Developer Student Clubs
University of Auckland

Machine Learning Workshop

The Colab Notebook

Insert notebook link here.

https://go.dscuoa.nz/mlcolab

https://colab.research.google.com/drive/1cBszWcDJP_9oe4K89GUhKjVMV5MxDXem?usp=sharing

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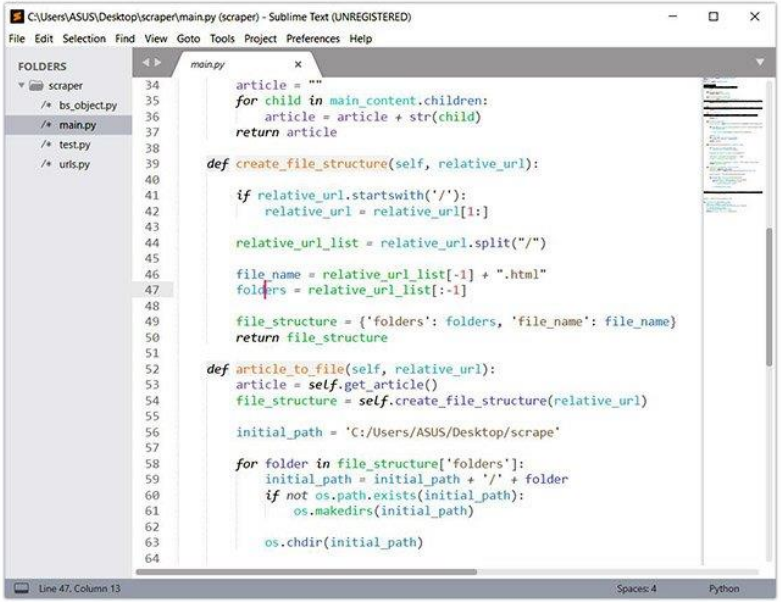
What is Google Colab?

An introduction to the running theme of thievery



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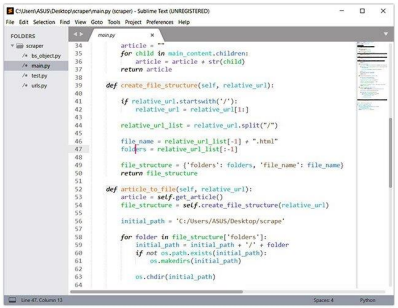

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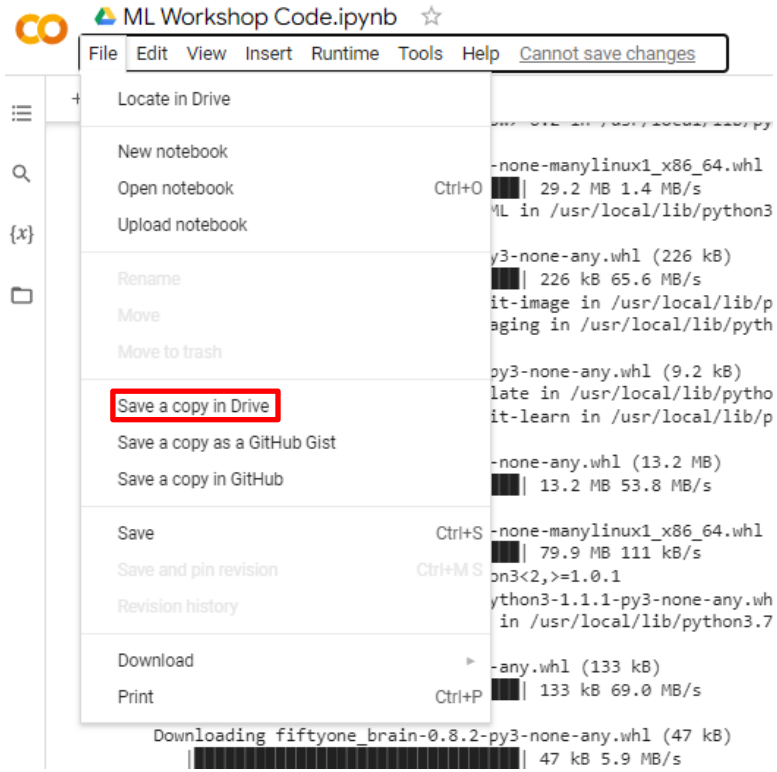
Disclaimer

The speaker may mention concepts and words such as “stealing” or “theft.”

Rest assured, what we are doing is 100% legal.

The Colab Notebook

Step One: Stealing the notebook



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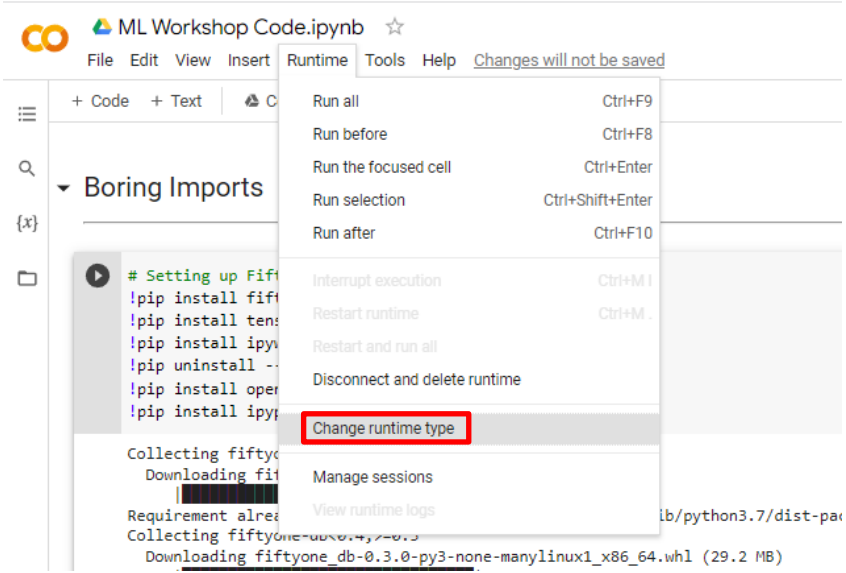
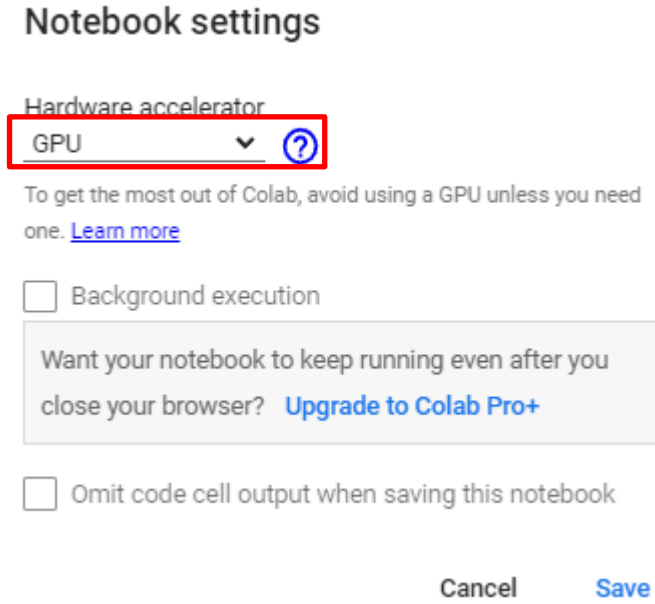
The Colab Notebook

Step Two: Stealing a GPU





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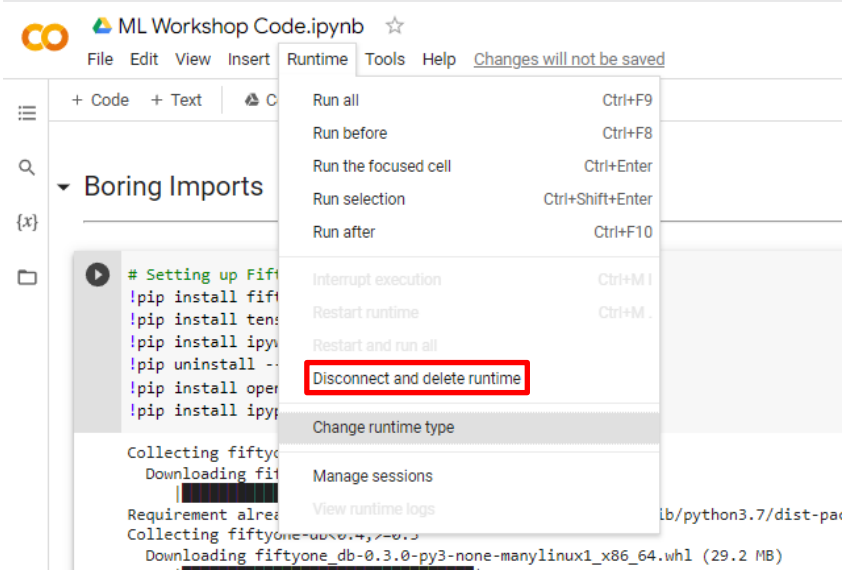
The Colab Notebook

Step Three: resetting the notebook



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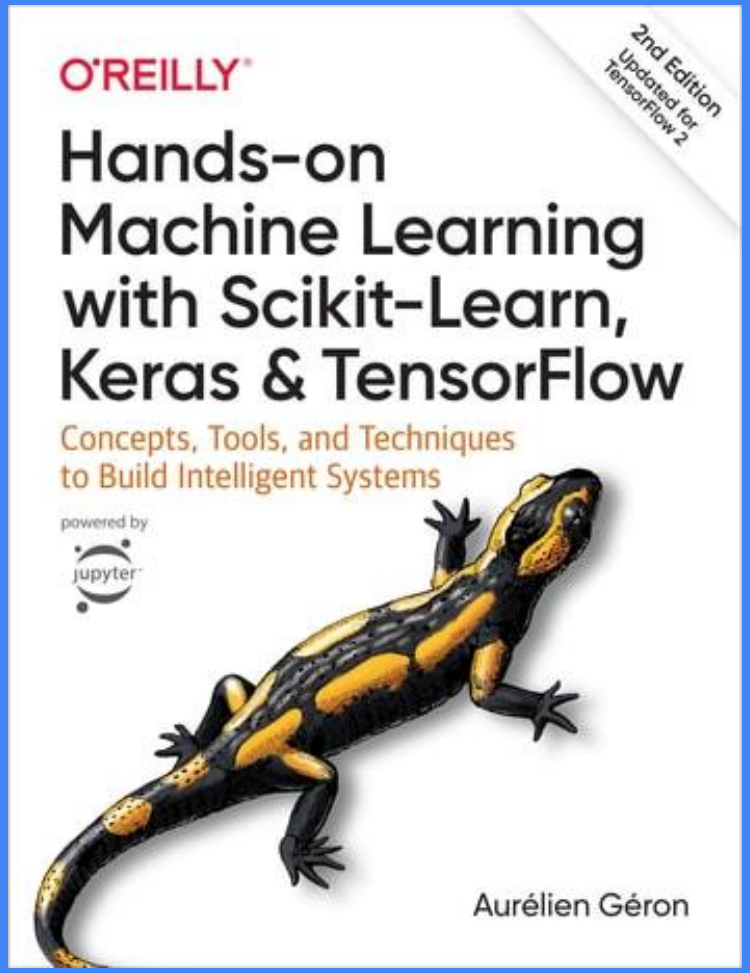
Generally Good Practical Resource



A Shameless Plug

Aurélien Géron

Speaker Event

25th May

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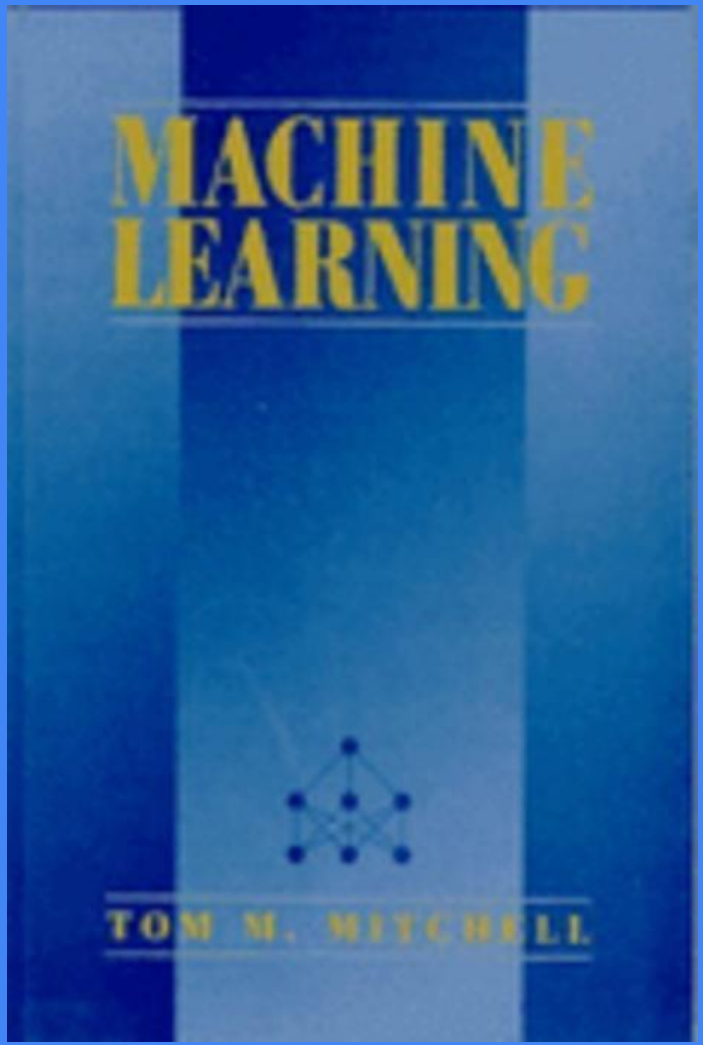
Generally Good Theoretical Resource



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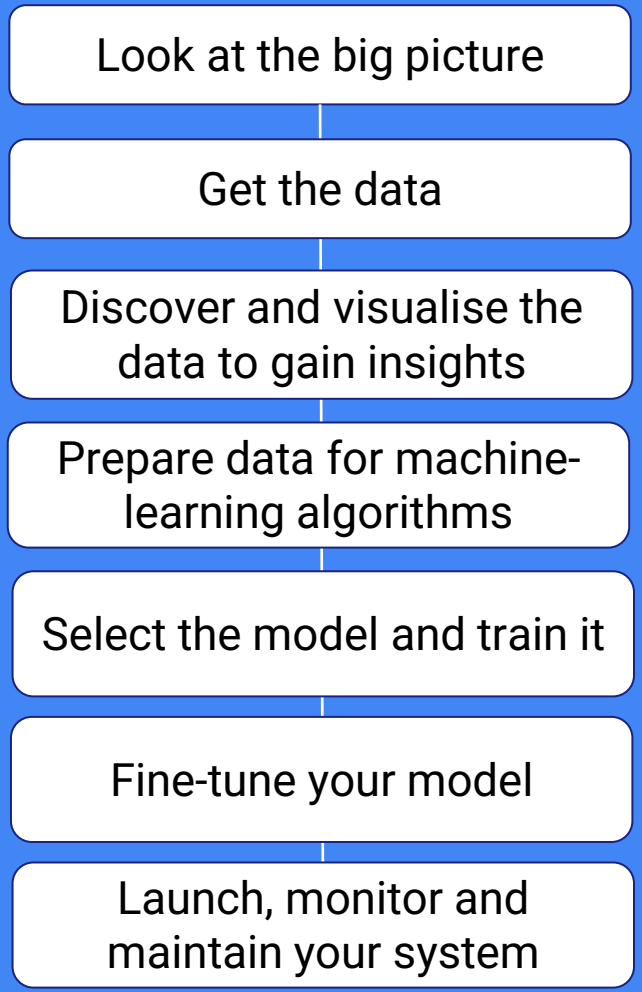
What this workshop will go through

Very practical focused

Impossible to teach the ins-and-outs of theory in a one hour workshop

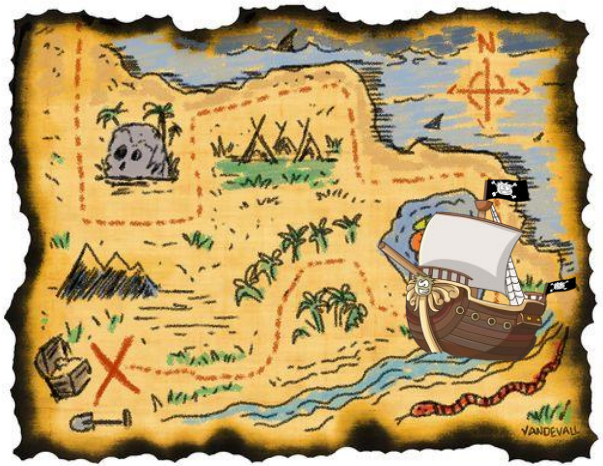
Further resources will be provided for your own discretion

Don’t worry about not understanding ALL the concepts or ALL the code!



What this workshop will cover:

The goal is to build something and have fun!



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- Look at the big picture
- Get the data
- Discover and visualise the data to gain insights
- Prepare data for machine-learning algorithms
- Select the model and train it
- Fine-tune your model
- Launch, monitor and maintain your system

What this workshop will cover:

The goal is to build something and have fun!

What we intend to explore

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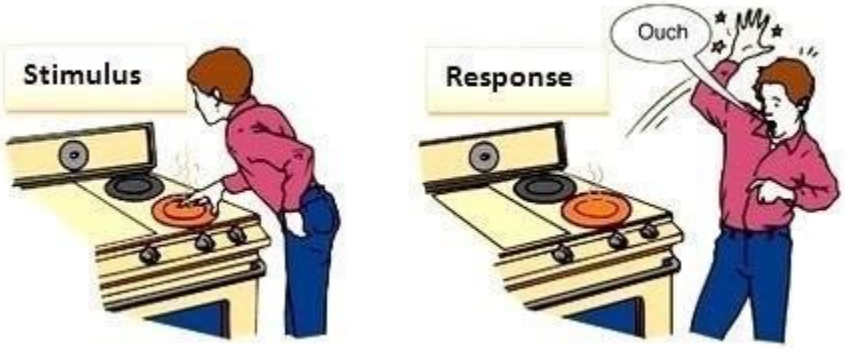
What is machine learning?



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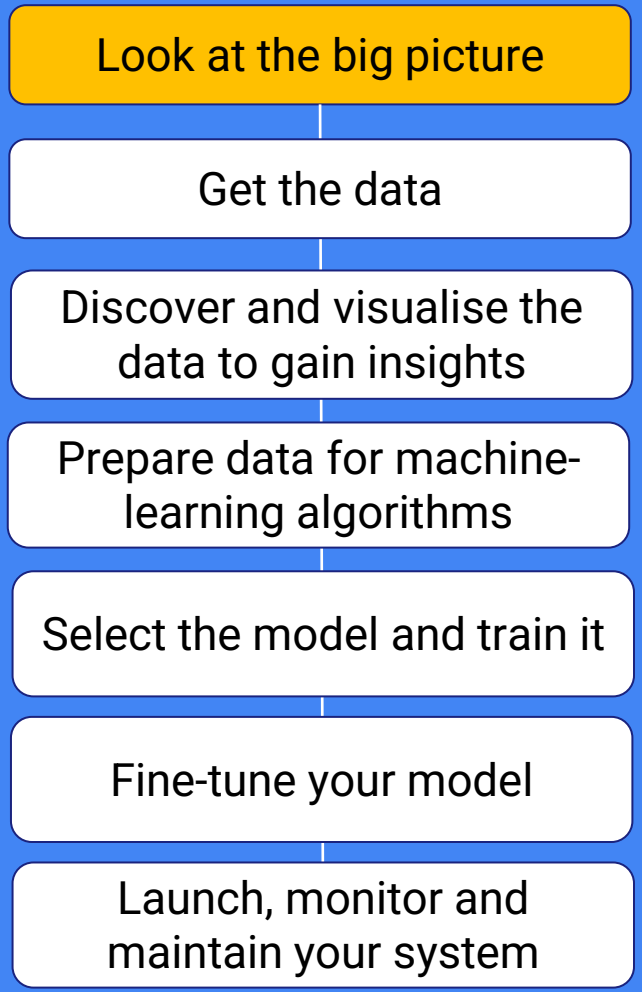
What is machine learning?

“A computer program is said to **learn** from experience *E* with respect to some class of tasks *T* and performance measure *P*, if its performance at tasks in *T*, as measured by *P*, improves with experience *E*.”

- Mitchell, T. M. (1997). Machine learning. New York: McGraw-Hill.

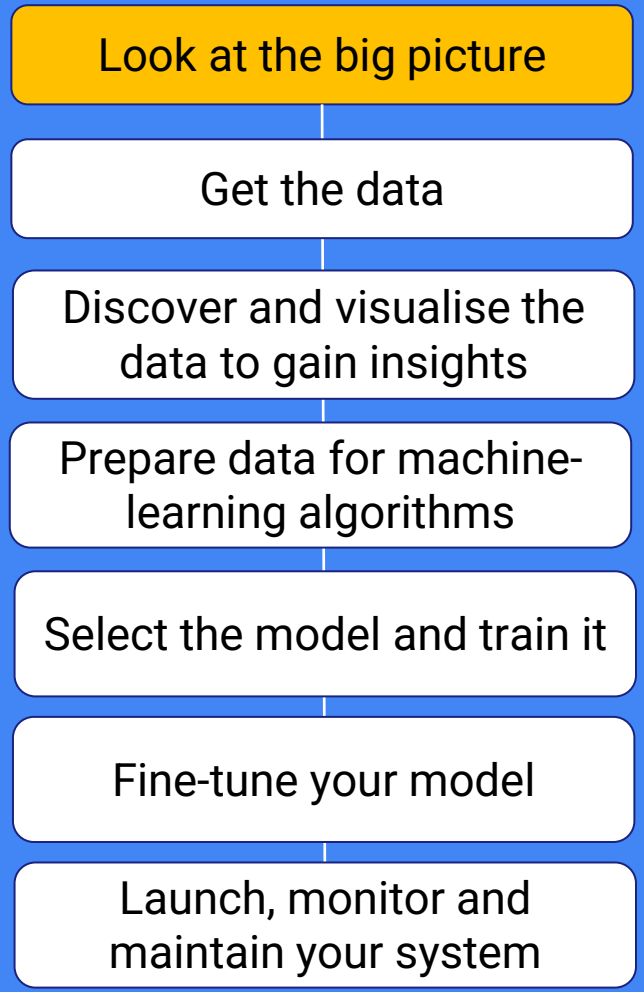


When to use machine learning?

Have a view of what you're trying to achieve.

Good places to start*:

- Can the rules be coded?
- Can the task be scaled?



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*https://docs.aws.amazon.com/machine-learning/latest/dg/machinelearning-dg.pdf#when-to-use-machine-learning

When to use machine learning? An example:

Life insurance:
- The rules can be coded
- The problem can scale

Solution: NOT a machine-learning algorithm!

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Look at the big picture

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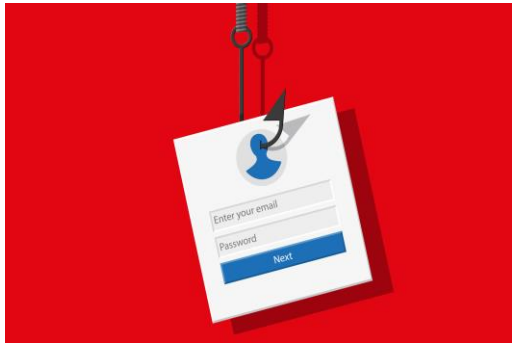
When to use machine learning? An example:



Phishing emails
- The rules cannot be coded
- The problem can scale

Solution: A machine-learning algorithm!

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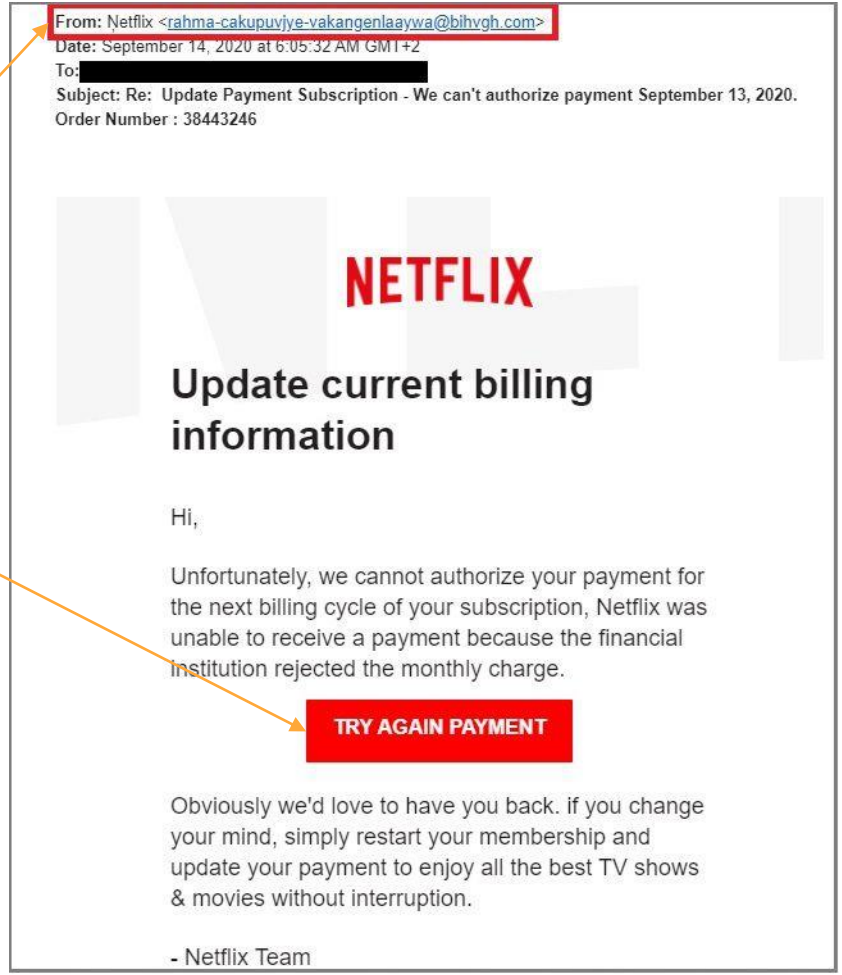
The rules cannot be coded:

- Suspicious sender
- Poor English
- And many more!



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Your task:

I want to find something from my room*

*Not my room

Quick and dirty checklist:

- The rules on searching for an item cannot be coded
- The problem can scale

Solution: A machine-learning algorithm!

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Look at the big picture

Get the data

Discover and visualise the data to gain insights

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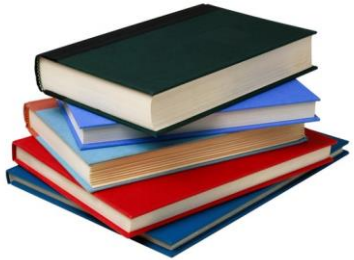
What I’m trying to find



Get the data:

Highly dependent on the big picture identified in the previous step!

Let's say I want to find a coin

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1. Look at the big picture
2. **Get the data**
3. Discover and visualise the data to gain insights
4. Prepare data for machine-learning algorithms
5. Select the model and train it
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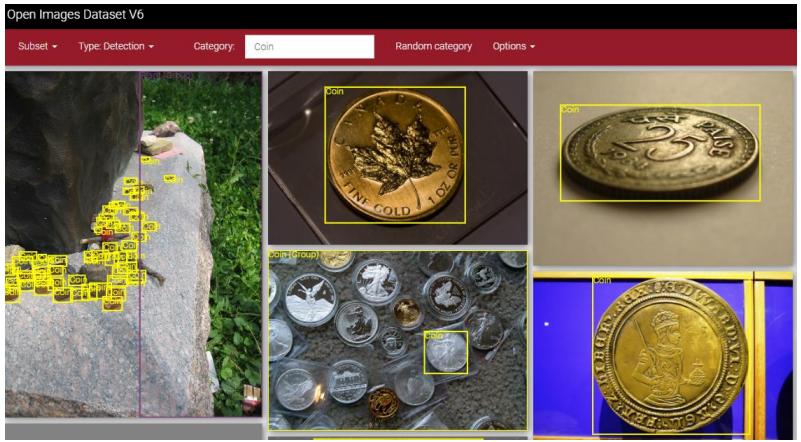
Get the data for the task:

We will be using Google Open Images as our dataset



Look at the big picture

Get the data

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FiftyOne

We will be using FiftyOne to handle importing the dataset

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Import FiftyOne:

```
[ ]  import fiftyone as fo
     import fiftyone.zoo as foz
     import random

     desired_class = "Coin"

     dataset = foz.load_zoo_dataset(
         "open-images-v6",
         label_types=["detections"],
         classes=[desired_class.capitalize()],
         max_samples=250,
         shuffle=True,
         seed = 5,
         num_workers = 20,
     )
```

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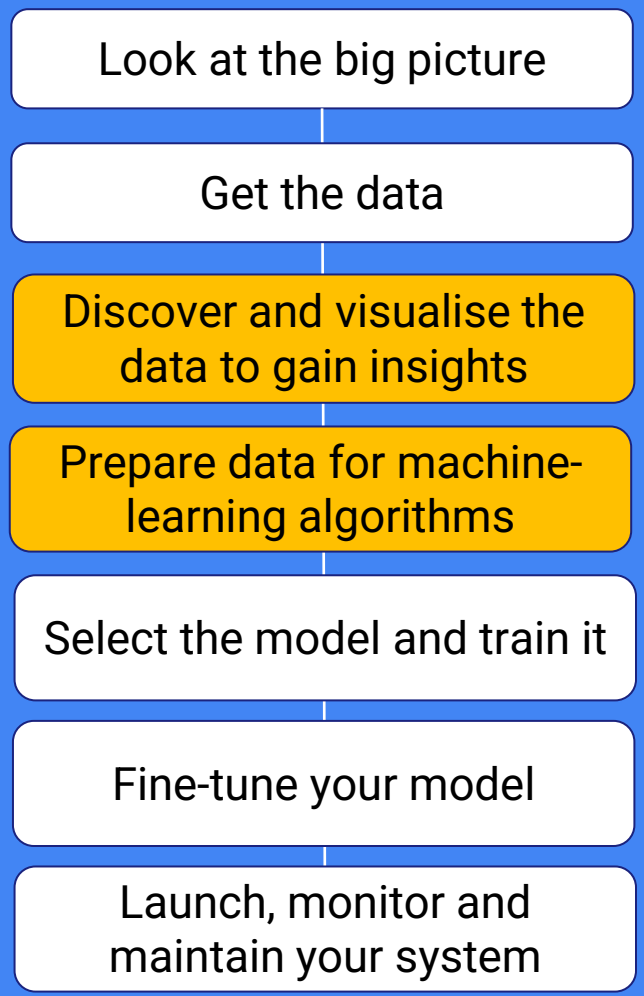


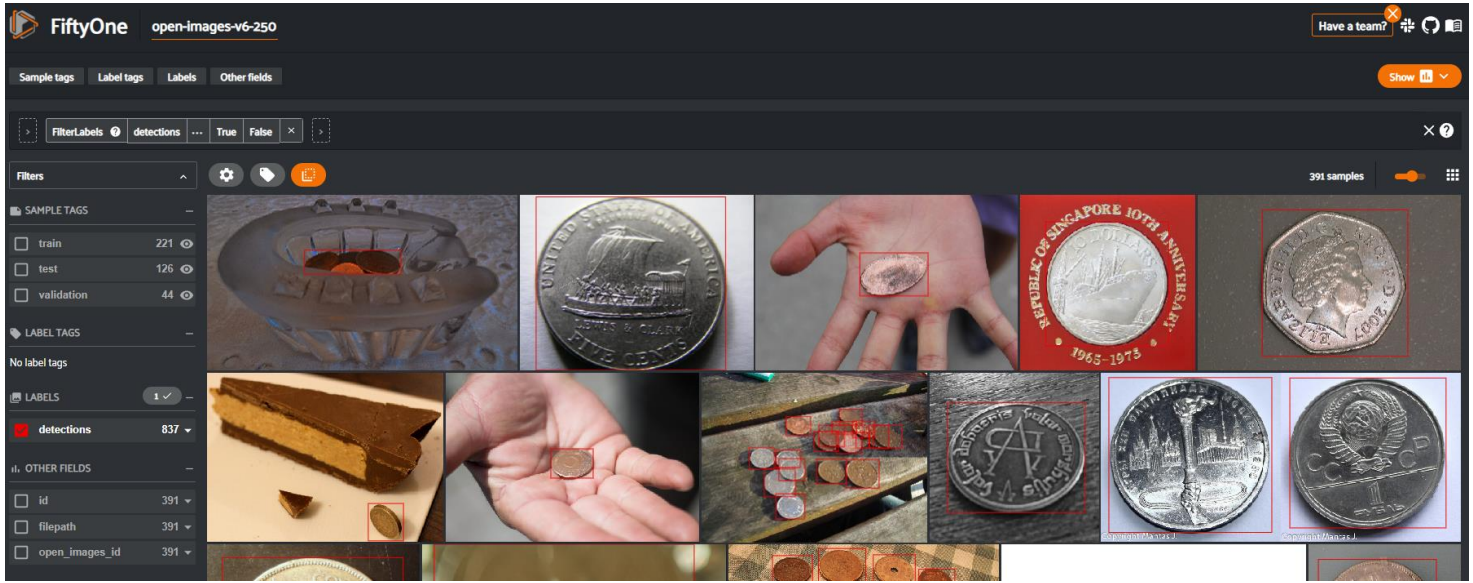
Viewing our desired_class

```
from fiftyone import ViewField as F

data_view = dataset.filter_labels("detections", (F("label") == desired_class) & (F("IsGroupOf") == False))

# Visualize the dataset in the FiftyOne App
session = fo.launch_app(view=data_view)
```

Viewing our desired_class



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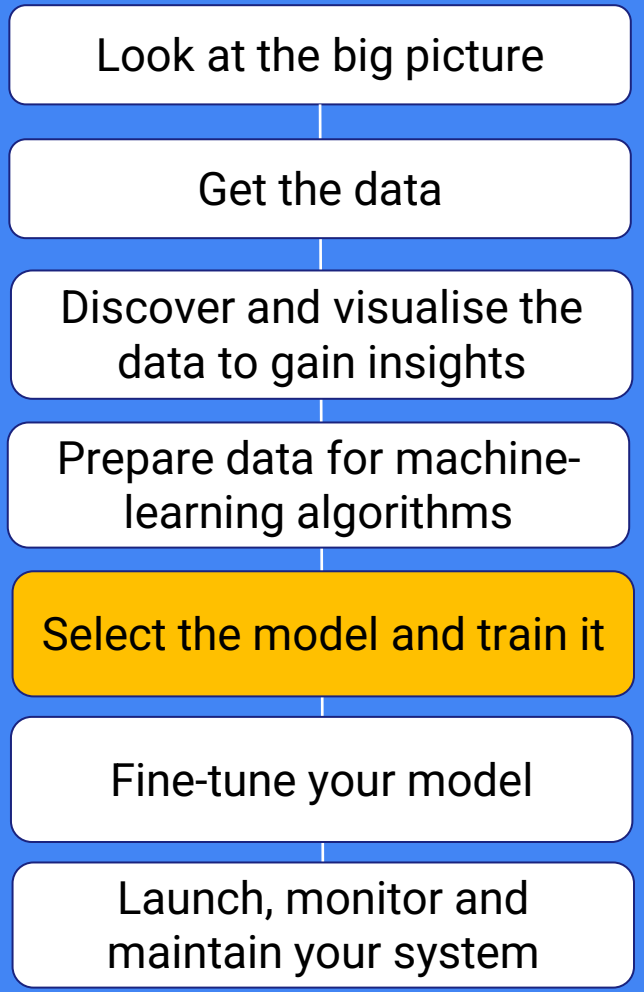
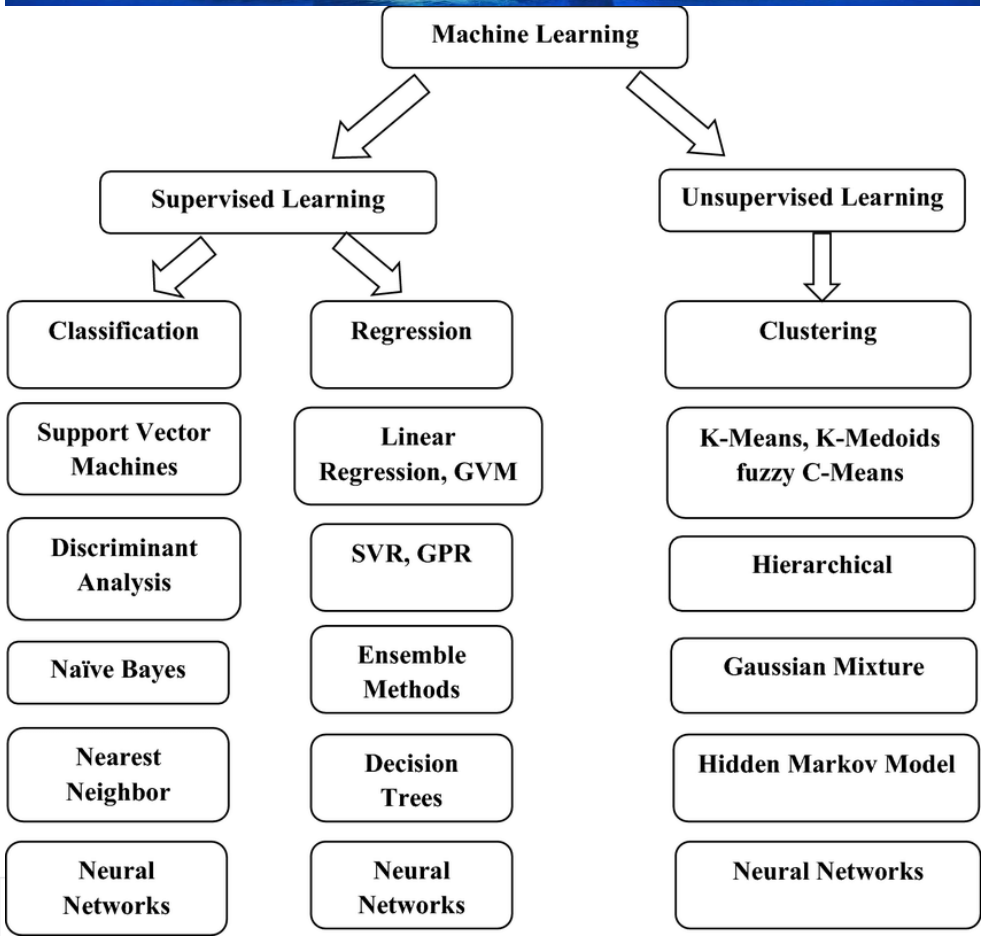
Determining our model:



Determining which algorithm to use:



Google Search

- Understand for what types of data the algorithm should be used for
- Understand when to use said algorithm
- Worry about the “what” rather than the “how”.

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Supervised Learning

An overly simple analogy

COIN

COIN

COIN

NO COIN

X A very large number

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Unsupervised Learning

An overly simple analogy

X A very large number

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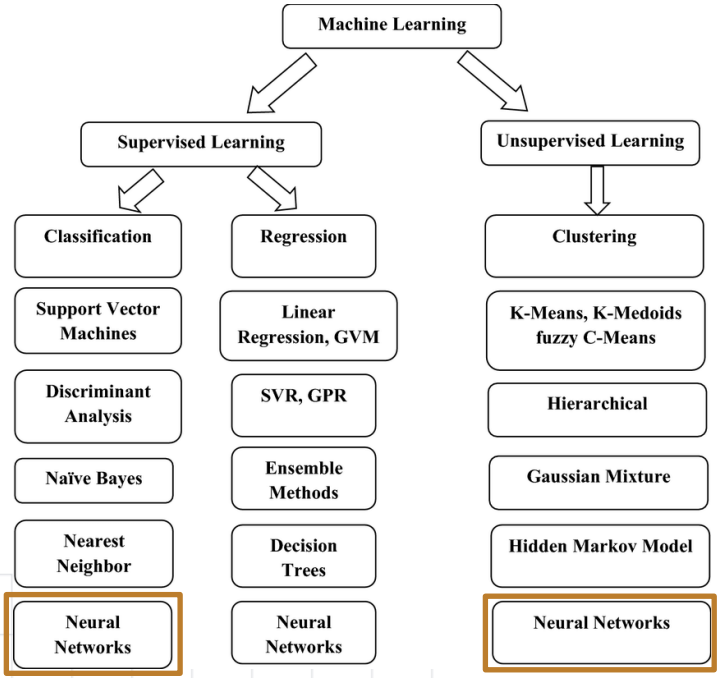
Disclaimer



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Determining which algorithm to use:

A lot of resources to gather data, train and monitor an algorithm

The solution is thievery! (Stealing a pre-trained algorithm)

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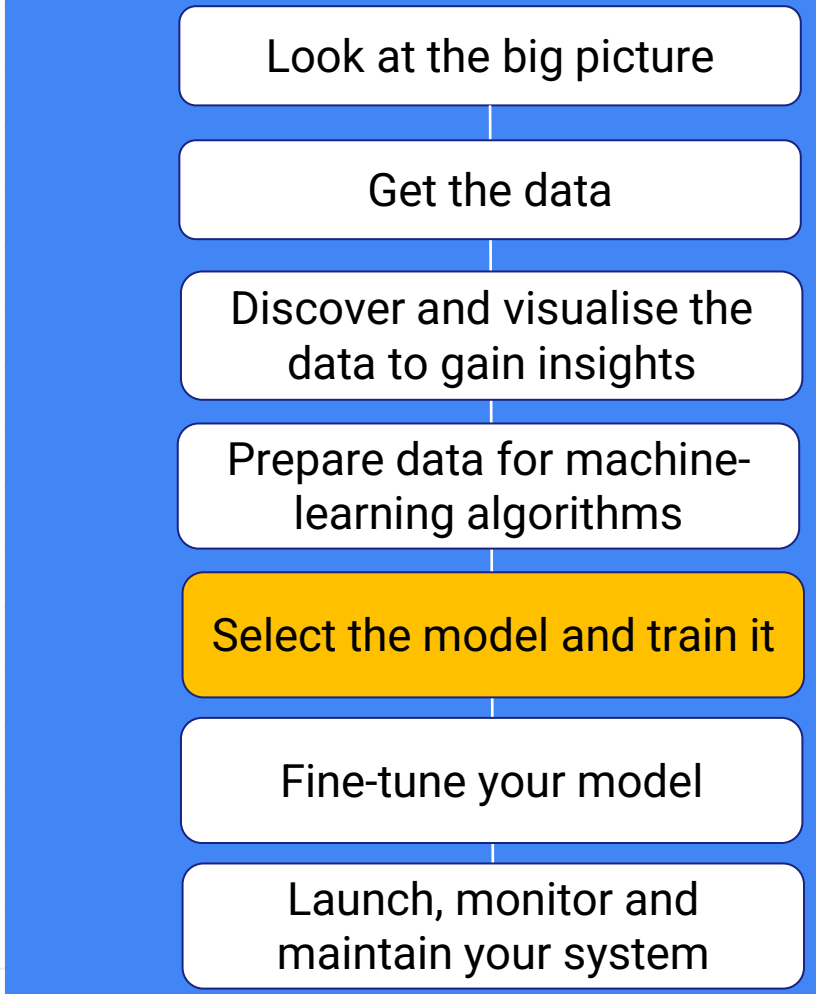
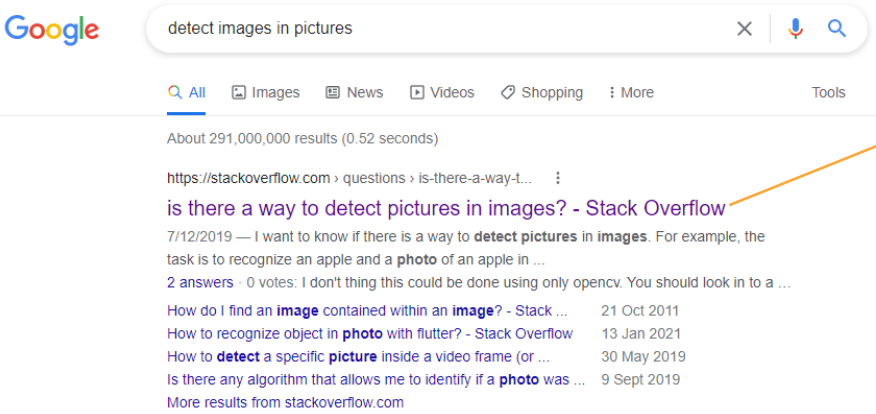
Disclaimer

Content from here on out will be focused on **NEURAL NETWORKS** and will be specific to **YOLOV5**



Determining which algorithm to use:



is there a way to detect pictures in images?

Asked 2 years, 4 months ago Modified 4 months ago Viewed 245 times

-2

I want to know if there is a way to detect pictures in images. For example, the task is to recognize an apple and a photo of an apple in given image. Is it possible with OpenCV or any other way?

opencv | image-processing | computer-vision | computer-science | object-recognition

Share Follow

asked Dec 7, 2019 at 4:04
Kundan
11

are you searching for some specific pictures or generally for any pictures? What kind of images does your application expect to see? – Micka Dec 8, 2019 at 22:30

Add a comment

2 Answers

Sorted by: Highest score (default)

0

I don't thing this could be done using only opencv. You should look in to a deep learning approach. There are many models trained for object detection. eg:- YOLO model

Share Follow

answered Dec 8, 2019 at 17:40
chamith mawela
36 ● 7

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Our training algorithm

- YoloV5 is a supervised, neural network algorithm
- The algorithm is used to detect things in images
- The algorithm requires images and labels for inputs

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Installing YoloV5

Installing YoloV5

```
[4]  # Clone YOLO-V5, change to its directory and install dependencies
     !git clone https://github.com/ultralytics/yolov5
     %cd yolov5
     !pip install -r requirements.txt
```

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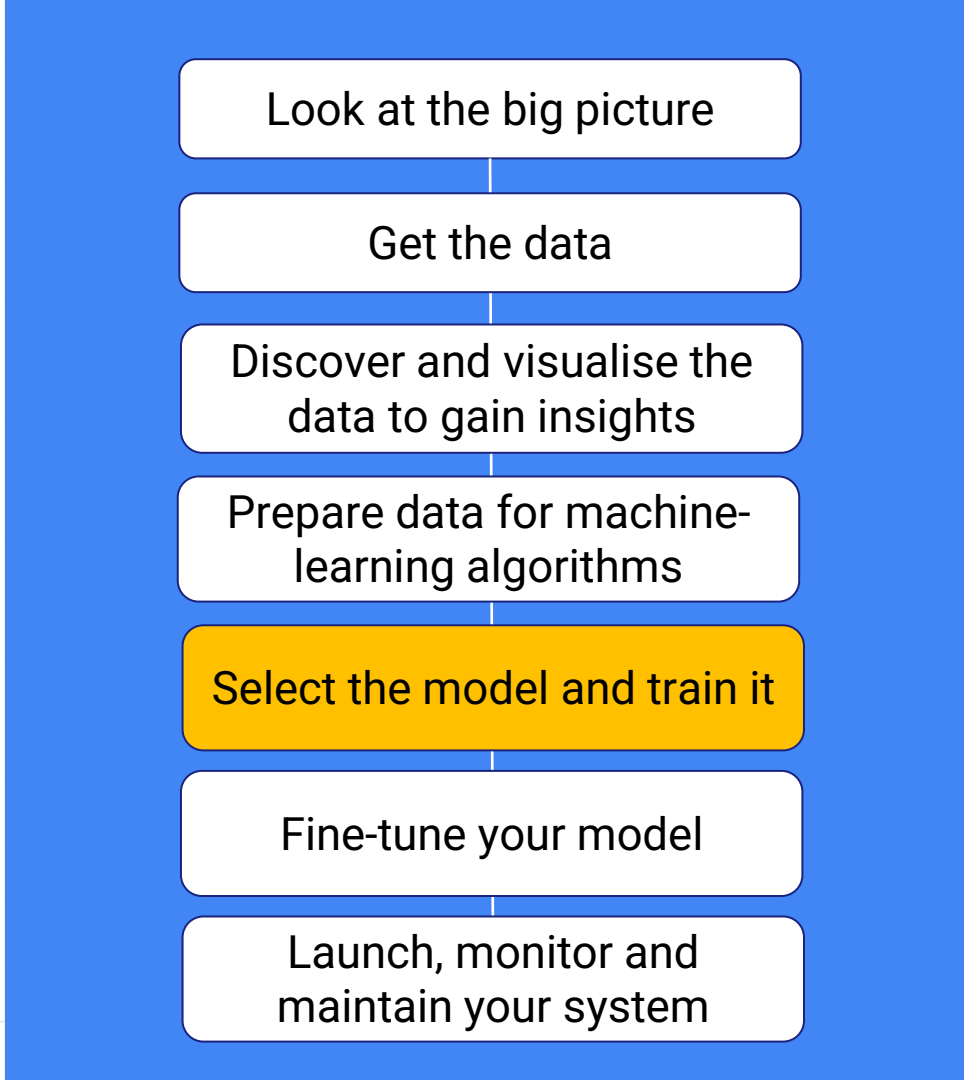

Configuring the yaml file

```
[5]  # Constructing the yaml file
     import yaml

     yaml_file = dict(
         path = "../dataset/FiftyOne",
         train = "/content/dataset/train/images",
         val = "/content/dataset/validate/images",
         test = "/content/dataset/test/images",
         nc = 1,
         names = [desired_class],
                     )

     with open(r'/content/yolov5/data/FiftyOne.yaml', 'w') as file:
         documents = yaml.dump(yaml_file, file)
         print(yaml_file)
```

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Creating the dataset directories

```
# Create dataset directories
!mkdir /content/dataset
!mkdir /content/dataset/train /content/dataset/train/images /content/dataset/train/labels
!mkdir /content/dataset/validate /content/dataset/validate/images /content/dataset/validate/labels
!mkdir /content/dataset/test /content/dataset/test/images /content/dataset/test/labels
```

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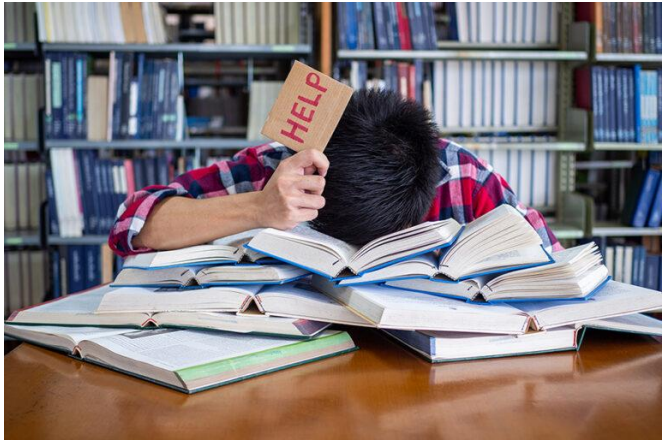
The train, validate and test set

Train set:



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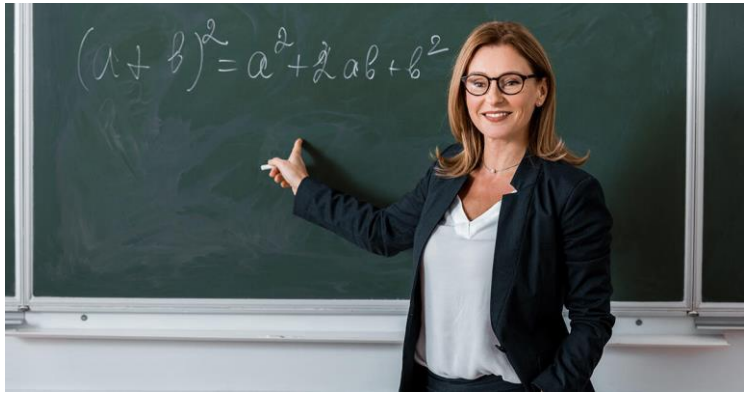
The train, validate and test set

Validate set:



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The train, validate and test set

Test set:

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Export the dataset into directories

```
[7] # Export dataset into select directories
    import os
    import shutil

    export_dir = "/content"
    dataset_type = fo.types.YOLOv5Dataset
    label_field = "detections"

    data_view.export(
        export_dir=export_dir,
        dataset_type=dataset_type,
        label_field=label_field,
    )

    for filename in os.listdir("/content/images/val"):
      random_value = random.randrange(10)
      if random_value == 0:
        filename = filename[:filename.index(".")]
        shutil.move("/content/images/val/{}.jpg".format(filename), "/content/dataset/test/images/{}.jpg".format(filename))
        shutil.move("/content/labels/val/{}.txt".format(filename), "/content/dataset/test/labels/{}.txt".format(filename))
      elif random_value == 1:
        filename = filename[:filename.index(".")]
        shutil.move("/content/images/val/{}.jpg".format(filename), "/content/dataset/validate/images/{}.jpg".format(filename))
        shutil.move("/content/labels/val/{}.txt".format(filename), "/content/dataset/validate/labels/{}.txt".format(filename))
      else:
        filename = filename[:filename.index(".")]
        shutil.move("/content/images/val/{}.jpg".format(filename), "/content/dataset/train/images/{}.jpg".format(filename))
        shutil.move("/content/labels/val/{}.txt".format(filename), "/content/dataset/train/labels/{}.txt".format(filename))
```

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Training the model

```
[8]  # Train the model
     !python train.py --img 640 --batch 32 --epochs 10 --data /content/yolov5/data/FiftyOne.yaml --weights yolov5n.pt --single-cls
```

A batch

Our dataset

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Training the model

```
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```

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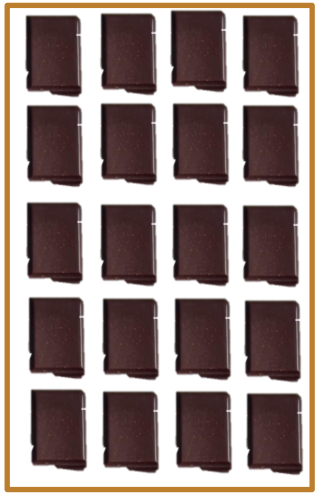
```



X 10

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Utilise YoloV5’s algorithm with pre-trained weights

```
                 from  n    params  module                                  arguments
  0                -1  1      1760  models.common.Conv                      [3, 16, 6, 2, 2]
  1                -1  1      4672  models.common.Conv                      [16, 32, 3, 2]
  2                -1  1      4800  models.common.C3                        [32, 32, 1]
  3                -1  1     18560  models.common.Conv                      [32, 64, 3, 2]
  4                -1  2     29184  models.common.C3                        [64, 64, 2]
  5                -1  1     73984  models.common.Conv                      [64, 128, 3, 2]
  6                -1  3    156928  models.common.C3                        [128, 128, 3]
  7                -1  1    295424  models.common.Conv                      [128, 256, 3, 2]
  8                -1  1    296448  models.common.C3                        [256, 256, 1]
  9                -1  1    164608  models.common.SPPF                      [256, 256, 5]
 10                -1  1     33024  models.common.Conv                      [256, 128, 1, 1]
 11                -1  1         0  torch.nn.modules.upsampling.Upsample    [None, 2, 'nearest']
 12          [-1, 6]  1         0  models.common.Concat                    [1]
 13                -1  1     90880  models.common.C3                        [256, 128, 1, False]
 14                -1  1      8320  models.common.Conv                      [128, 64, 1, 1]
 15                -1  1         0  torch.nn.modules.upsampling.Upsample    [None, 2, 'nearest']
 16          [-1, 4]  1         0  models.common.Concat                    [1]
 17                -1  1     22912  models.common.C3                        [128, 64, 1, False]
 18                -1  1     36992  models.common.Conv                      [64, 64, 3, 2]
 19         [-1, 14]  1         0  models.common.Concat                    [1]
 20                -1  1     74496  models.common.C3                        [128, 128, 1, False]
 21                -1  1    147712  models.common.Conv                      [128, 128, 3, 2]
 22         [-1, 10]  1         0  models.common.Concat                    [1]
 23                -1  1    296448  models.common.C3                        [256, 256, 1, False]
 24      [17, 20, 23]  1      8118  models.yolo.Detect                      [1, [[10, 13, 16, 30, 33, 23], [30, 61, 62, 45, 59, 119], [116, 90, 156, 198, 373, 326]], [64, 128, 256]]
Model summary: 270 layers, 1765270 parameters, 1765270 gradients, 4.2 GFLOPs
```

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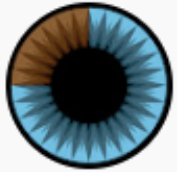
Additional Resources

tds



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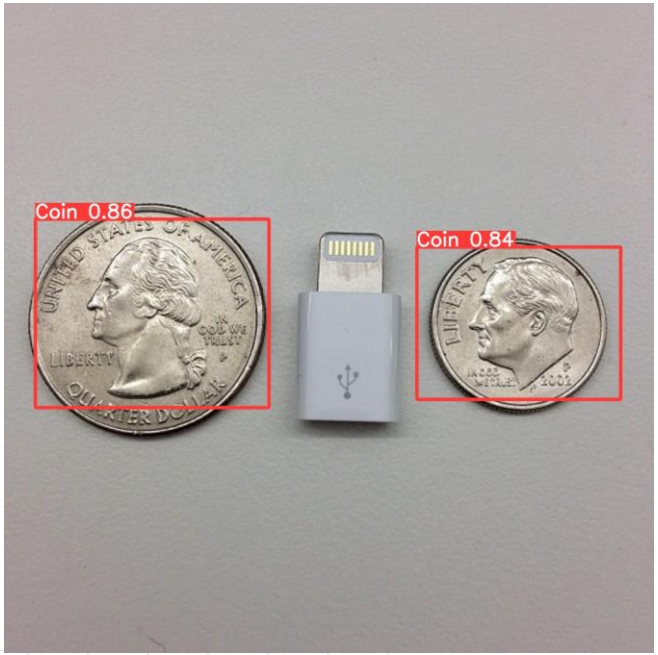
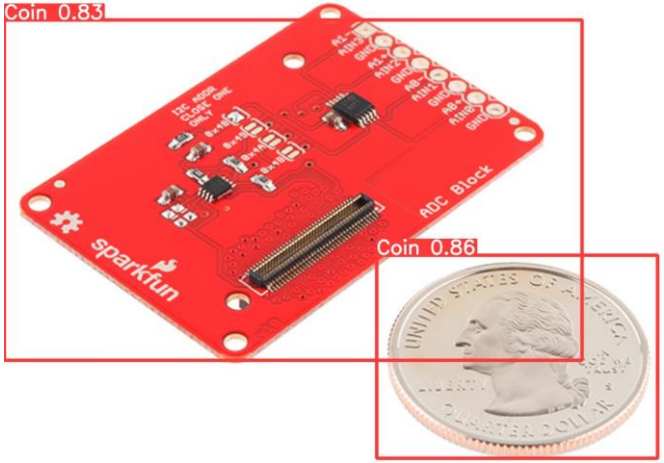
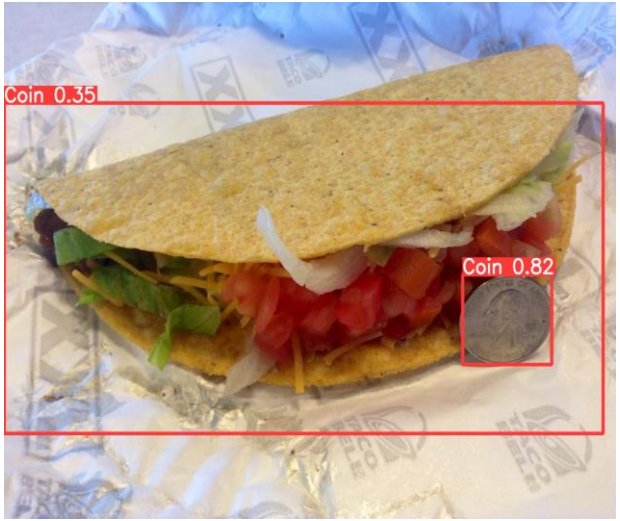
Detecting coins!



Whoops!





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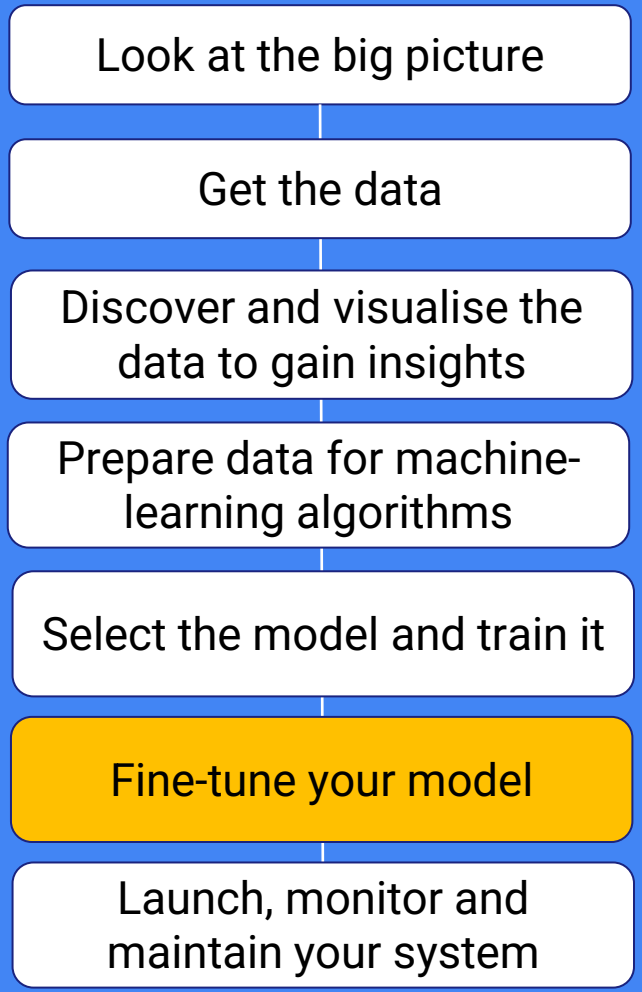
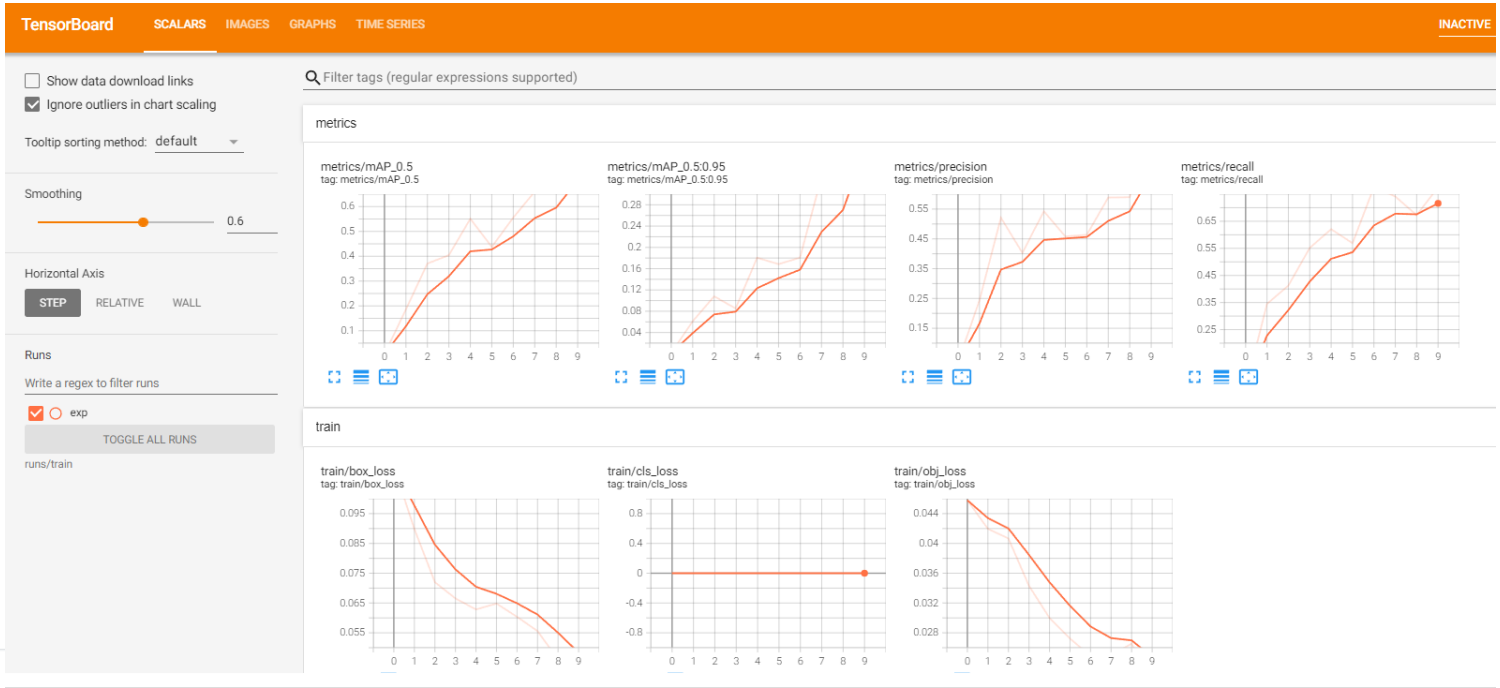
Fine-tune your model

```
[ ]  # View tensorboard
     %load_ext tensorboard
     %tensorboard --logdir runs/train
```

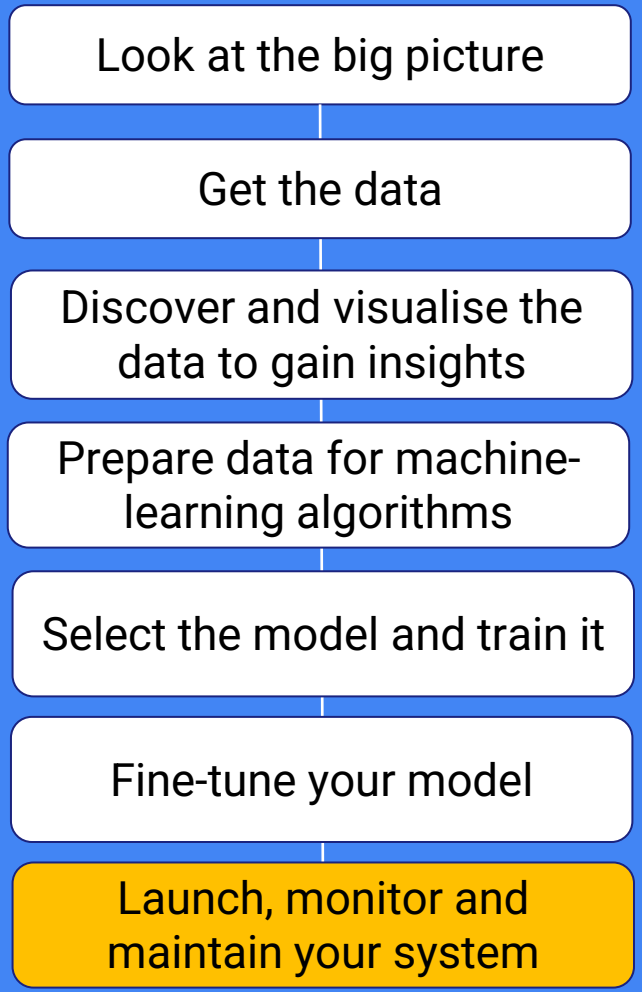


Fine-tune your model



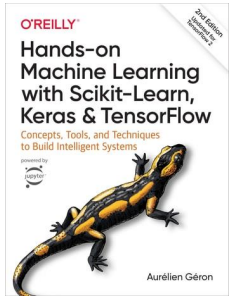
Launch, monitor and maintain your system

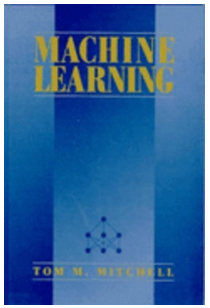
Shifting more towards software design



Where next?

THEORY





tds

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PRACTICE

+ kaggle +

EXPLORATION

Google StackExchange

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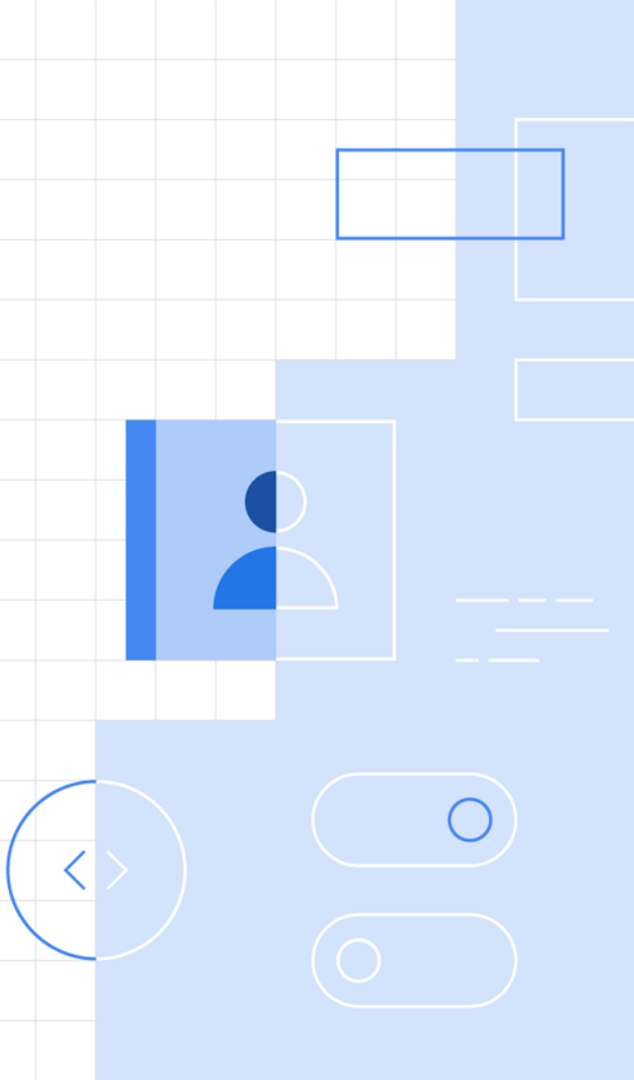
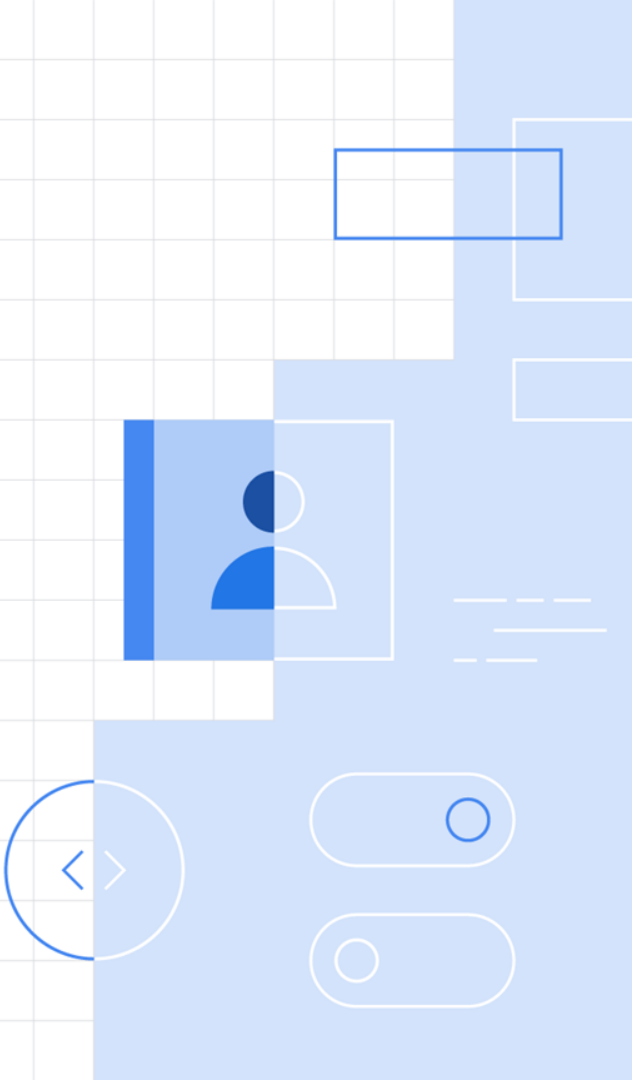
Breaktime!



Thank you!



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