Bell Ringer

As you come in and get settled, follow these instructions:

1. Find your seat
2. Take out and set-up your laptop
3. Go to www.joinpd.com and key in

Students browse: www.joinpd.com

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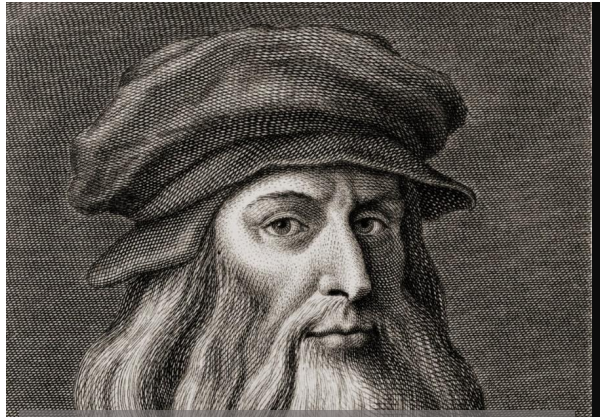
daVinci@SUTD (STEAMxD)

Human-Centric Design + Technology Interdisciplinary Immersion

SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

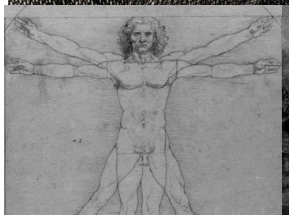
STEAMxD™

A BETTER WORLD BY DESIGN.



Takes inspiration from **Leonardo da Vinci**, a man who was

- ahead of his time, with highly imaginative and innovative ideas arising from the deep blending of science and arts; and
- an artist, architect, engineer and scientist – combined



daVinci@SUTD

Unique integration of HASS, Design and STEM

Inspiring youths in **human-centred designs and innovations** that are grounded in **Science, Technology, Engineering and Mathematics**, fused with the understanding of **Humanities, Arts and Social Sciences** to serve greater societal needs.

daVinci@SUTD STEAMxD Immersion Programme

Day 3 (PM) – Artificial Intelligence Session

Ibrahim Thahir[1] and Melvin Lee[1]

[1] Engineering Product Development (EPD)

Workshop Scenario

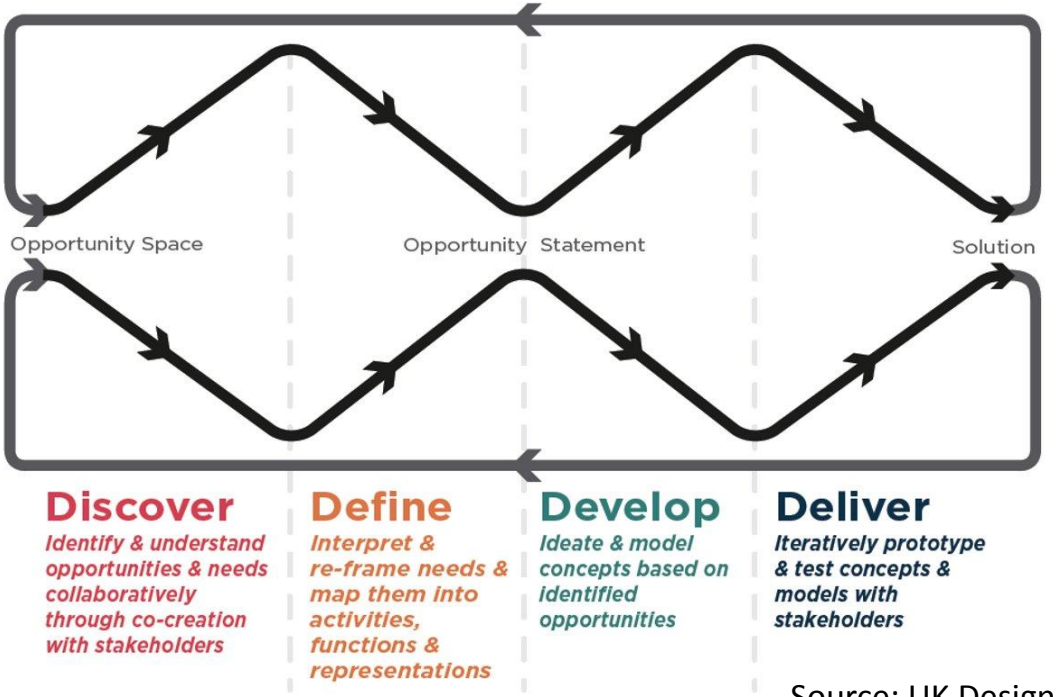
Each student team sets up a startup Co. specializing in AI-equipped robotics for rescue operations. (Tech. Co.)

Company works worldwide and needs to understand its clients' needs. (User Needs)

In a startup Co. founders carry out all of the work, hence, it is important to master different skills in the fields of Humanities, Design and STEM. (Transdisciplinary)

Design Brief

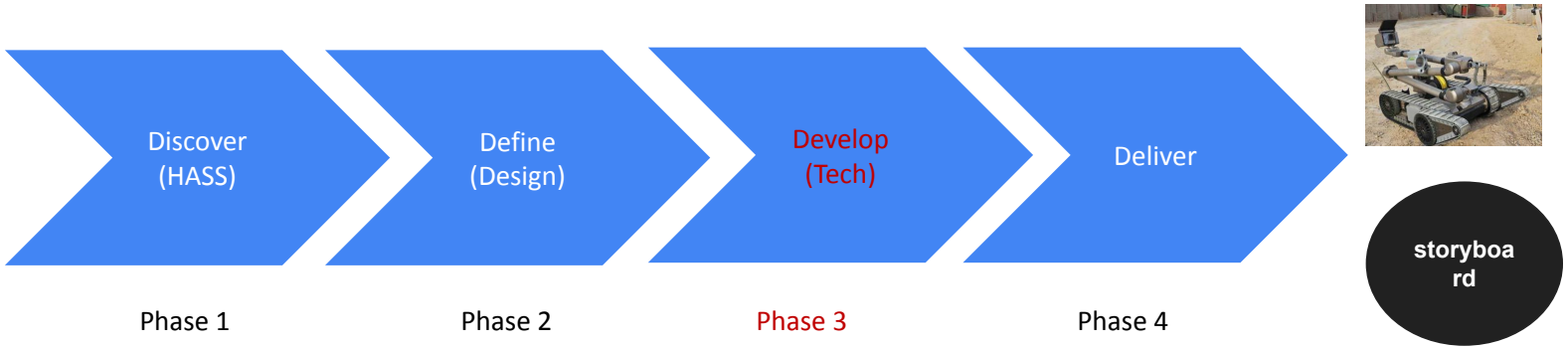
Design Process



Source: UK Design Council Double Diamond

Design Brief

Workflow



How many of you have experience in Python?

Students choose an option

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Have you tried machine learning?

Students choose an option

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Have you read through the pre-learning materials?

Students choose an option

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Write down 3 learning points from the pre-learning materials

Students, write your response!

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Questions on the pre-learning materials?

Students, write your response!

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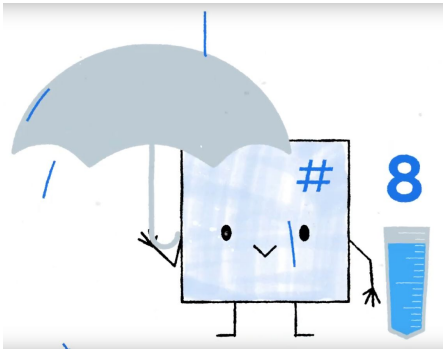
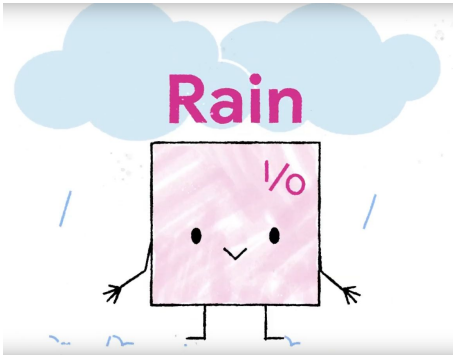
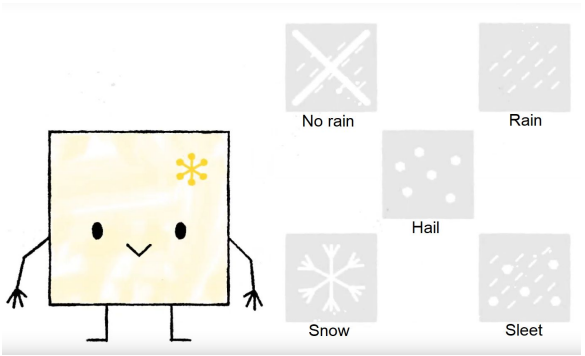
What is machine learning?

What is machine learning?

- Supervised learning
  - Regression, Classification & Multi-class classification



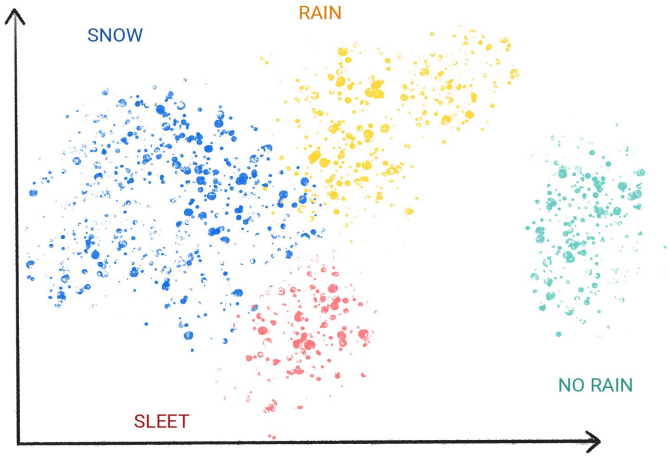


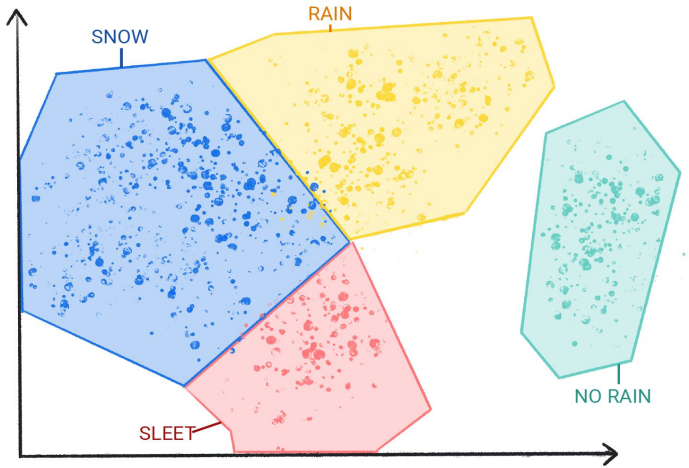


Credit: https://developers.google.com/machine-learning/intro-to-ml

What is machine learning?

- Unsupervised learning
  - Clustering

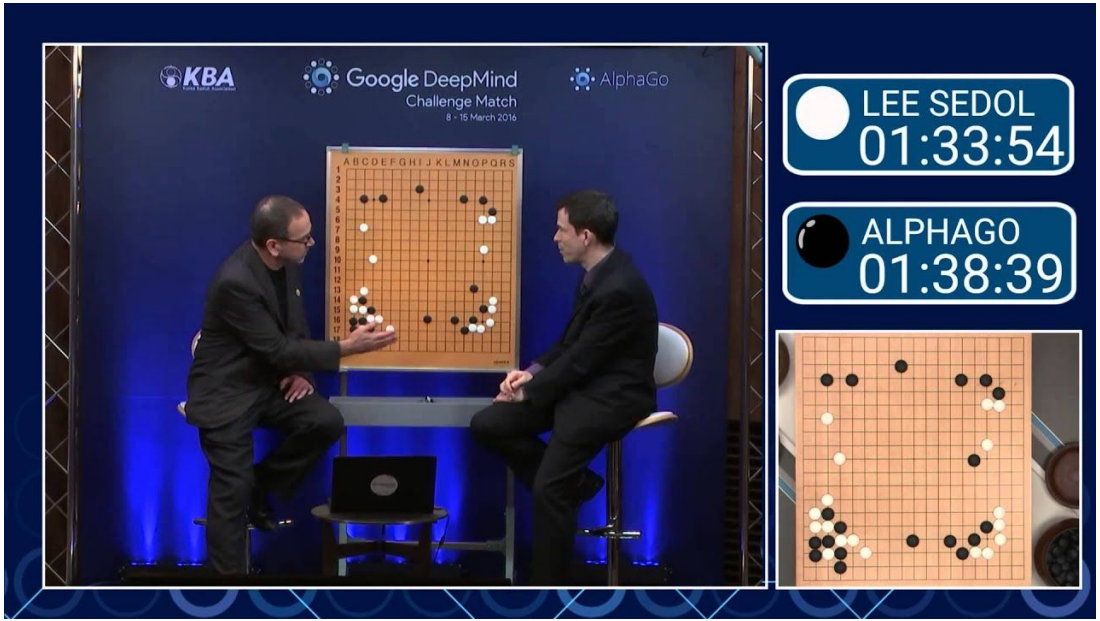




Credit: https://developers.google.com/machine-learning/intro-to-ml

What is machine learning?

- Reinforcement learning
  - AlphaGo



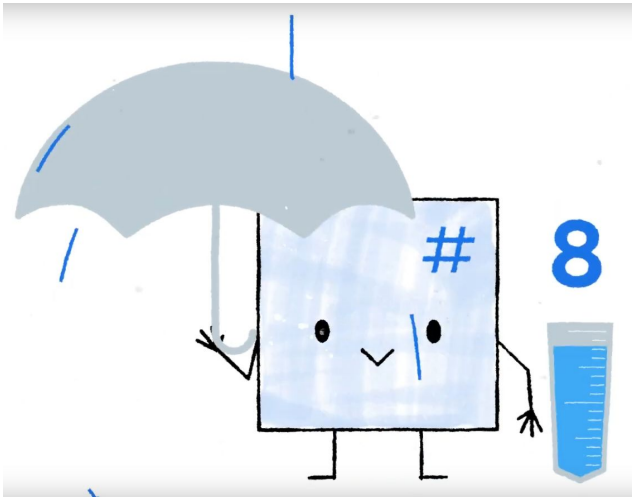
Credit: https://developers.google.com/machine-learning/intro-to-ml

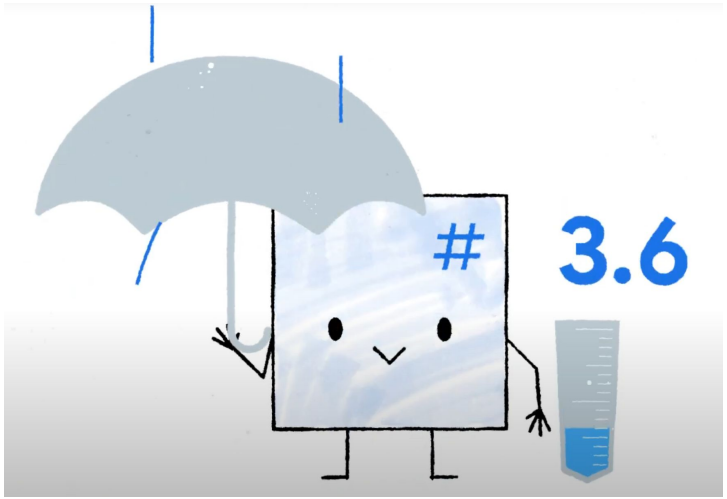
Supervised learning

- Supervised machine learning is based on the following core concepts
  - Data
  - Model
  - Training
  - Evaluating
  - Inference

Credit: https://developers.google.com/machine-learning/intro-to-ml

Supervised learning - Data

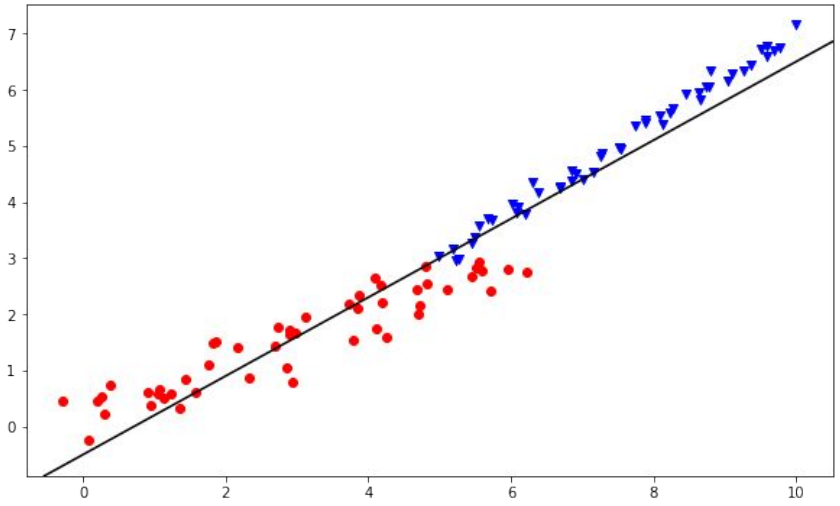




Credit: https://developers.google.com/machine-learning/intro-to-ml

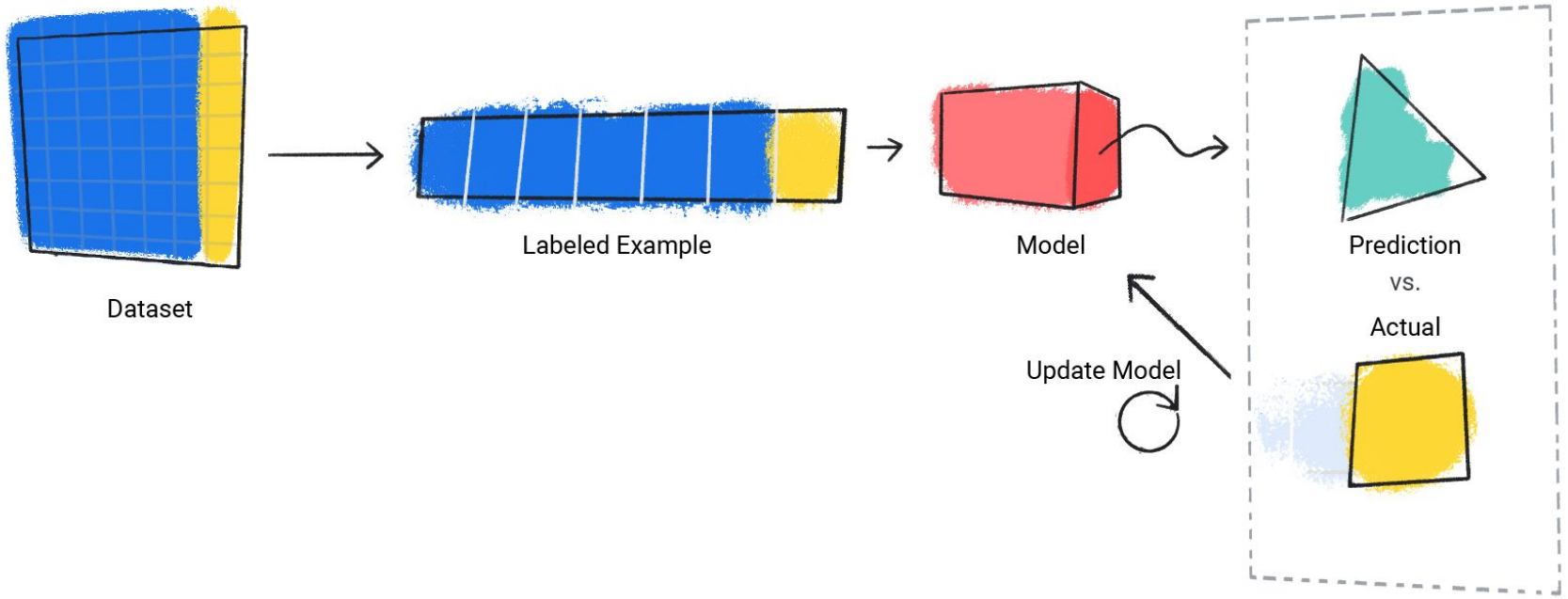
Supervised learning - Model

- In supervised learning, a model is the complex collection of numbers that define the mathematical relationship from specific input feature patterns to specific output label values. The model discovers these patterns through training.



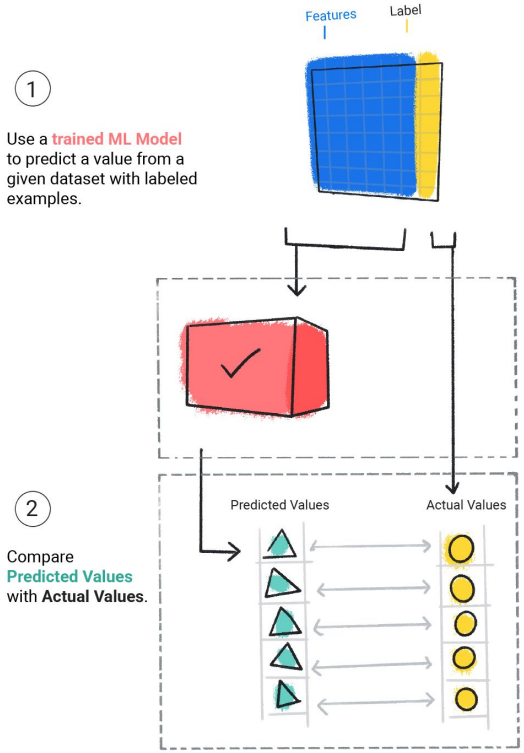
Credit: https://developers.google.com/machine-learning/intro-to-ml

Supervised learning - Training



Credit: https://developers.google.com/machine-learning/intro-to-ml

Supervised learning - Evaluating



Credit: https://developers.google.com/machine-learning/intro-to-ml

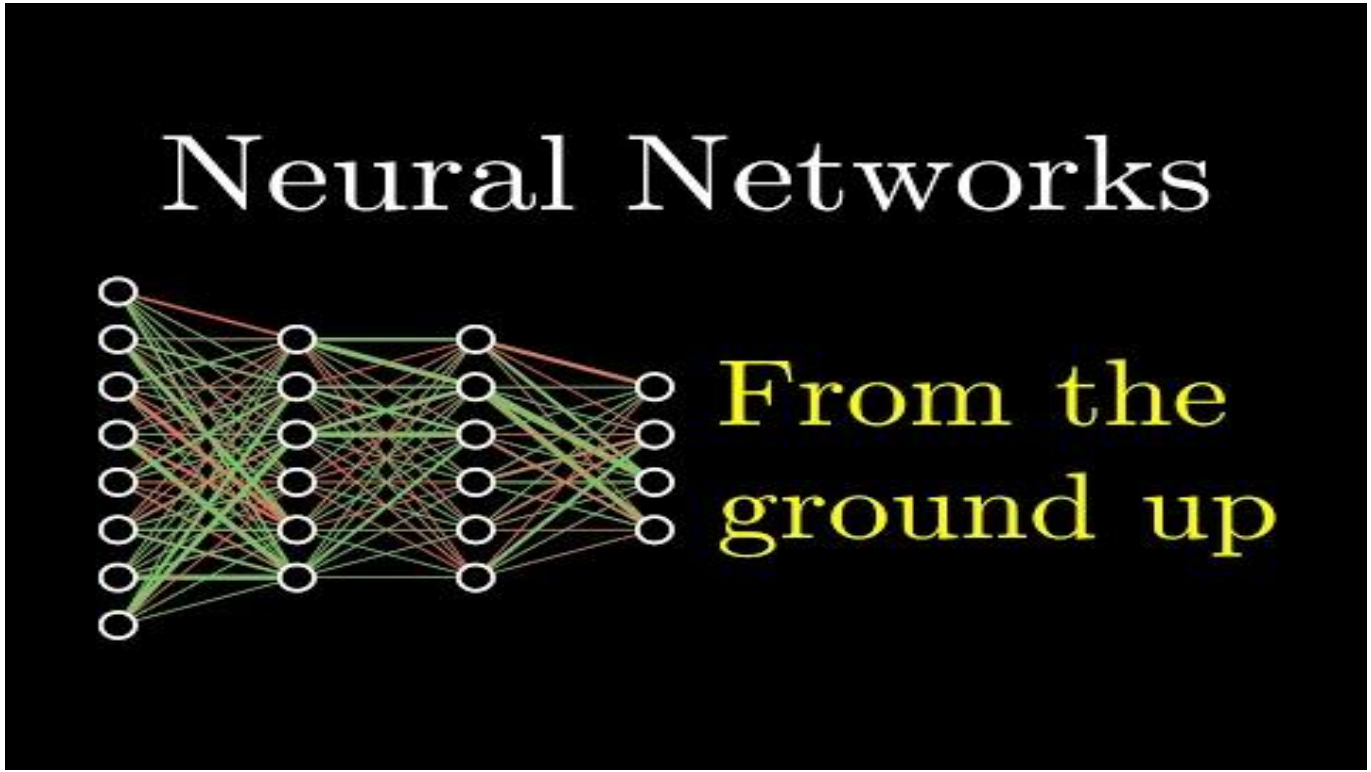
Supervised learning - Inference

- Once we're satisfied with the results from evaluating the model, we can use the model to make predictions, called inferences, on unlabeled examples. In the weather app example, we would give the model the current weather conditions—like temperature, atmospheric pressure, and relative humidity—and it would predict the amount of rainfall.

Temperature	**ATM**	**Relative Humidity**	**Rainfall**
30℃	101.325kPa	87%	? ? ?

Credit: https://developers.google.com/machine-learning/intro-to-ml

What is a neural network?



Credit: 3Blue1Brown (https://www.youtube.com/watch?v=aircAruvnKk)

Labelling of images

1. Proceed to the link and sign-up for an account

Labelling of images

1. Proceed to the link and sign-up for an account
2. Access this gdrive to download the dataset
    a. There will be two datasets; sample.zip and baseline-dataset.zip

Students browse: drive.google.com/drive/folders/1ZomnP3k6-a1SZfF4P2IrQFYi909cyByz?u...
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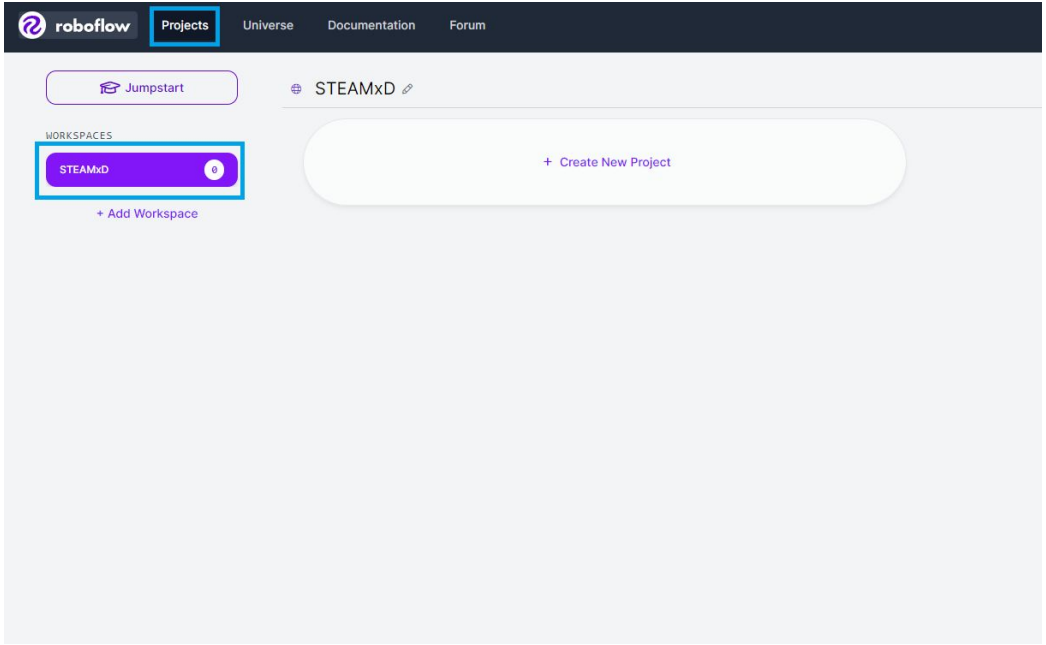
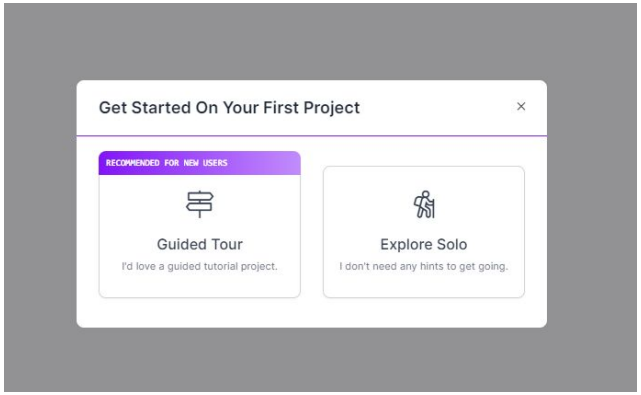
Steps for Roboflow - Image labelling

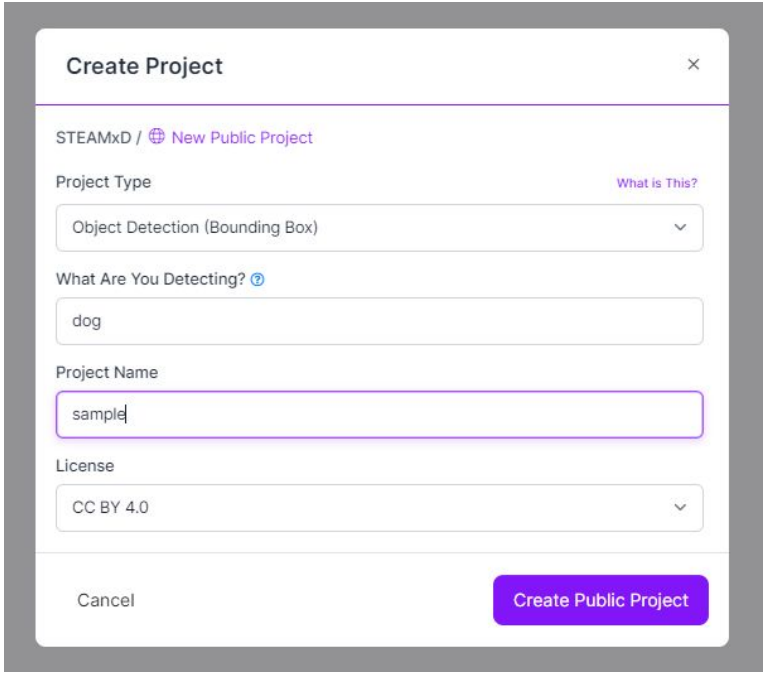
- Once you've signed up an account go to the projects tab and select your workspace



Steps for Roboflow - Image labelling

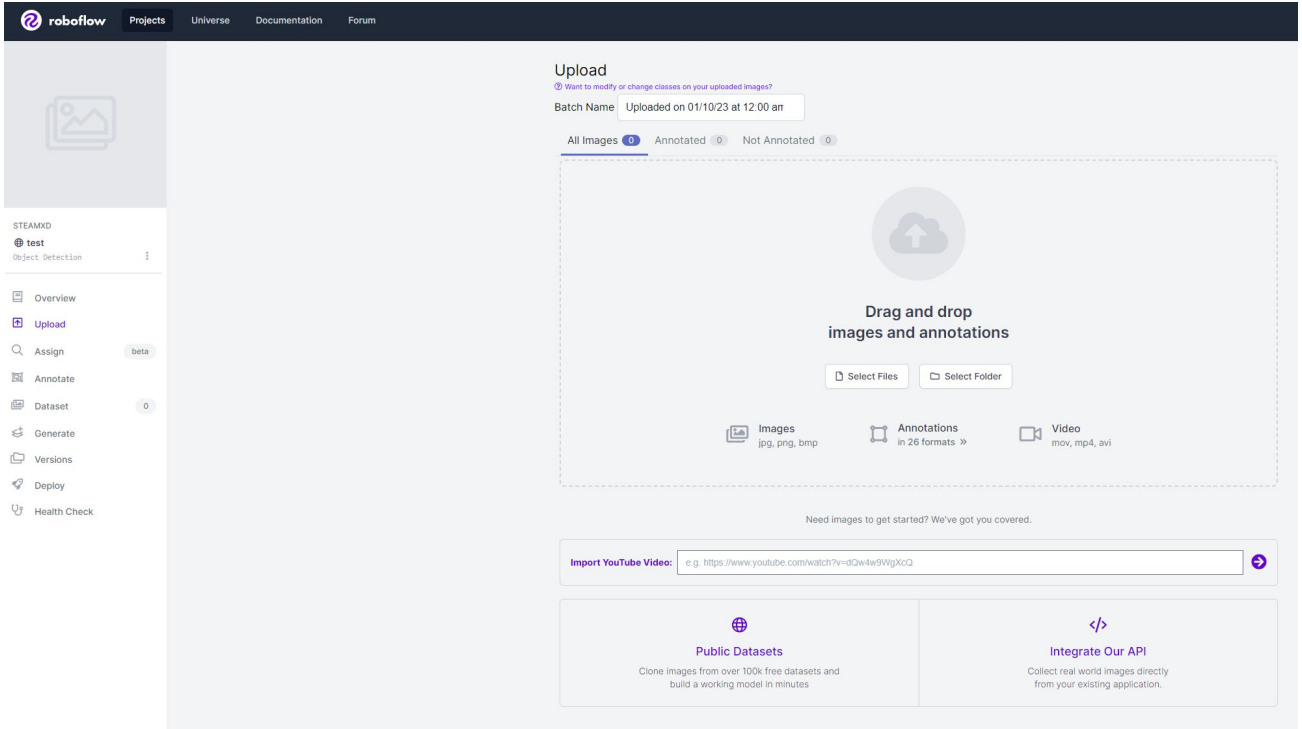
- Create new project -> explore solo -> fill in the details





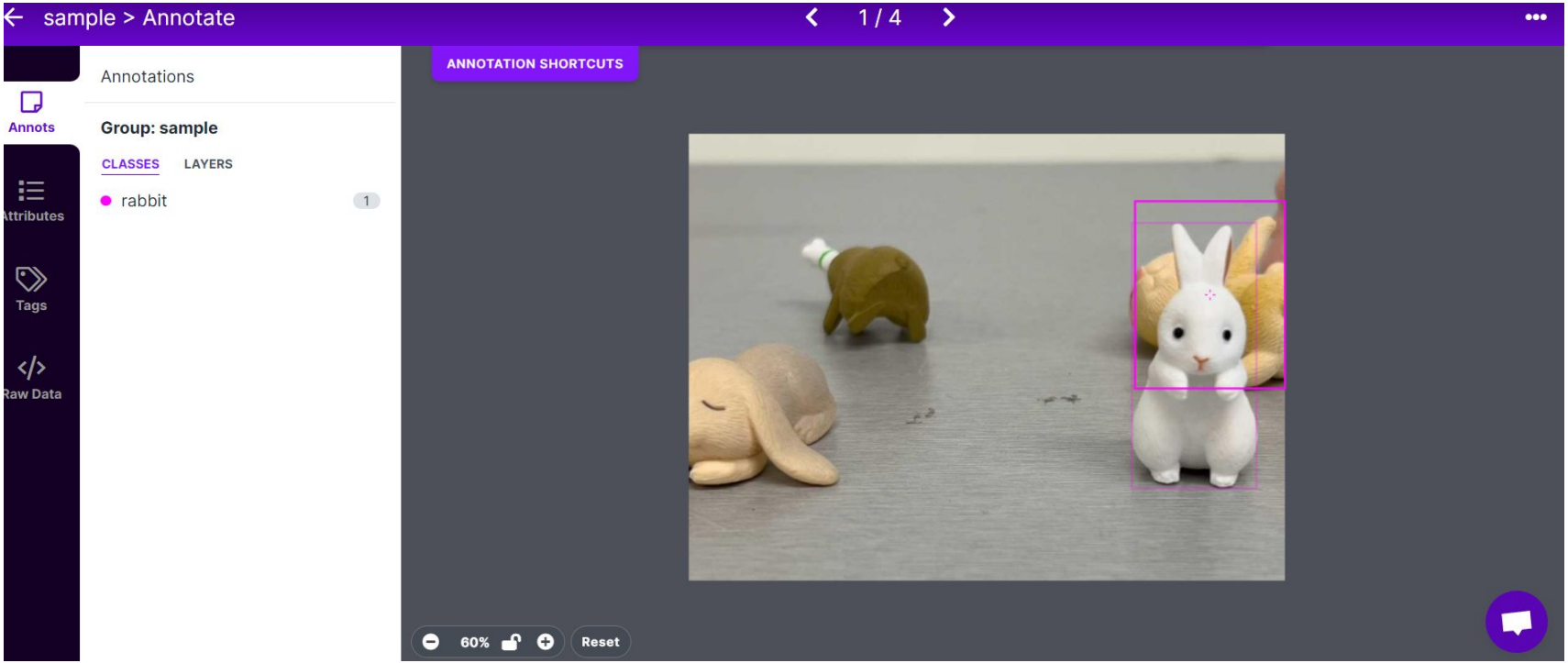
Steps for Roboflow - Image labelling

- Upload the images from sample.zip and click **“save and continue”**



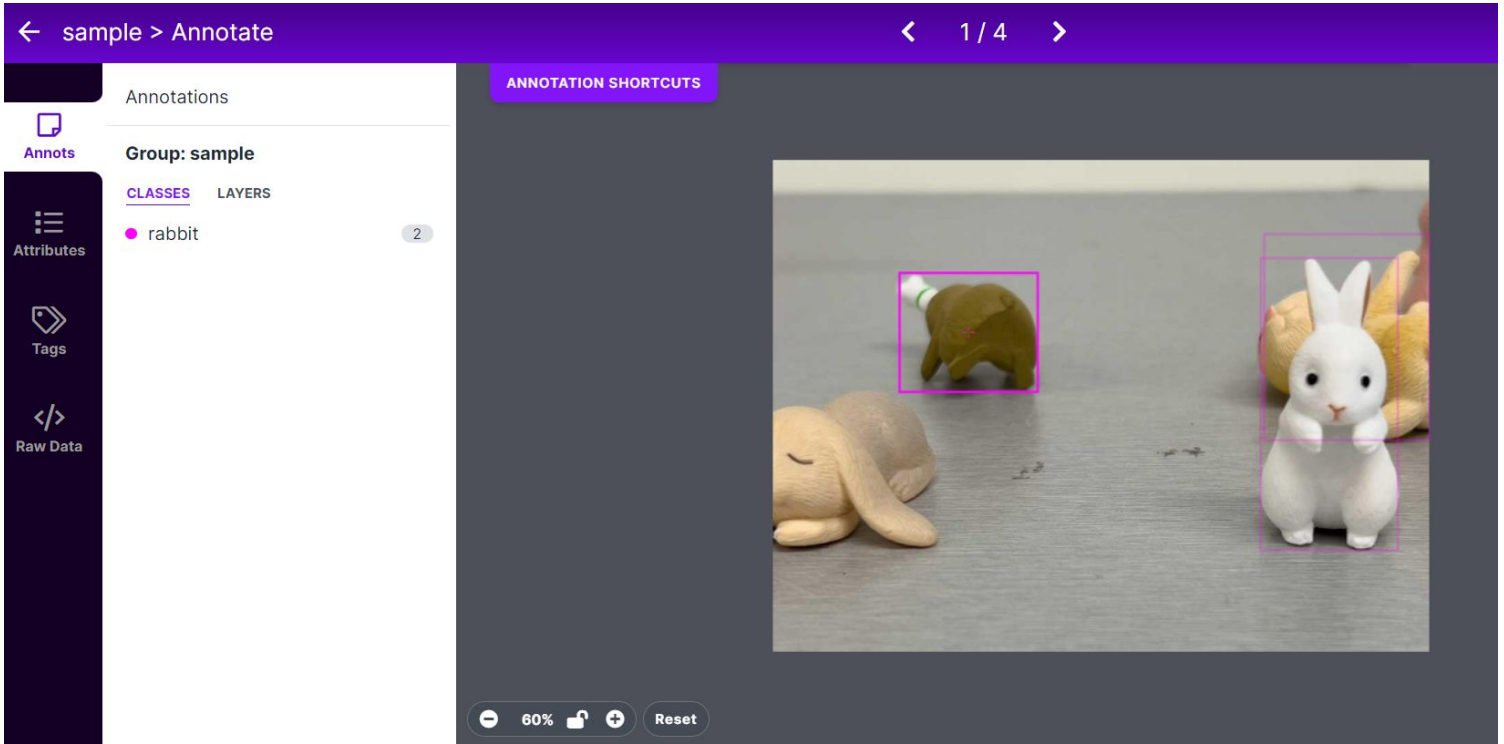
Steps for Roboflow - Image labelling (Good Practises)

- Label occluded objects



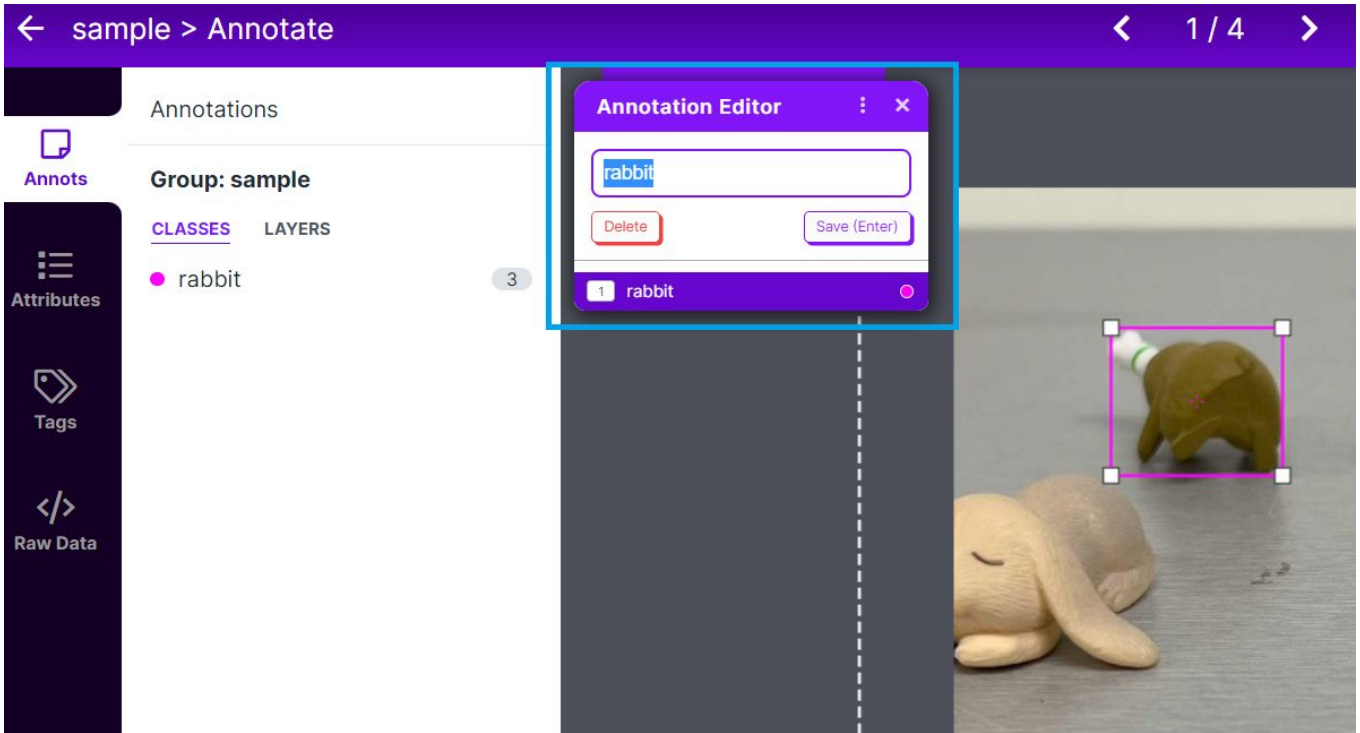
Steps for Roboflow - Image labelling (Good Practises)

- Create tight bounding boxes



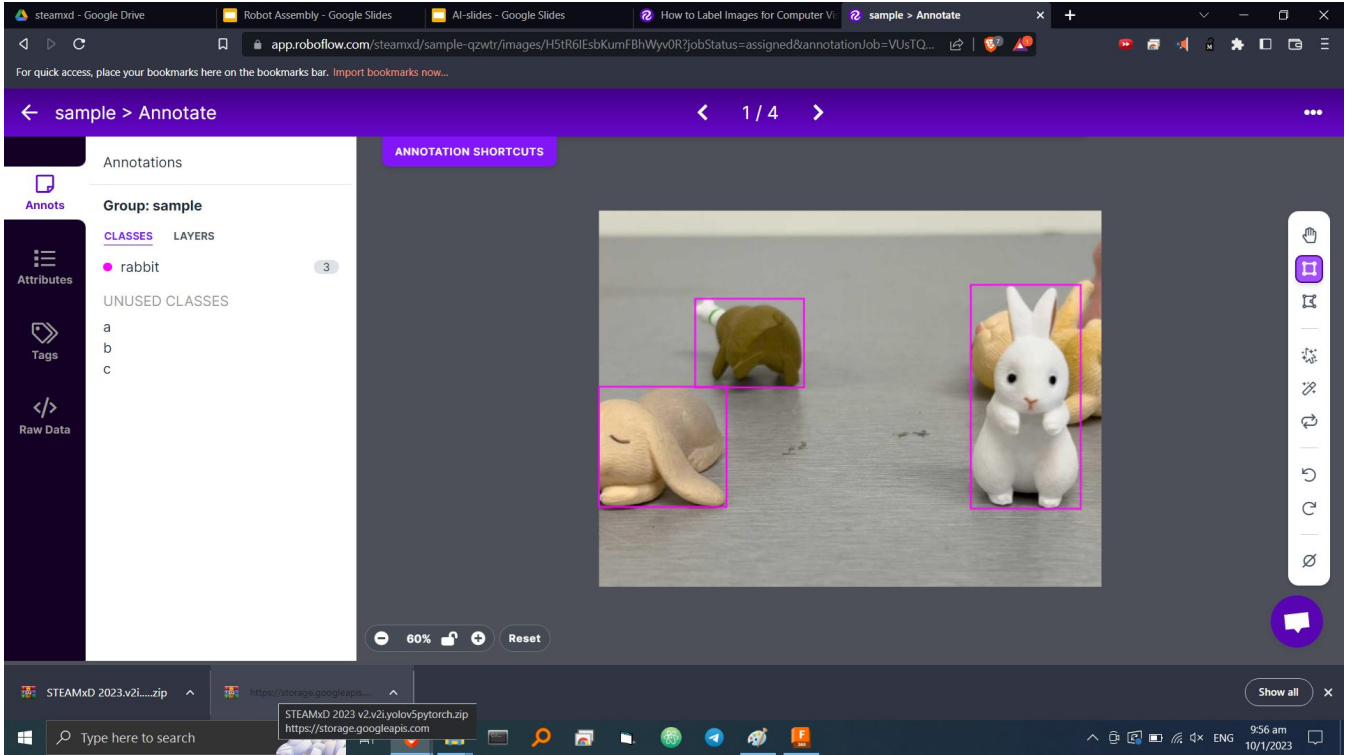
Steps for Roboflow - Image labelling (Good Practises)

- Create specific label names



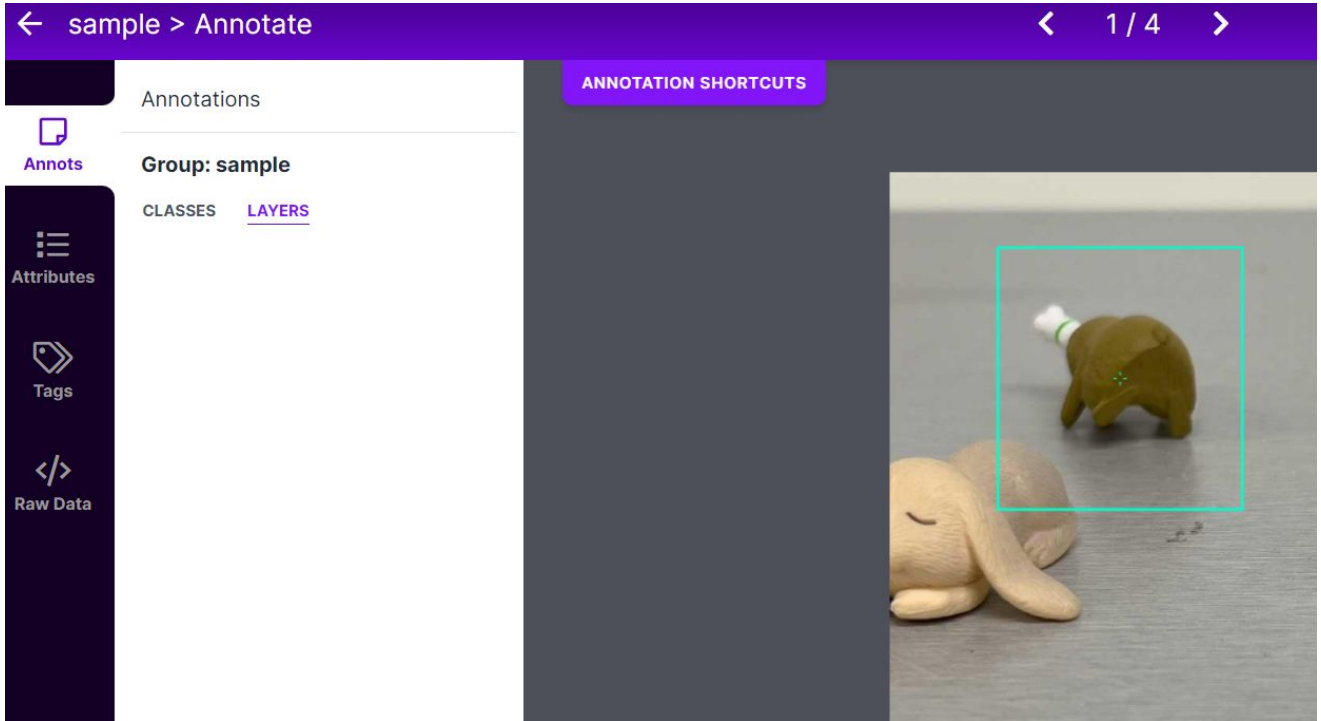
Steps for Roboflow - Image labelling (Bad Practises)

- Occluded objects not labelled



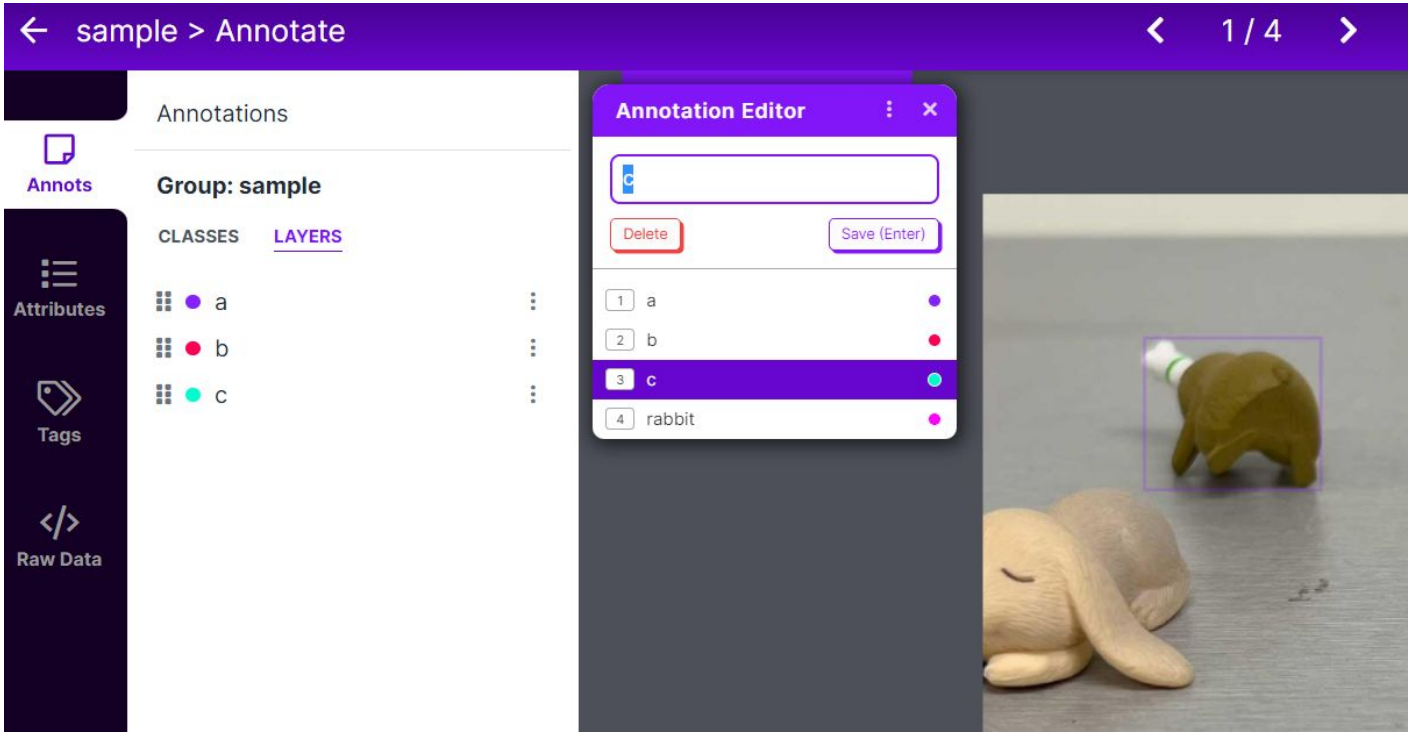
Steps for Roboflow - Image labelling (Bad Practises)

- Non-tight bounding boxes



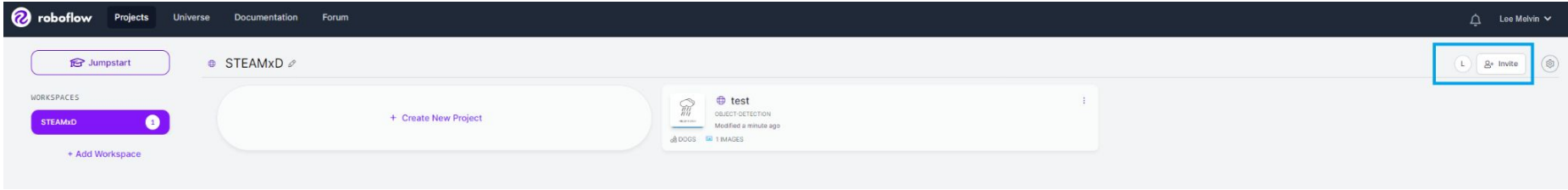
Steps for Roboflow - Image labelling

- Non-specific label names



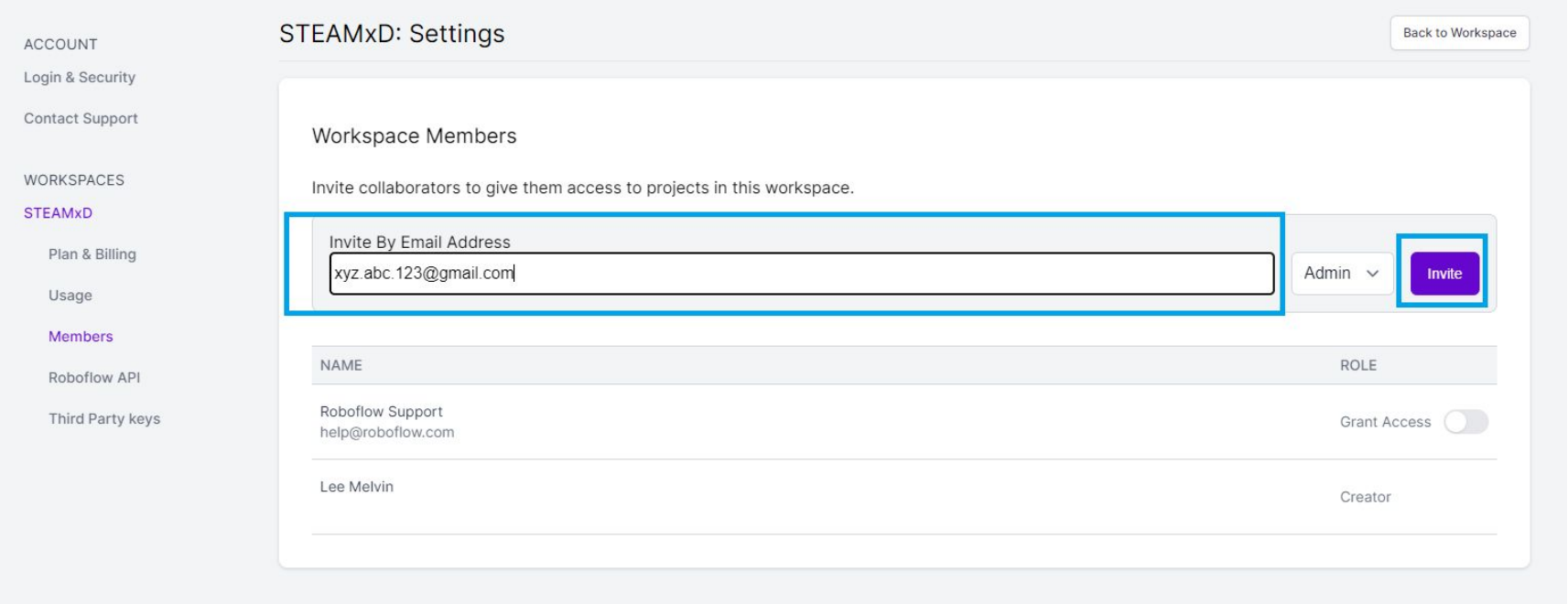
Steps for Roboflow - How to invite teammates

- At the top left hand corner within your workspace you can click the **+ invite** icon



Steps for Roboflow - How to invite teammates

- Key in your teammates email and click on **invite**



Steps for Roboflow - Labelling images best practises

- Go to link, alternative you can refer to the video

Follow along demo

Students browse: www.github.com/leemjm92/STEAMxD/blob/main/custom-yolov5-object-det...

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