XplorEEE:
Foundation of Data Science in Python

Instructors:

Ho Mun Kit

Zhuang Huiping

Program Schedule

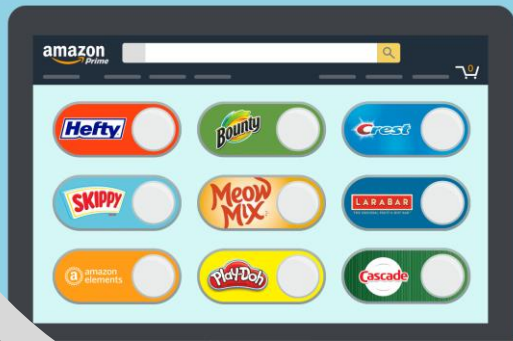| Time	Program
09:00 – 09:30	Introduction: What is Data Science
09:30 – 11:00	Introduction: Python Basics
11:00 – 12:00	Python libraries for Data Science
12:00 – 13:00	Hands-on: Linear Regression

WHAT IS DATA SCIENCE?

Data and information

from places you hardly notice
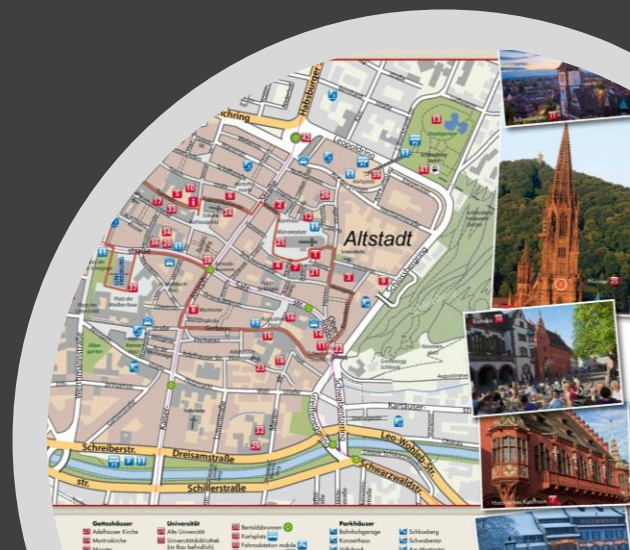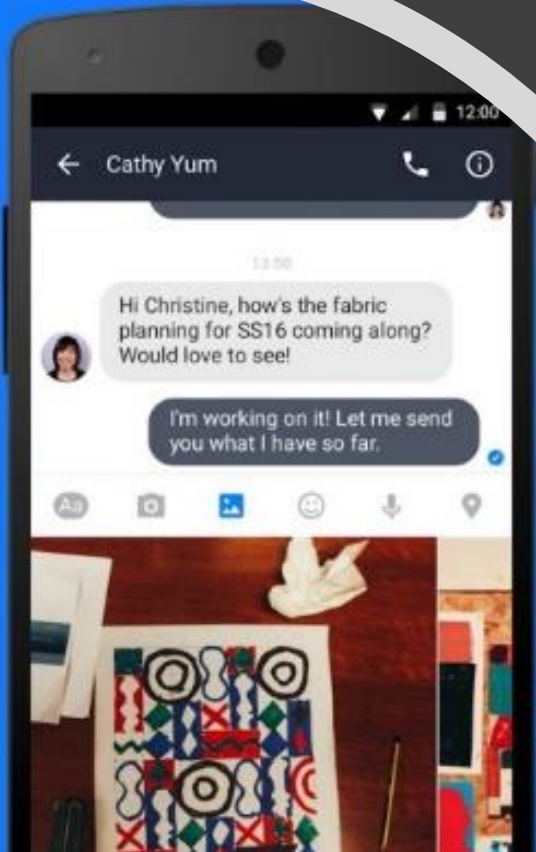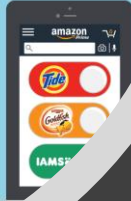
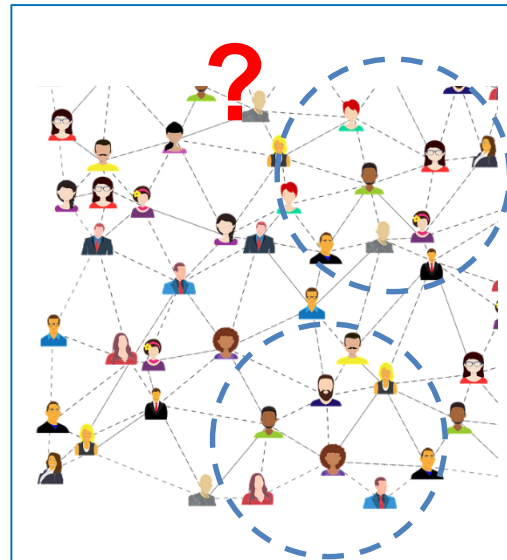We are <u>consuming</u> and <u>generating</u> data every day
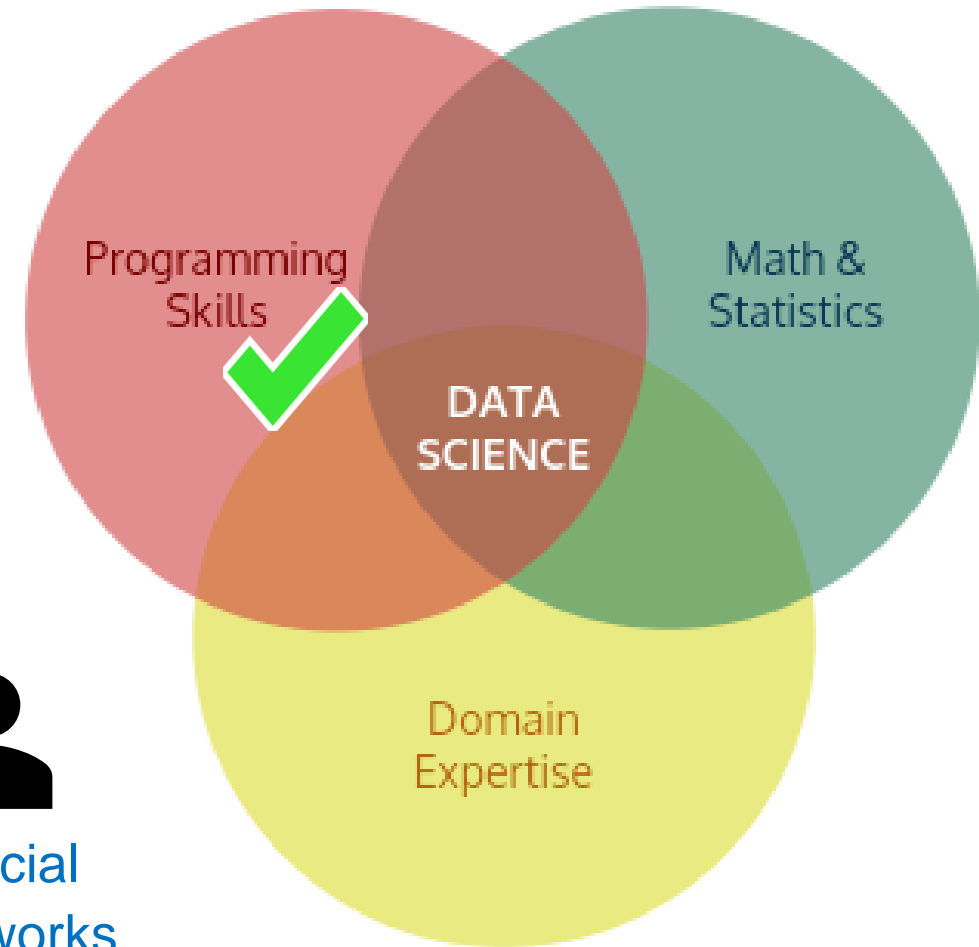
Data science

Exploration and analysis of data in order to discover meaningful patterns to answer critical questions

Advertising

Social Networks

Data → Information → Knowledge

OBJECTIVE: Extract knowledge to automate decision-making of identical problems in the future

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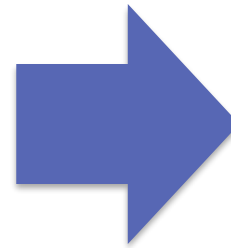
PROGRAMMING

How do I tell a computer to accomplish a certain task?

Exercise: How do I cook this pack of noodles?

Tips:
- What do you need?
- Which indicators do you look out for?

| Noodles in packaging | → | ? | → | ... | → | ? | → | Ready to eat |

Quick hands-on: Robot Guidance

Link: https://bit.ly/1zIvq2z

Classic software

| Decompose the problem | → | Design algorithms | → | Integrate into a system | → | Measure performance |

SOFTWARE 2.0

Machine learning algorithms
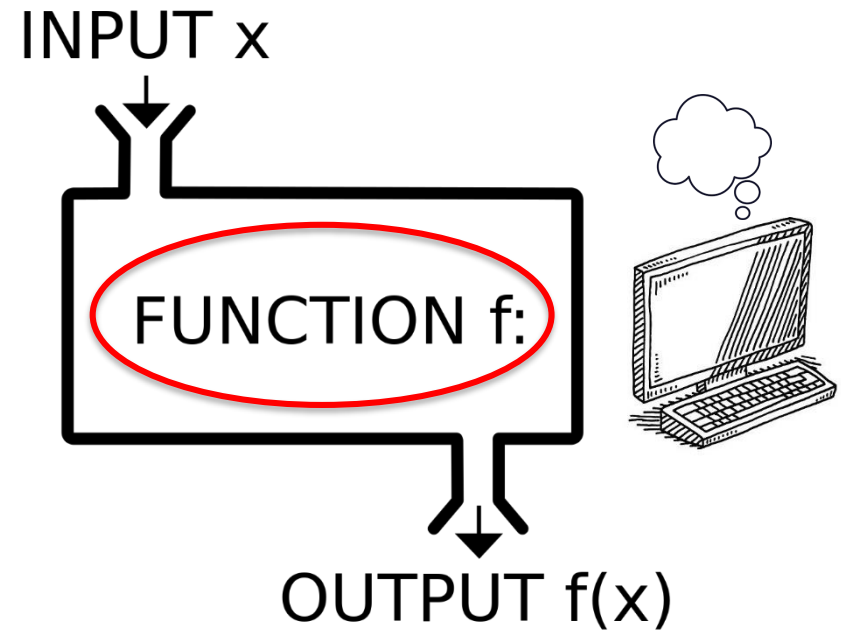
Programming a more complex task

Handwriting recognition task

true label: 0
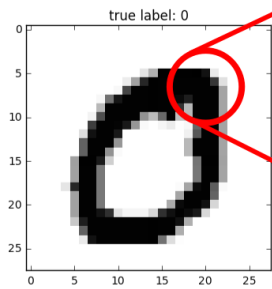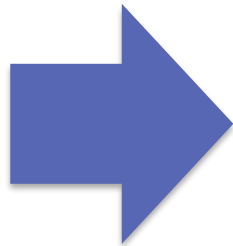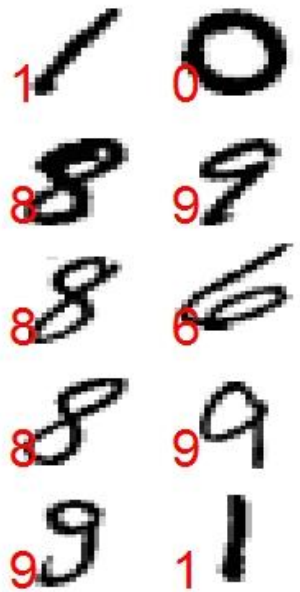
$$\vec{x} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_m \end{bmatrix}$$

Each 8-bit pixel takes the value of 0-255
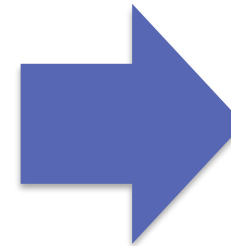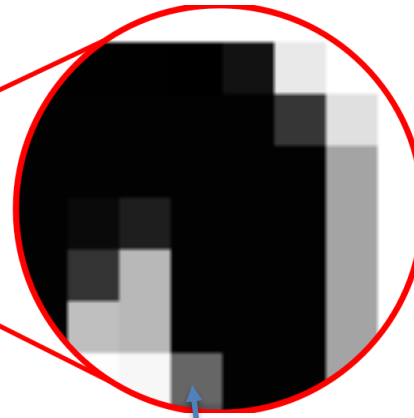
Classifier algorithm

0
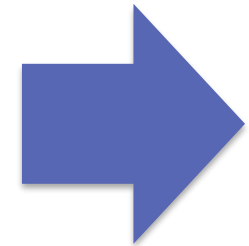
Machine Learning Algorithms

Cats Dogs
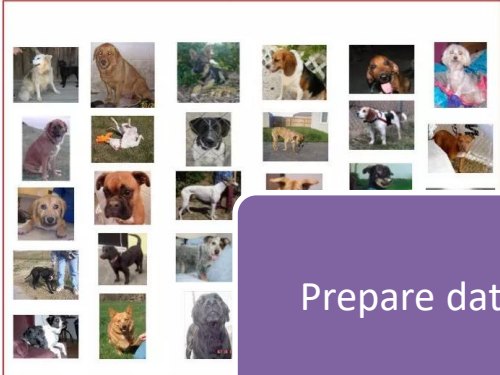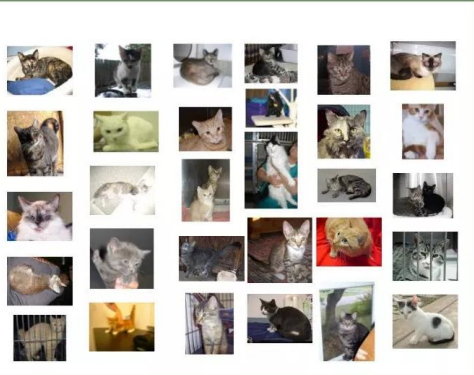
Prepare data

Hypothesis: $h_\theta(x) = \theta_0 + \theta_1 x$

Parameters: θ_0, θ_1

Select hypothesis function

Specify desirable goal
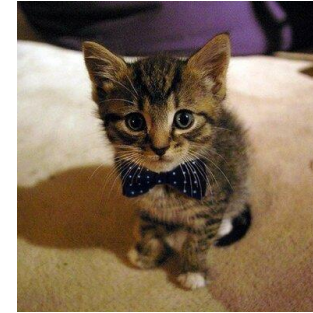
CAT ✔️   CAT ❌

Computer searches for a program/function

Measure performance

CAT (LABELED PHOTOS)

DOG

OUTPUT
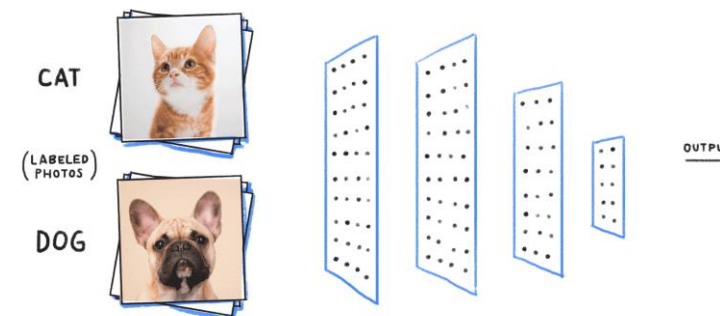
ML/AI APPLICATIONS IN REAL WORLD

ML/AI applications in **real world**

- So, how do you actually use ML/AI?

Where do you collect the data from? How do you use it to solve problems of the real world?

ML/AI applications in **real world**

- So, how do you actually use ML/AI?

  Where do you collect the data from? How do you use it to solve problems of the real world?

Signals ➡️ Sensors ➡️ Data ➡️ ML

ML and <u>Signal Processing</u>?

<u>IEEE Signal Processing Society</u>   <u>https://www.youtube.com/watch?v=mexN6d8QF9o</u>

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ML and **Robotics**?
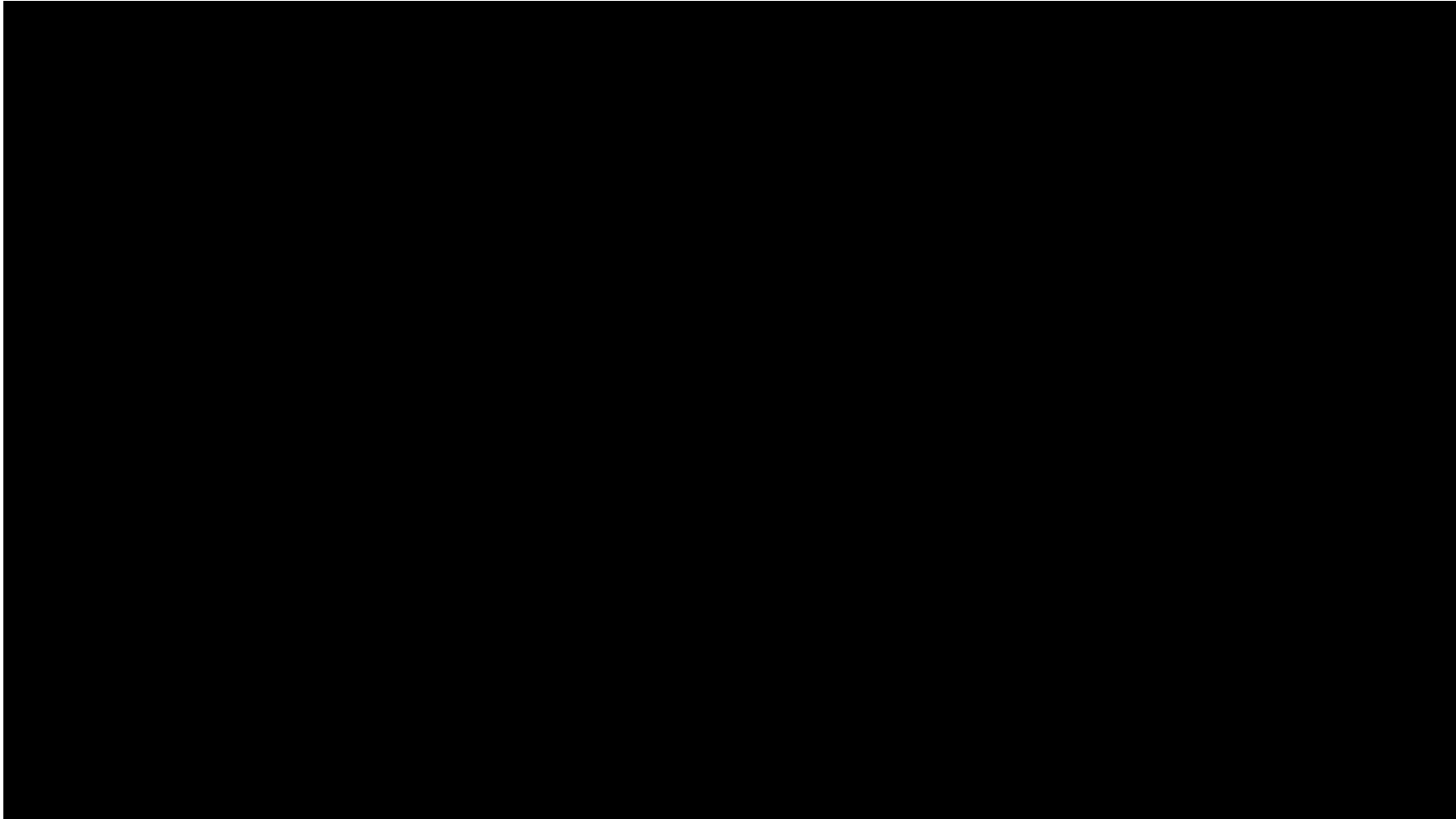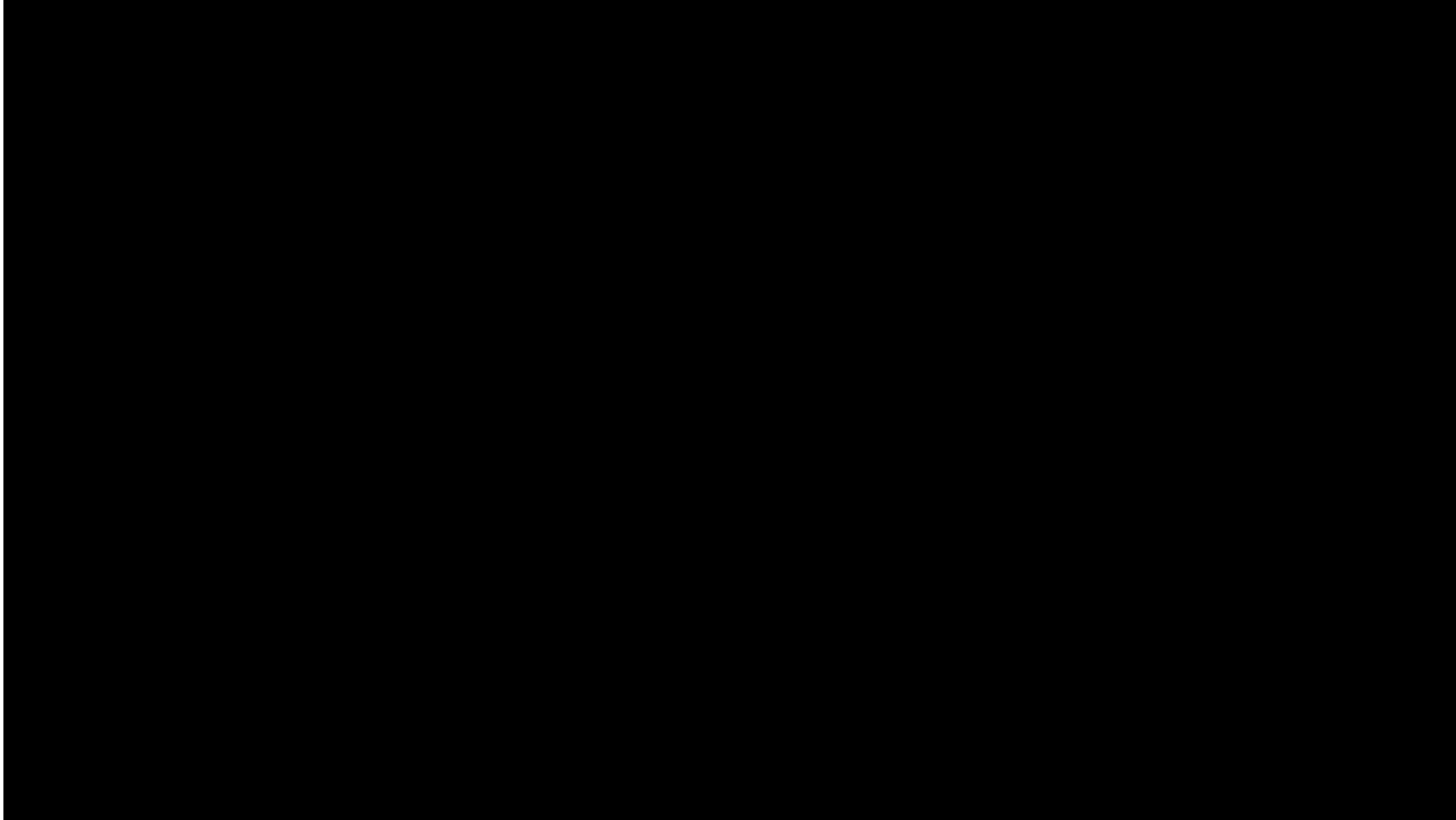
Shkurti, Florian, et al. "Underwater multi-robot convoying using visual tracking by detection." *Intelligent Robots and Systems (IROS), 2017 IEEE/RSJ International Conference on*. IEEE, 2017.

https://www.youtube.com/watch?v=Em7V-vBApHc

ML and Manufacturing (IoT)?

AI/ML everywhere??

ML and **Power Systems**?

- ✓ Load/Demand Forecasting
- ✓ Fault Detection and Classification
- ✓ Weather/ Wind Forecasting