machine learning, deep learning and other techniques, so machines can execute tasks "smartly" without human.
- ✓ • **Supervised Learning:** It relies **on labeled** dataset for training
- ✓ • **Unsupervised:** The dataset has no label.
- * • **Reinforcement Learning:** A machine interacts with its environment, performs actions, and learns by a trial-and-error, and **reward/punishment** method.

Resources:

A. You can expand your knowledge in ML, after completing this course, by reading the following books:



B. Online Courses

1. Deep Learning Specialization

(Become a Machine Learning expert. Master the fundamentals of deep learning and break into AI.)

By Andrew Ng, Course on [Coursera.org](https://www.coursera.org/deep-learning-specialization)

A word of advice: You can get **overwhelmed** by tones of resources; for now, focus only on the materials provided in this course. You can easily expand your knowledge later after you build a great foundation and learned the basics.

Is This a Right Course for You?!

You need to have some very basic knowledge in Manufacturing, Math, Coding, and Statistics.

I will provide a background depends on each topic.

This course is not:

- Manufacturing Processes (MECH 392)
- Detailed Mathematical Theories of Machine Learning (CPSC 340)
- Coding & Programming ✓
- Statistical Data Analyses (MECH 305/306)

Evaluation:

- Assignments (20%)
- Final Exam (40%)
- Projects (40%) – *Team-based* , *open-ended*
 - EEG
 - Injection Molding
 - CNC Monitoring System
 - Metal 3D Printer
 - AE Sensor
 - Thermoforming
 - Propose Your Own Project

Implementing ML Concepts

We will use Python-3, and for the IDE (Integrated Development Environment), any of these options:

- Jupyter Notebook, installed on your computer (Recommended: Install [Anaconda](#))
- Jupyter Notebook, on Browser (<https://jupyter.org/try>)
- [Google Colab](#)

(See Canvas for details)

Getting up to Speed

If you are new in Python, or if your coding skill in Python got rusty, please follow study the materials under **Tutorials/DIY** and complete Tutorial 0.

- **Tutorial 0: Do It Yourself!** (Follow the instruction on Canvas)
- **Tutorial 1 (Sep 19th):** Mondays 10-11 AM

Office Hours and Questions:

For any questions, regarding, Tutorials, Practice Examples (DIY), Assignments, and Projects, please email your TAs (Erfan and Sajad), and one of them would schedule an office hour to answer your question.

- **Erfan:** erfanbyt@student.ubc.ca
- **Sajad:** momehr@student.ubc.ca



Objectives:

After completing this course, you will learn the main, ML techniques and their applications, which are :

- Regression
- Classification
- Deep Learning
 - ANN
 - CNN
 - RNN
- PCA


If time allows we will cover:

- YOLO
- ML Deployment *

You will also gain knowledge on applications of ML in Manufacturing, through a manifold examples and case studies.

You will master these topics through completing a final open-ended project.

Next Step,

- Study the materials posted under **Tutorials/DIY**
- Complete **Tutorial 0** by next Tuesday (*there is no tutorial next week, your first Tutorial is on Mon 19th*)
- Contact TAs, if you have any problem with installation or questions regarding these materials

- Next Lecture, Tuesday, Sep 13th