

## 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](http://www.joinpd.com) and key in



Students browse: [www.joinpd.com](http://www.joinpd.com)

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**daVinci@SUTD**  
**(STEAMxD)**

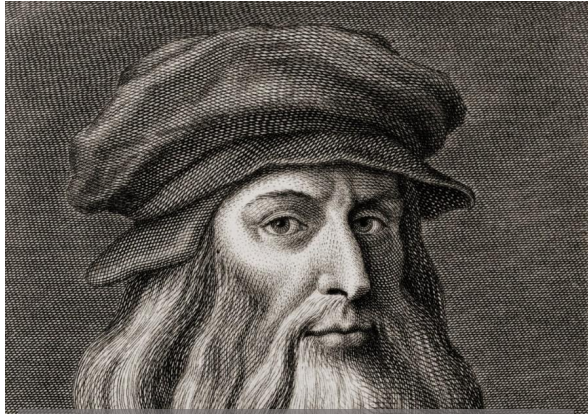
***Human-Centric  
Design +  
Technology  
Interdisciplinary  
Immersion***



SINGAPORE UNIVERSITY OF  
TECHNOLOGY AND DESIGN

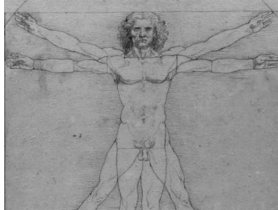


**A BETTER WORLD BY DESIGN.**



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<sup>1</sup> and Melvin Lee<sup>1</sup>

<sup>1</sup> Engineering Product Development (EPD)

# Workshop Scenario

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

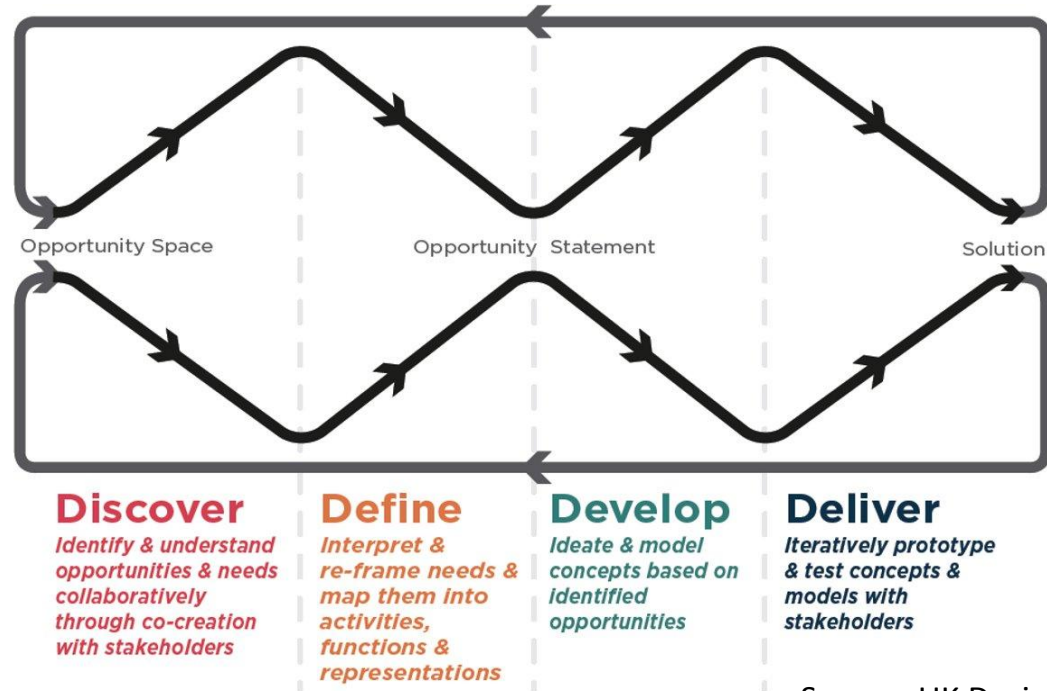
Company works worldwide and needs to understand its clients' needs.  
**(User Needs)**

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



Phase 1  
Day 1

Phase 2  
Day 1

Phase 3  
Day 2  
Day 3  
Day 4

Phase 4  
Day 5



# 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!



Pear Deck

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Questions on the  
pre-learning materials?



Students, write your response!



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What is machine learning?

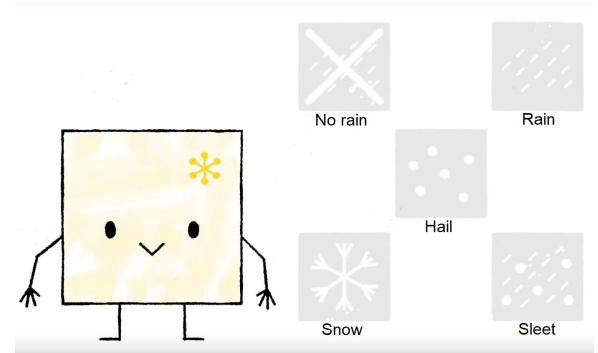
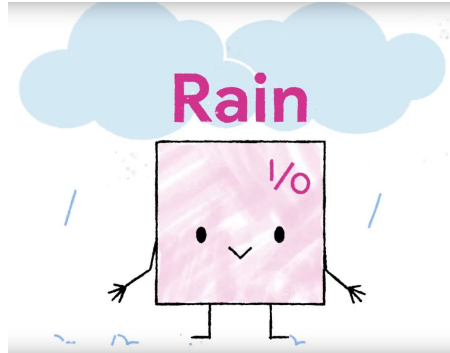
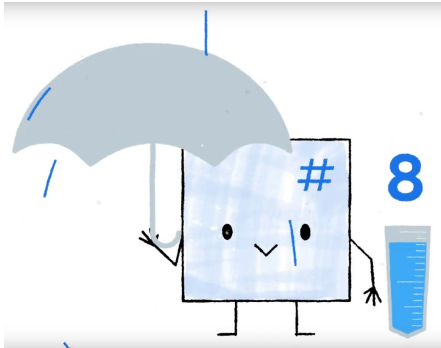


Google AI



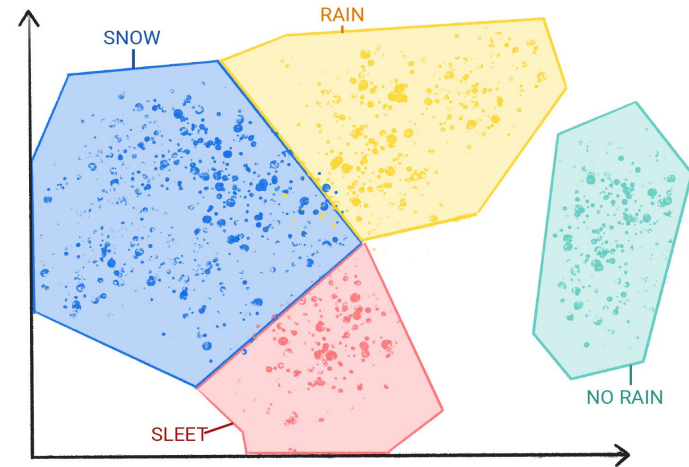
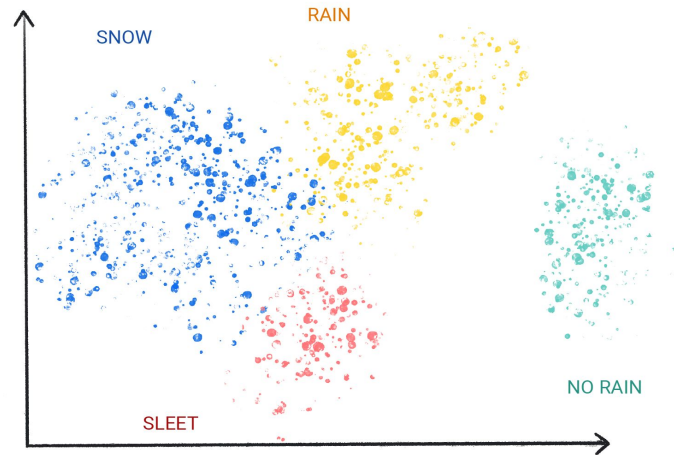
# What is machine learning?

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



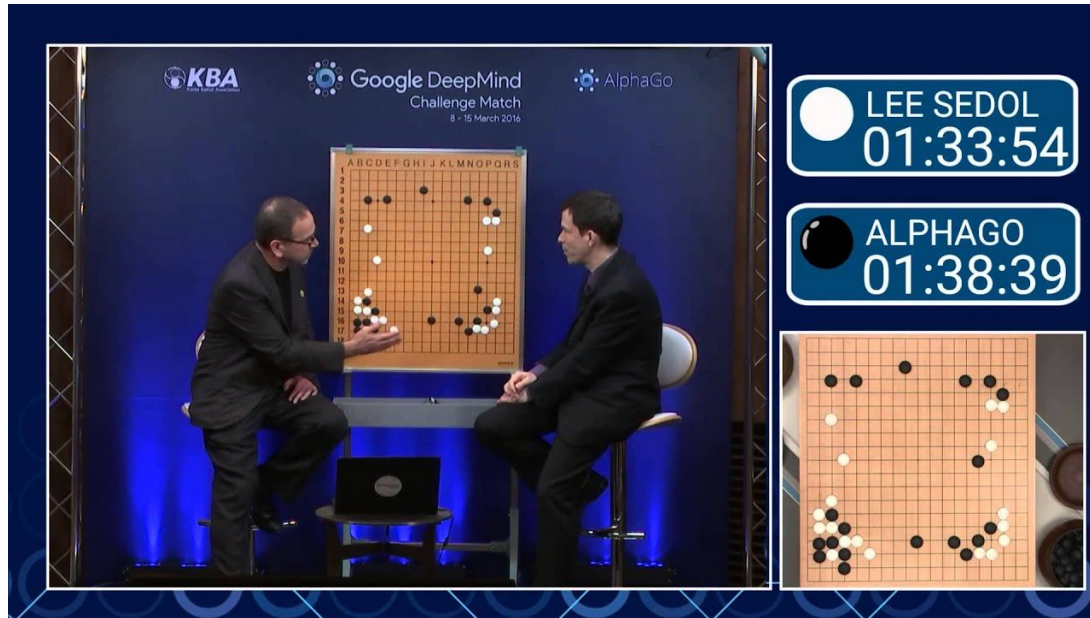
# What is machine learning?

- Unsupervised learning
  - Clustering



# What is machine learning?

- Reinforcement learning
  - AlphaGo

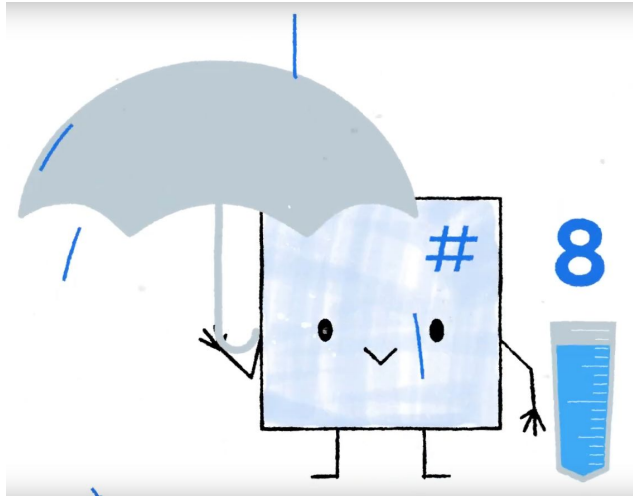




# Supervised learning

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

# Supervised learning - Data

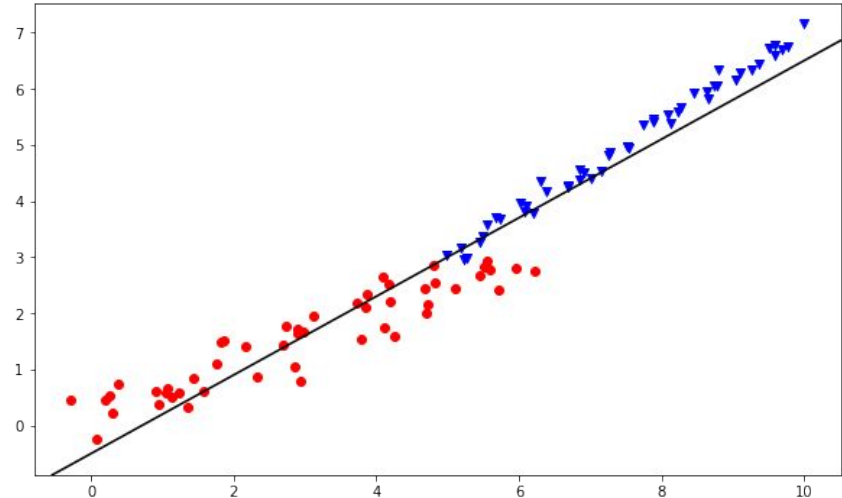


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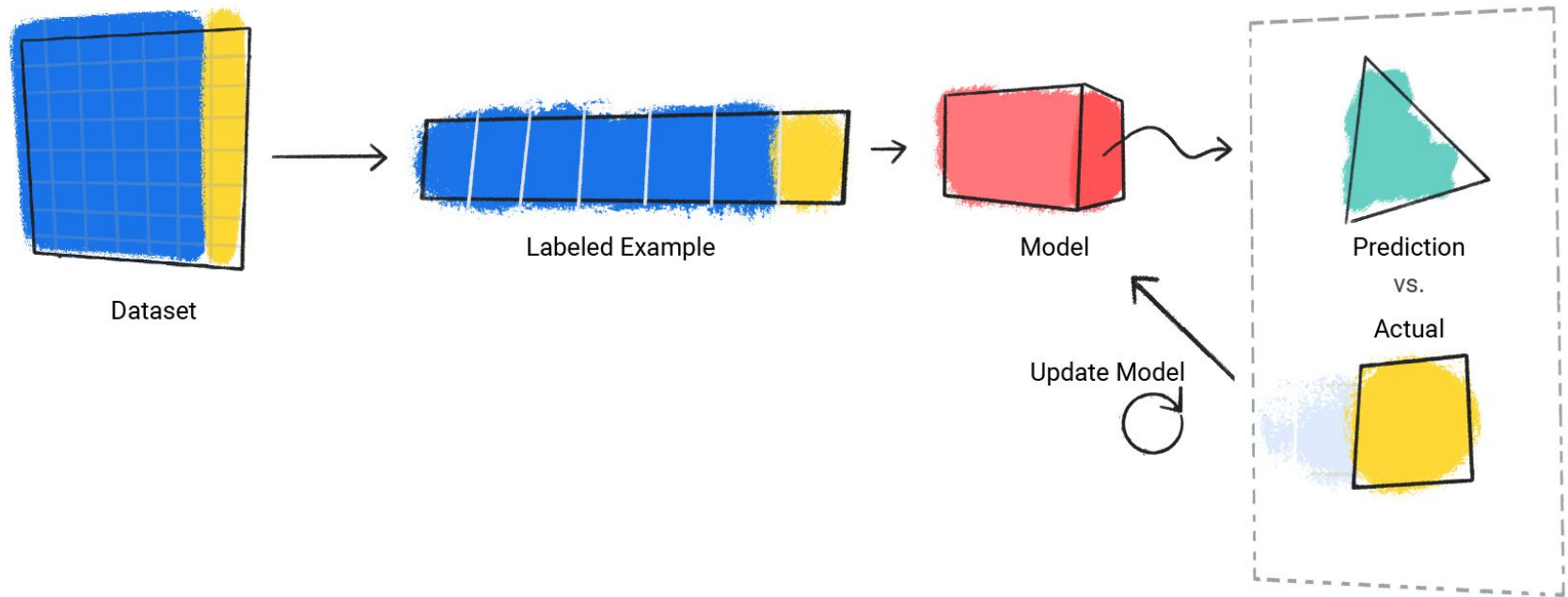


# Supervised learning - Model

- 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.



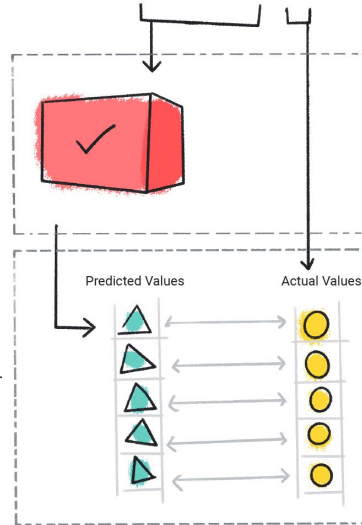
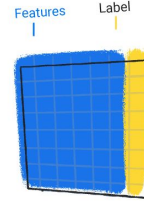
# Supervised learning - Training



# Supervised learning - Evaluating

1

Use a **trained ML Model** to predict a value from a given dataset with labeled examples.







2

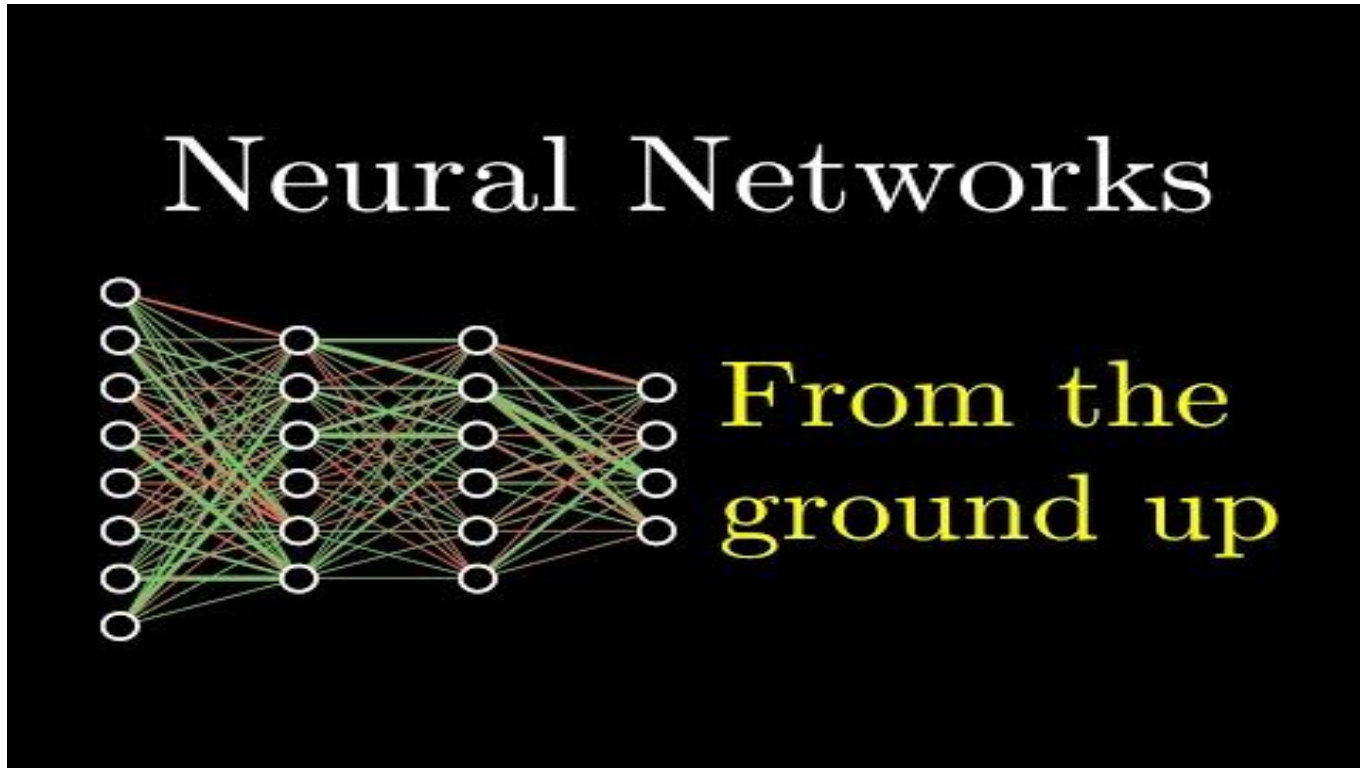
Compare **Predicted Values** with **Actual Values**.

# 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°C	101.325kPa	87%	???

What is a neural network?



# Labelling of images

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



Students browse: [www.roboflow.com](https://www.roboflow.com)



# 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

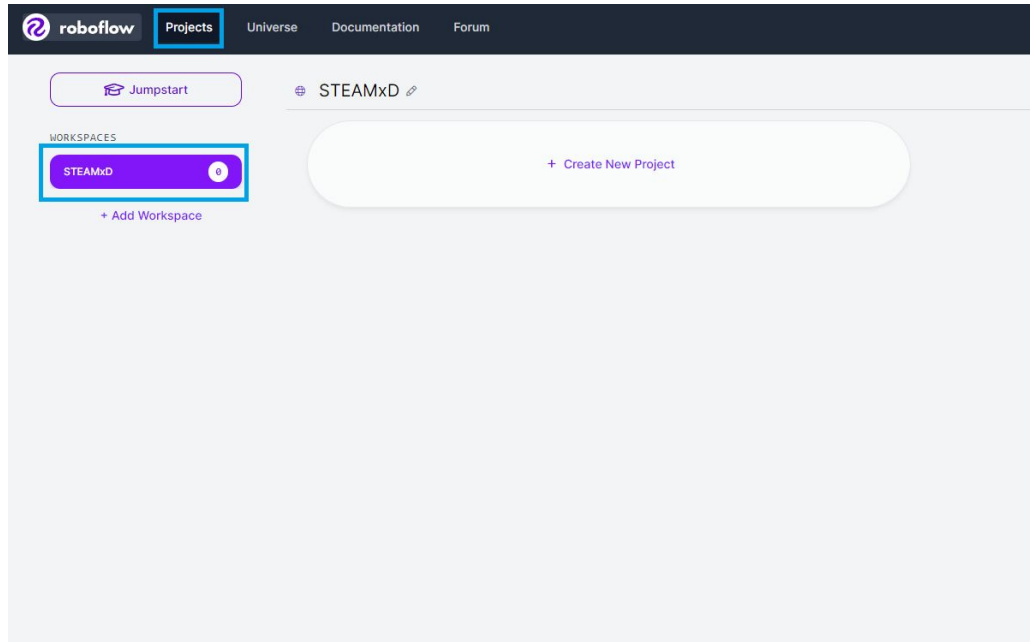


Students browse: [drive.google.com/drive/folders/1ZomnP3k6-a1SZfF4P2lrQFYi909cyByz?u...](https://drive.google.com/drive/folders/1ZomnP3k6-a1SZfF4P2lrQFYi909cyByz?u...)

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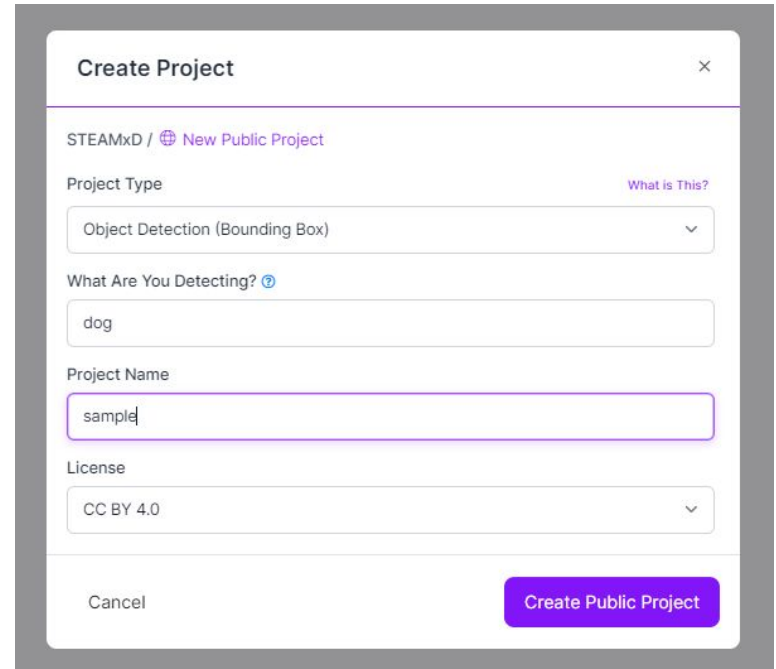
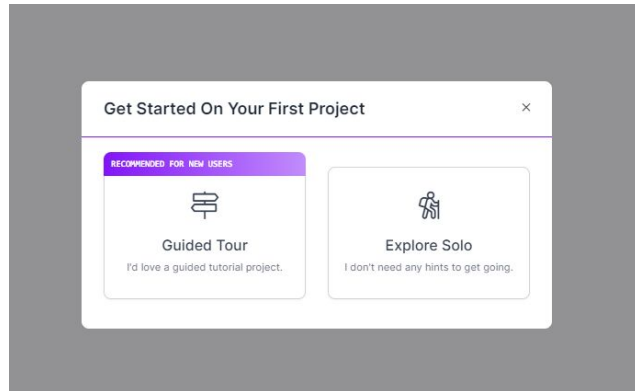
# Steps for Roboflow - Image labelling

- 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

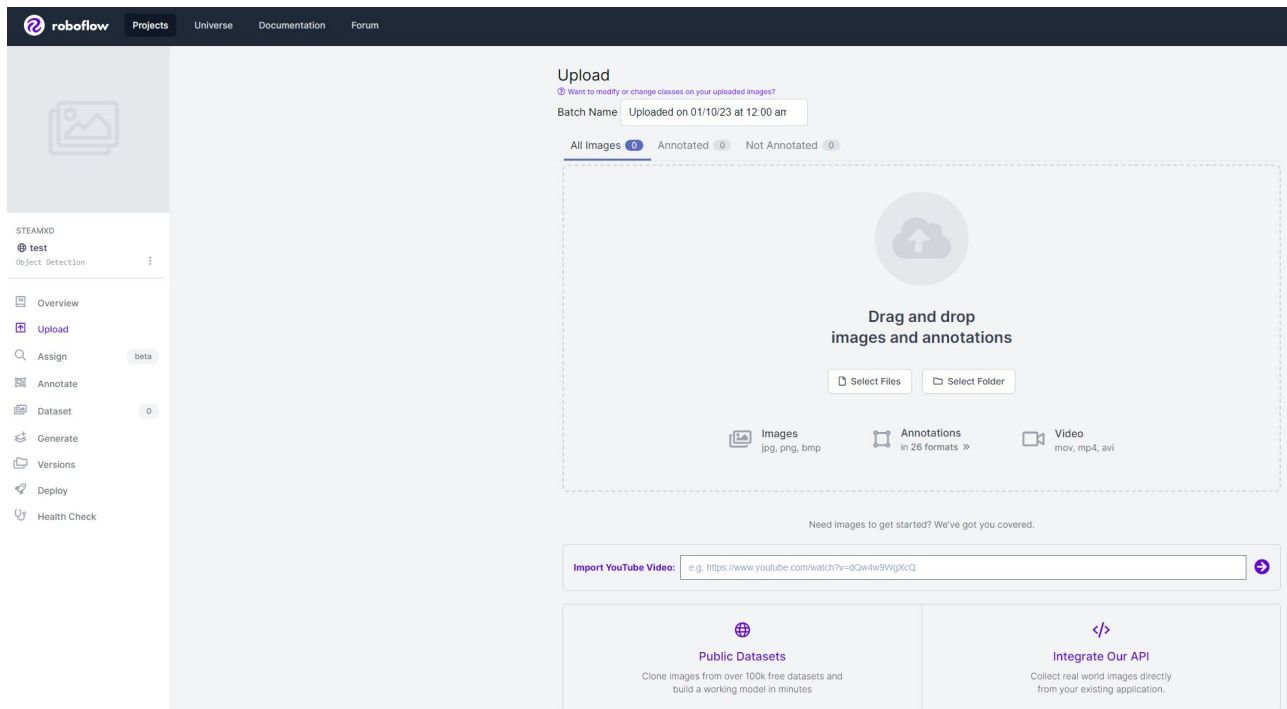


A screenshot of a "Create Project" dialog box with a close button (X) in the top right corner. The dialog contains the following fields and options:

- STEAMxD / [New Public Project](#)
- Project Type: [What is This?](#)  
Object Detection (Bounding Box) [dropdown arrow]
- What Are You Detecting? [?](#)  
dog
- Project Name  
sample
- License  
CC BY 4.0 [dropdown arrow]
- Buttons: Cancel and Create Public Project

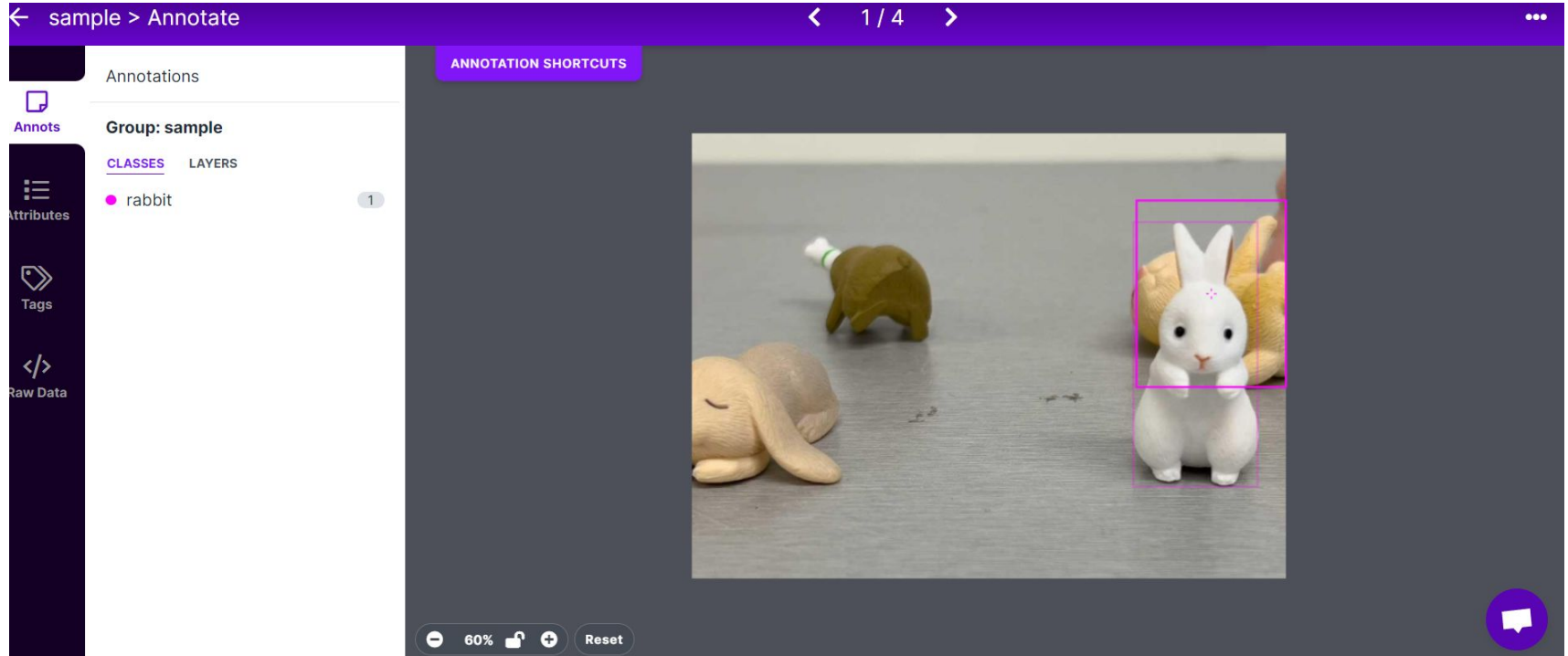
# Steps for Roboflow - Image labelling

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



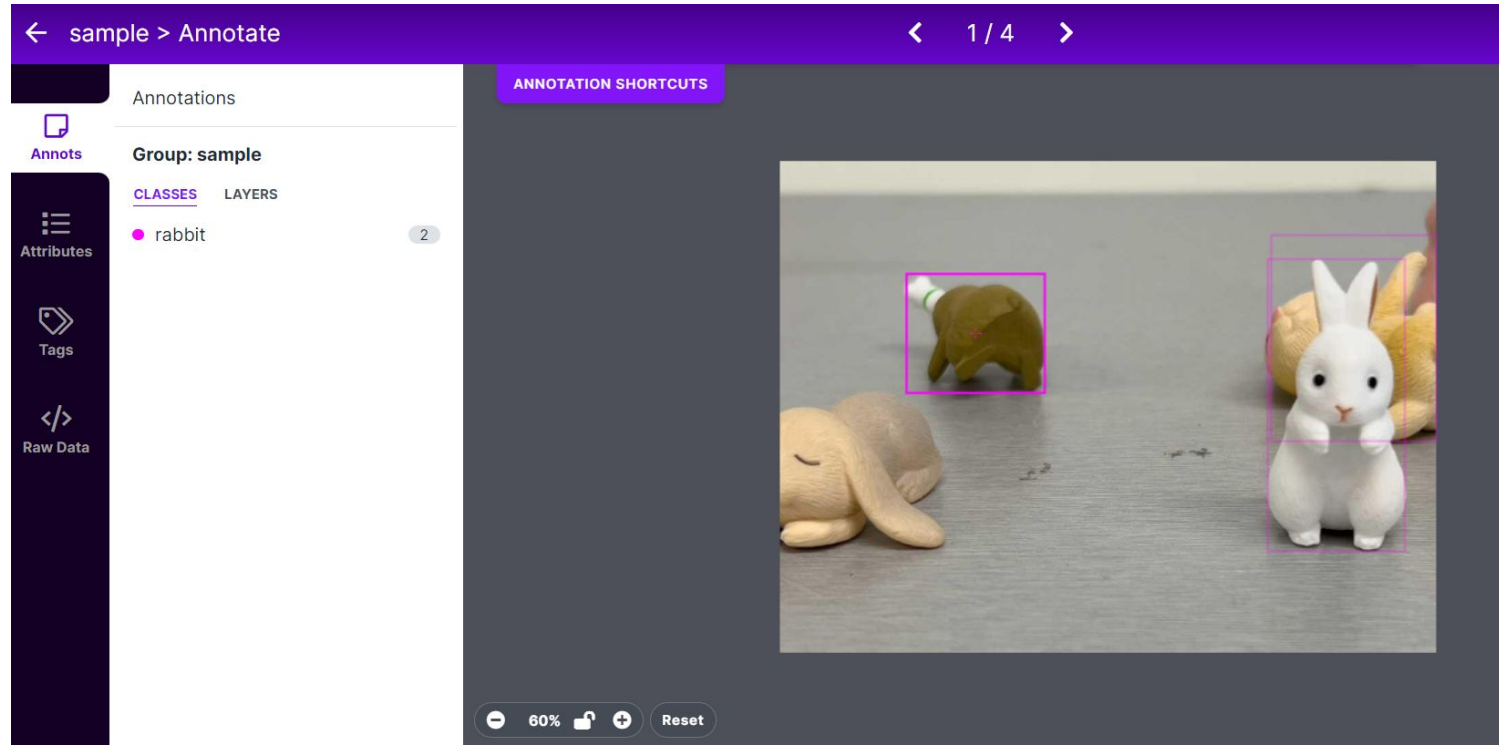
# Steps for Roboflow - Image labelling (Good Practises)

- Label occluded objects



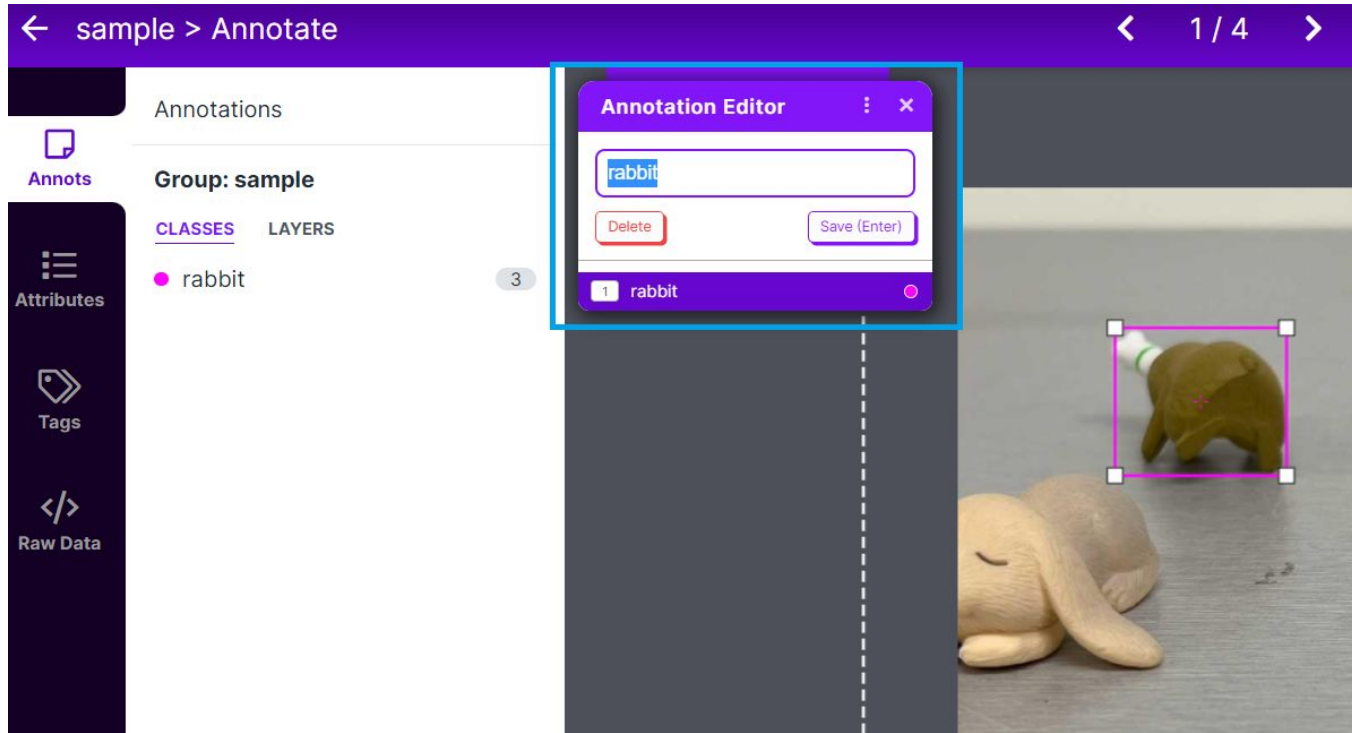
# Steps for Roboflow - Image labelling (Good Practises)

- Create tight bounding boxes



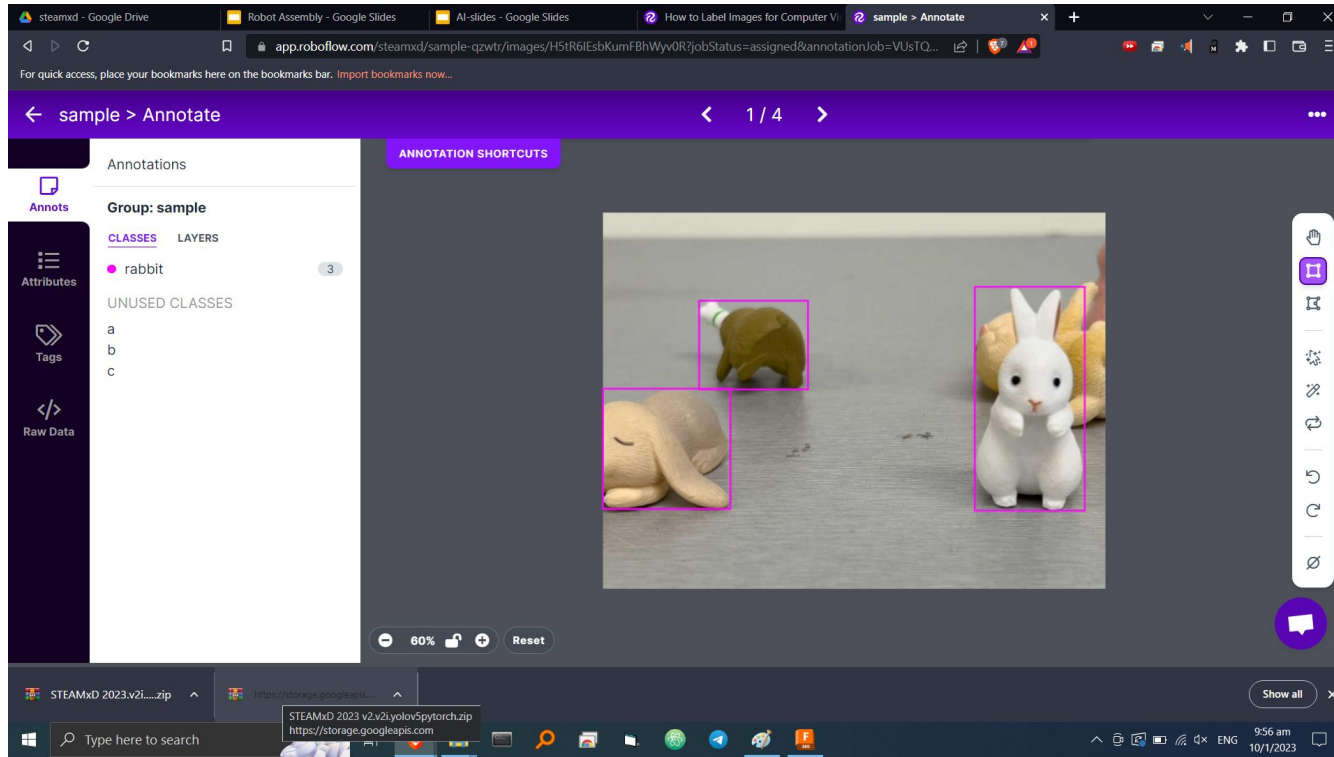
# Steps for Roboflow - Image labelling (Good Practises)

- Create specific label names



# Steps for Roboflow - Image labelling (Bad Practises)

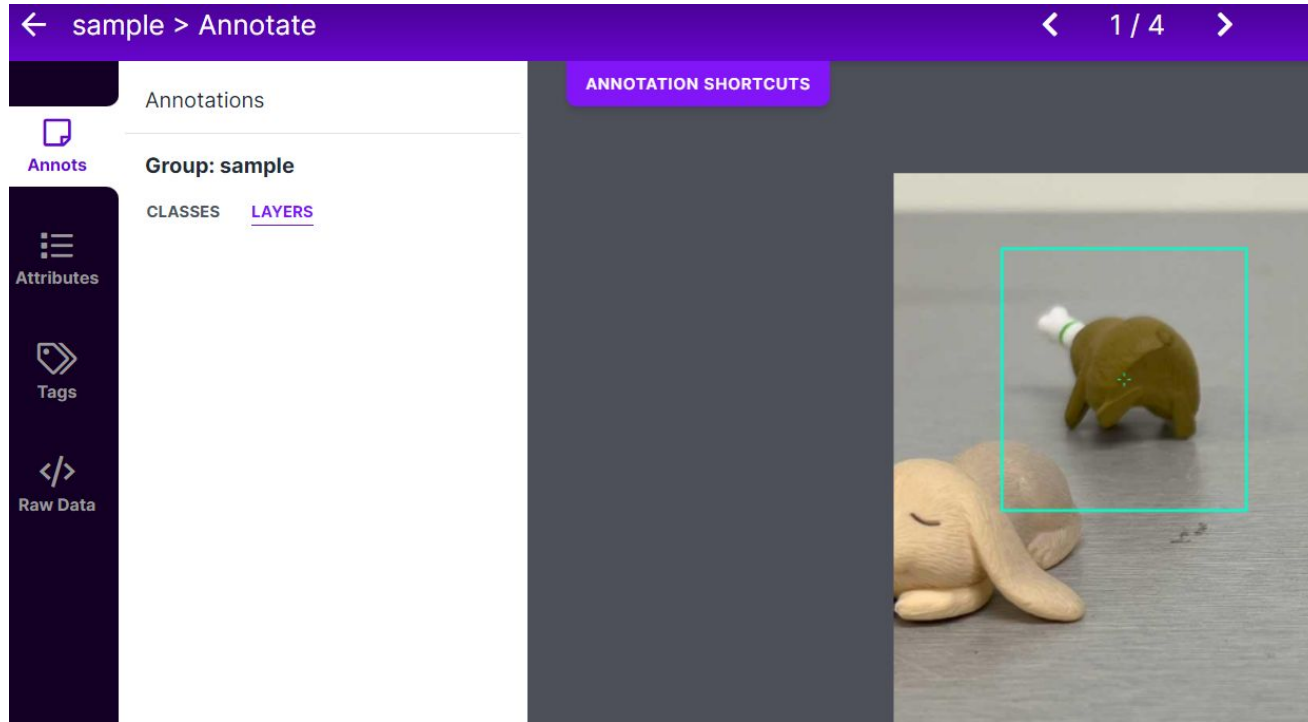
- Occluded objects not labelled





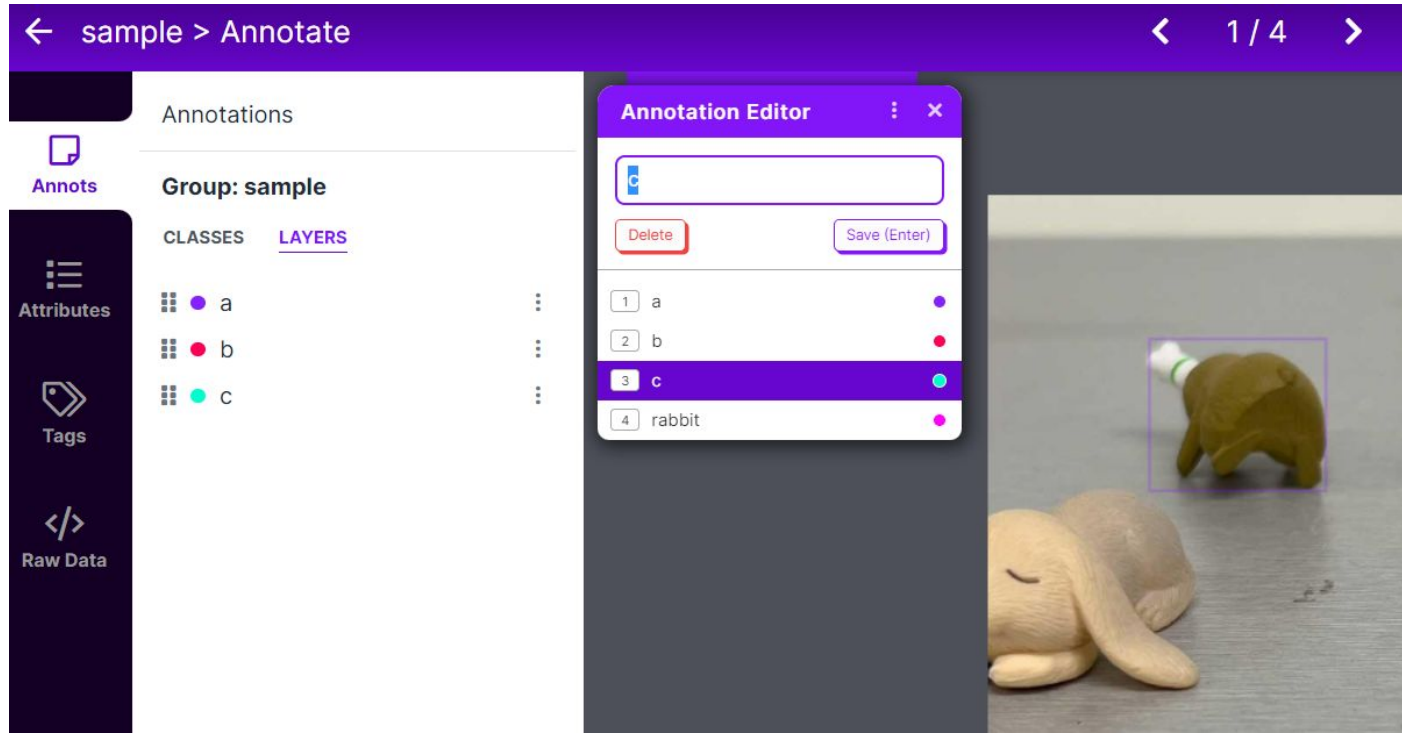
# Steps for Roboflow - Image labelling (Bad Practises)

- Non-tight bounding boxes



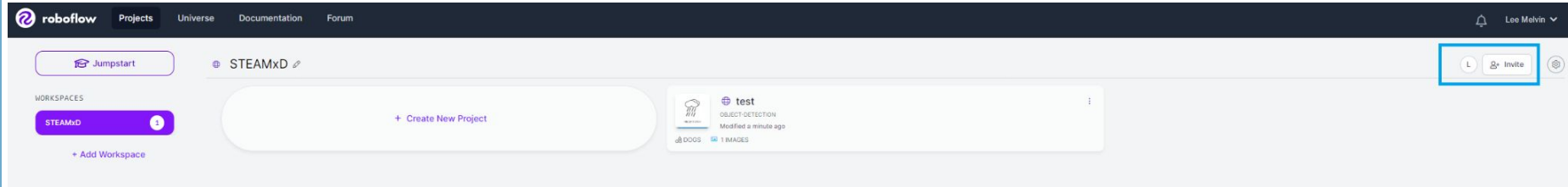
# Steps for Roboflow - Image labelling

- 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**

The screenshot shows the 'STEAMxD: Settings' page. On the left is a sidebar with navigation links: ACCOUNT (Login & Security, Contact Support), WORKSPACES (STEAMxD, Plan & Billing, Usage, Members, Roboflow API, Third Party keys), and a 'Back to Workspace' button. The main content area is titled 'Workspace Members' and includes the instruction 'Invite collaborators to give them access to projects in this workspace.' Below this, a blue box highlights the 'Invite By Email Address' section, which contains a text input field with the email 'xyz.abc.123@gmail.com' and a purple 'Invite' button. To the right of the input field is an 'Admin' dropdown menu. Below the input field is a table listing workspace members.

NAME	ROLE
Roboflow Support help@roboflow.com	Grant Access <input type="checkbox"/>
Lee Melvin	Creator

# 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...](https://www.github.com/leemjm92/STEAMxD/blob/main/custom-yolov5-object-det...)

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