# Kaggle: Nuts and Bolts

By Noah Gundotra

Brought to you by SUSA x Cal Kaggle Team!

# Kaggle: What is Kaggle?

- Host data science competitions
  - Datasets
  - Leaderboards
  - Community (like Piazza)
- Recruitment
- Research

# Kaggle

[Demo]

# Kaggle: What is Kaggle?

- Hosts Jupyter Notebooks for data exploration
- Supports Python, R, Julia
- Somewhat complicated to use properly @ first

# Kaggle: Why Kaggle?

- Recognition, $, Learning
- Facebook, SAP, BNP Paribas, J.P. Morgan
- Even Shell(?)

BNP PARIBAS
FACTOR

SAP

kaggle

Google

acquisition

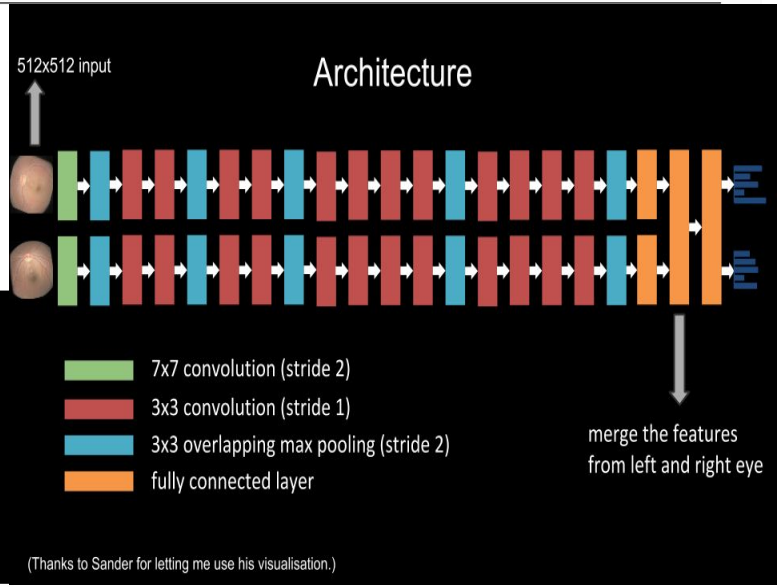
# Google is acquiring data science community Kaggle

Posted Mar 7, 2017 by Frederic Lardinois (@fredericl), Matthew Lynley (@mattlynley), John Mannes (@JohnMannes)



# From Kaggle to Google DeepMind: An interview with Jeffrey De Fauw

Megan Risdal | 07.11.2016



# anokas

Mikel Bober-Irizar

Guildford, England, United Kingdom

Joined 2 years ago · last seen 10 days ago

http://mxbi.net

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Competitions Master

Home | Competitions (43) | Kernels (138) | Discussion (426) | ••• | Contact User | Follow User

| Competitions Master | | Kernels Master | | Discussion Master | |
|---|---|---|---|---|---|
| Current Rank | Highest Rank | Current Rank | Highest Rank | Current Rank | Highest Rank |
| 101 | 74 | 4 | 1 | 16 | 5 |
| of 66,214 | | of 109,136 | | of 40,791 | |

Computer Science > Computer Vision and Pattern Recognition

# Cultivating DNN Diversity for Large Scale Video Labelling

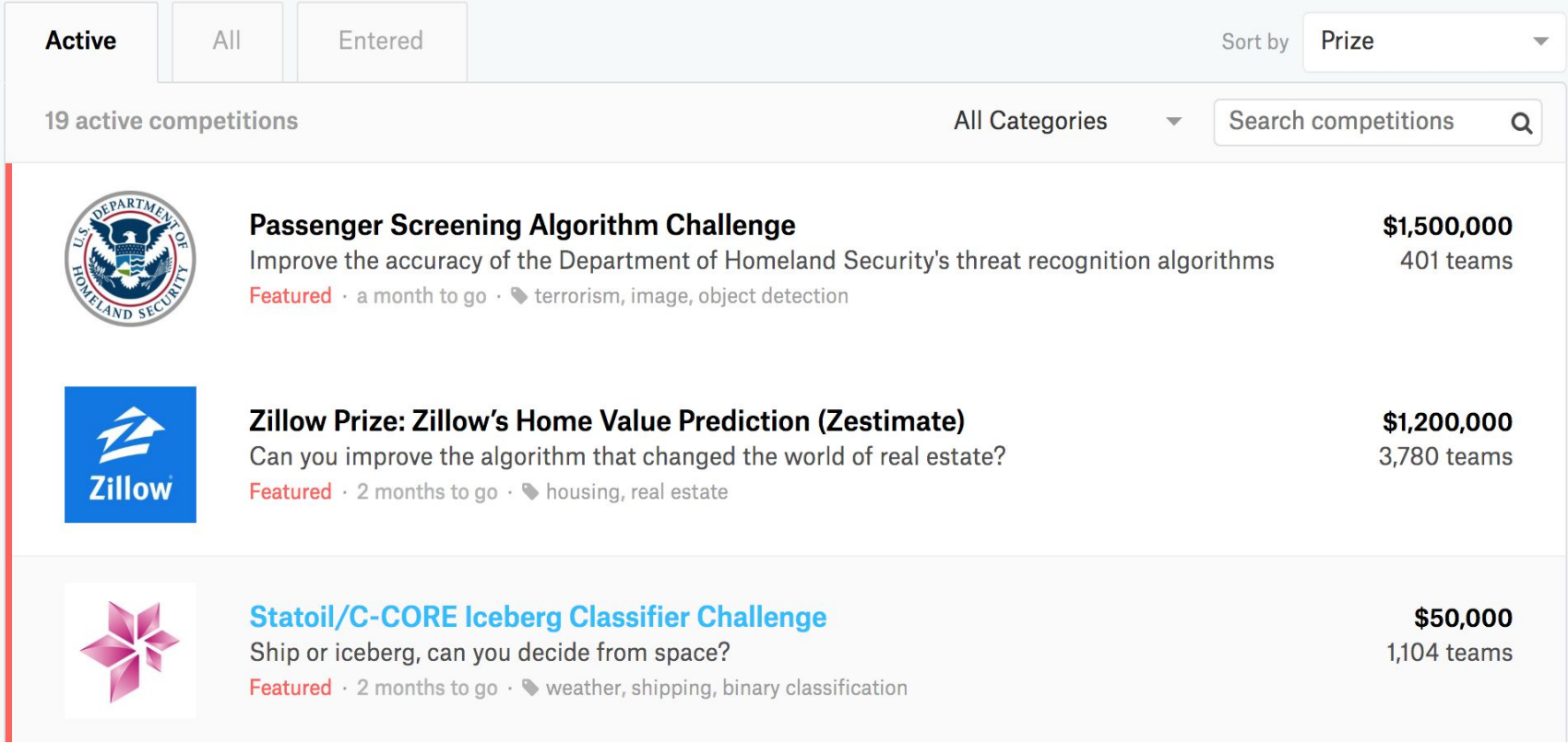
Mikel Bober-Irizar, Sameed Husain, Eng-Jon Ong, Miroslaw Bober

*(Submitted on 13 Jul 2017)*

We investigate factors controlling DNN diversity in the context of the Google Cloud and YouTube-8M Video Understanding Challenge. While it is well-known that ensemble methods improve prediction performance, and that combining accurate but diverse predictors helps, there is little knowledge on how to best promote & measure DNN diversity. We show that diversity can be cultivated by some unexpected means, such as model over-fitting or dropout variations. We also present details of our solution to the video understanding problem, which ranked #7 in the Kaggle competition (competing as the Yeti team).

# $1.25 Million

Will be awarded to Kaggle Competitors as the TSA Screening Competition ends in 4 weeks




# Competitions

**ImageNet Object Detection from Video Challenge**
Identify and label ordinary objects in videos
Research · 12 years to go · image, object detection

**Spooky Author Identification** — **$25,000**
Share code and discuss insights to identify horror authors from their writings — 645 teams
Playground · a month to go · literature, linguistics, multiclass classification

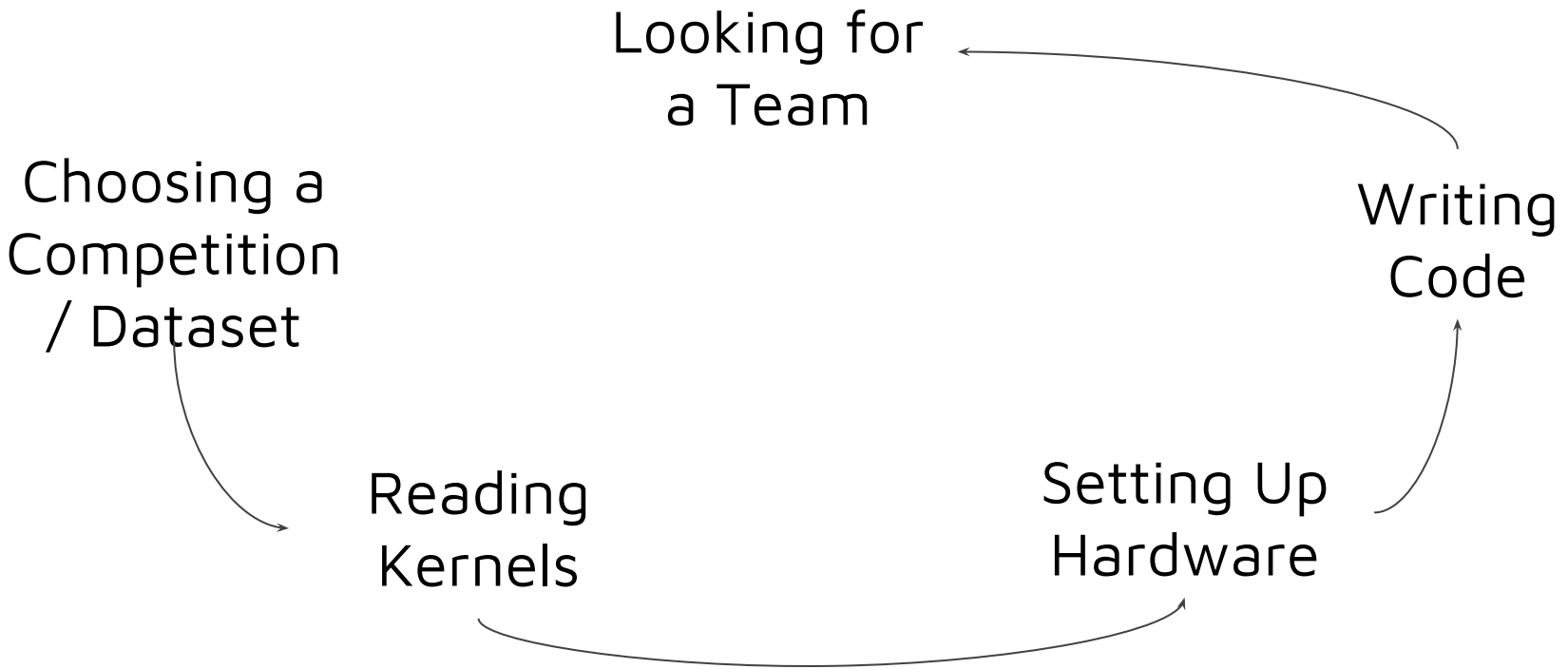
**Dog Breed Identification** — **Kudos**
Determine the breed of a dog in an image — 326 teams
Playground · 3 months to go · animals, image, multiclass classification, object identification

**Titanic: Machine Learning from Disaster** — 9,219 teams
Start here! Predict survival on the Titanic and get familiar with ML basics
Getting Started · 2 years to go · tabular, binary classification

# Competitions

# Approaching Kaggle Competitions

# Kaggle Workflow



# How to Choose a Competition

- Money
  - High profile competitions, featured
- Recognition
  - Recruitment, Featured, Research, Playgrounds
- Learning
  - Research, Playgrounds, Getting Started “competitions”

# How to Choose a Dataset

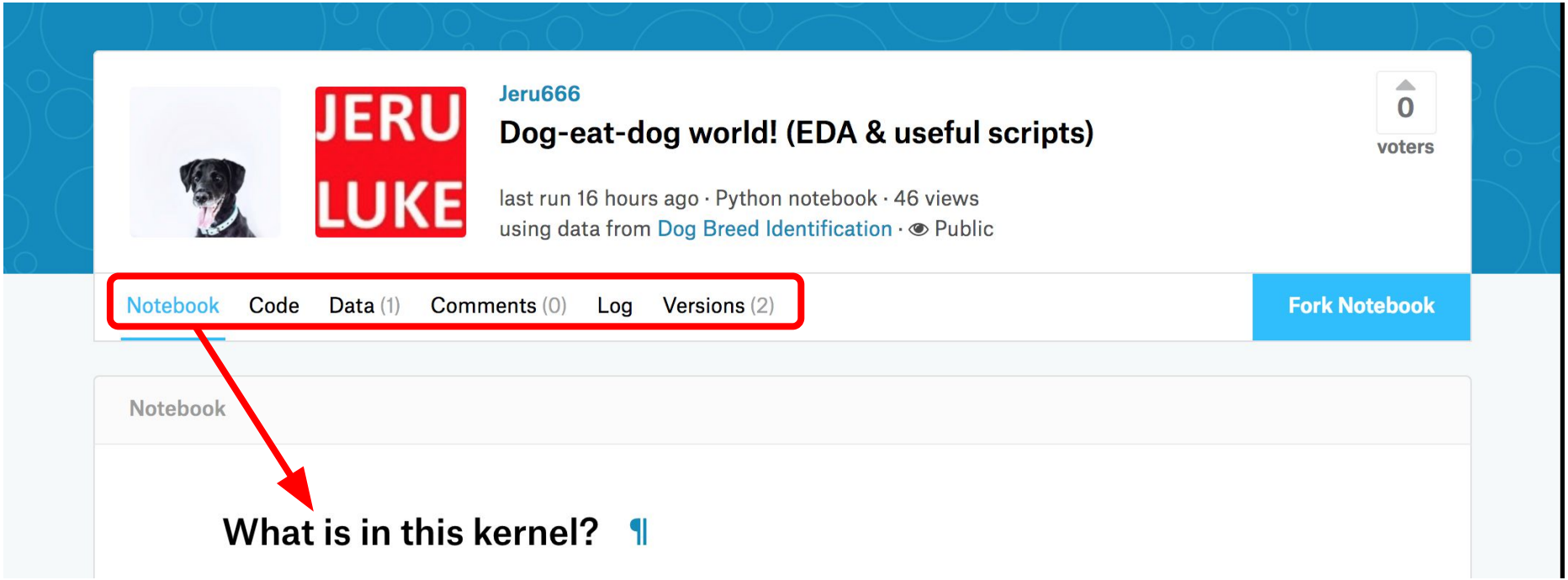
If you have something you want to study: look for it on Kaggle first

- Stock Market Data
- Iowa Liquor Sales
- Fashion MNIST
- Data on Kagglers & Data Scientists
- Video Game Sales & Pricings

# How to Read Kernels

- Some code you will need to understand
- Some code you will not

We will walk through the Dog Breed Identification Competition




# Reading Kernels


Jeru666

**Dog-eat-dog world! (EDA & useful scripts)**

last run 16 hours ago · Python notebook · 46 views
using data from Dog Breed Identification · Public

0
voters

Notebook | Code | Data (1) | Comments (0) | Log | Versions (2) | Fork Notebook

Code — This script has been released under the Apache 2.0 open source license. Download Code


```
1  {"metadata": {"kernelspec": {"name": "python3", "display_name": "Python 3", "language": "python"},
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   1. Data Exploration\n", "* Checking for missing values\n", "* Visualizing distribution of various
   dog breeds\n", "\n", "### 2. Useful Scripts\n", "* Script to segregate images into their
```


# Reading Kernels

JERU
LUKE

Jeru666

**Dog-eat-dog world! (EDA & useful scripts)**

last run 16 hours ago · Python notebook · 46 views
using data from Dog Breed Identification · Public

0
voters

Notebook | Code | Data (1) | Comments (0) | Log | Versions (2) | Fork Notebook

Data

Dog Breed Identification
- labels.csv
- sample_submission....
- test.zip
- train.zip

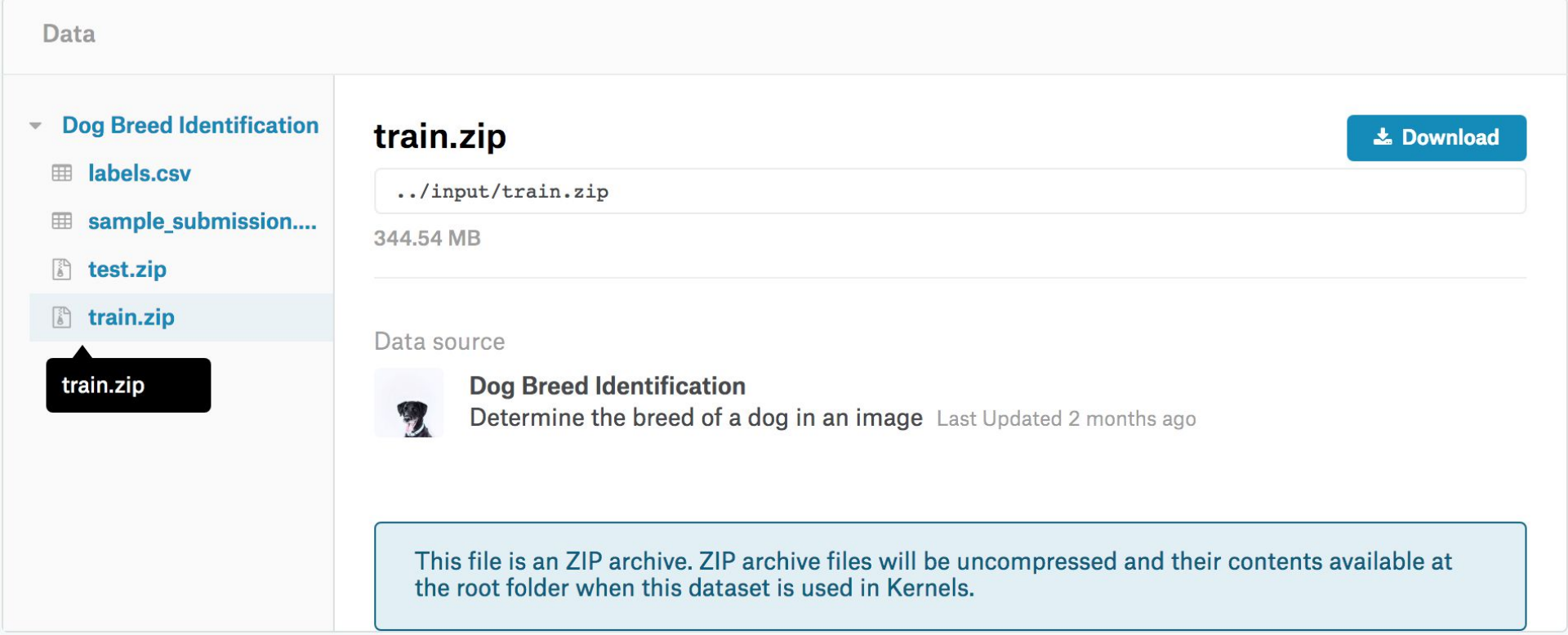
**Dog Breed Identification**

Determine the breed of a dog in an image

Last Updated 2 months ago

About this Dataset

# Reading Kernels




# Reading Kernels

# Kernels: How They Work

- Built on Jupyter Notebook API
  - Just different CSS style
- Run on Docker, which is virtual system on Kaggle's Cloud
- Provide real-time access to data, indefinite storage of your data results (I believe)
- **Max 1 hour of continuous usage of Kaggle kernels**

Kaggle / docker-python

Watch 40 | Star 413 | Fork 195

Code | Issues 1 | Pull requests 0 | Projects 0 | Wiki | Insights

Branch: master | docker-python / Dockerfile | Find file | Copy path

```
52  RUN apt-get install -y libfreetype6-dev && \
53      apt-get install -y libglib2.0-0 libxext6 libsm6 libxrender1 libfontconfig1 --fix-missing && \
54      # textblob
55      pip install textblob && \
56      #word cloud
57      conda install -y -c https://conda.anaconda.org/amueller wordcloud && \
58      #igraph
59      conda install -y -c conda-forge python-igraph && \
60      #xgboost
61      cd /usr/local/src && mkdir xgboost && cd xgboost && \
62      git clone --depth 1 --recursive https://github.com/dmlc/xgboost.git && cd xgboost && \
63      make && cd python-package && python setup.py install && \
64      pip install lightgbm && \
65      #lasagne
66      cd /usr/local/src && mkdir Lasagne && cd Lasagne && \
67      git clone --depth 1 https://github.com/Lasagne/Lasagne.git && cd Lasagne && \
68      pip install -r requirements.txt && python setup.py install && \
69      #keras
```

XGBoost

Lasagne

# What is in this kernel?

## 1. Data Exploration

- Checking for missing values
- Visualizing distribution of various dog breeds

## 2. Useful Scripts

- Script to segregate images into their respective breeds (to help with augmentation later on)

[2]:
```
% ls
```

```
__notebook_source__.ipynb
```

# What is in this kernel?

## 1. Data Exploration

- Checking for missing values
- Visualizing distribution of various dog breeds

## 2. Useful Scripts

- Script to segregate images into their respective breeds (to help with augmentation later on)

[3]:
```
% ls ../
```

```
config/  input/  lib/  working/
```

# What is in this kernel?

## 1. Data Exploration

- Checking for missing values
- Visualizing distribution of various dog breeds

## 2. Useful Scripts

- Script to segregate images into their respective breeds (to help with augmentation later on)

[4]:
```
% pwd
```

```
'/kaggle/working'
```

# What is in this kernel?

## 1. Data Exploration

- Checking for missing values
- Visualizing distribution of various dog breeds

## 2. Useful Scripts

- Script to segregate images into their respective breeds (to help with augmentation later on)

[8]:
```
% ls /kaggle/input
```

```
labels.csv  sample_submission.csv  test/  train/
```

[7]:

```
% cat /kaggle/config/jupyter.json
```

```
{
  "control_port": 1004,
  "hb_port": 1003,
  "iopub_port": 1002,
  "ip": "*",
  "key": "kaggle",
  "shell_port": 1001,
  "stdin_port": 1005,
  "transport": "tcp"
}
```

[8]:
```
% ls /kaggle/input
```

```
labels.csv  sample_submission.csv  test/  train/
```

[9]:
```
% ls /kaggle/input/train/
```

```
0021f9ceb3235effd7fcde7f7538ed62.jpg  814be837610c46b122ff45f71e97133d.jpg
002211c81b498ef88e1b40b9abf84e1d.jpg  815079d1d62429b3134f2afa1a53ef65.jpg
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007b8a07882822475a4ce6581e70b1f8.jpg  8182c860efb9ebf248886c0e70216e01.jpg
```

# Data Exploration

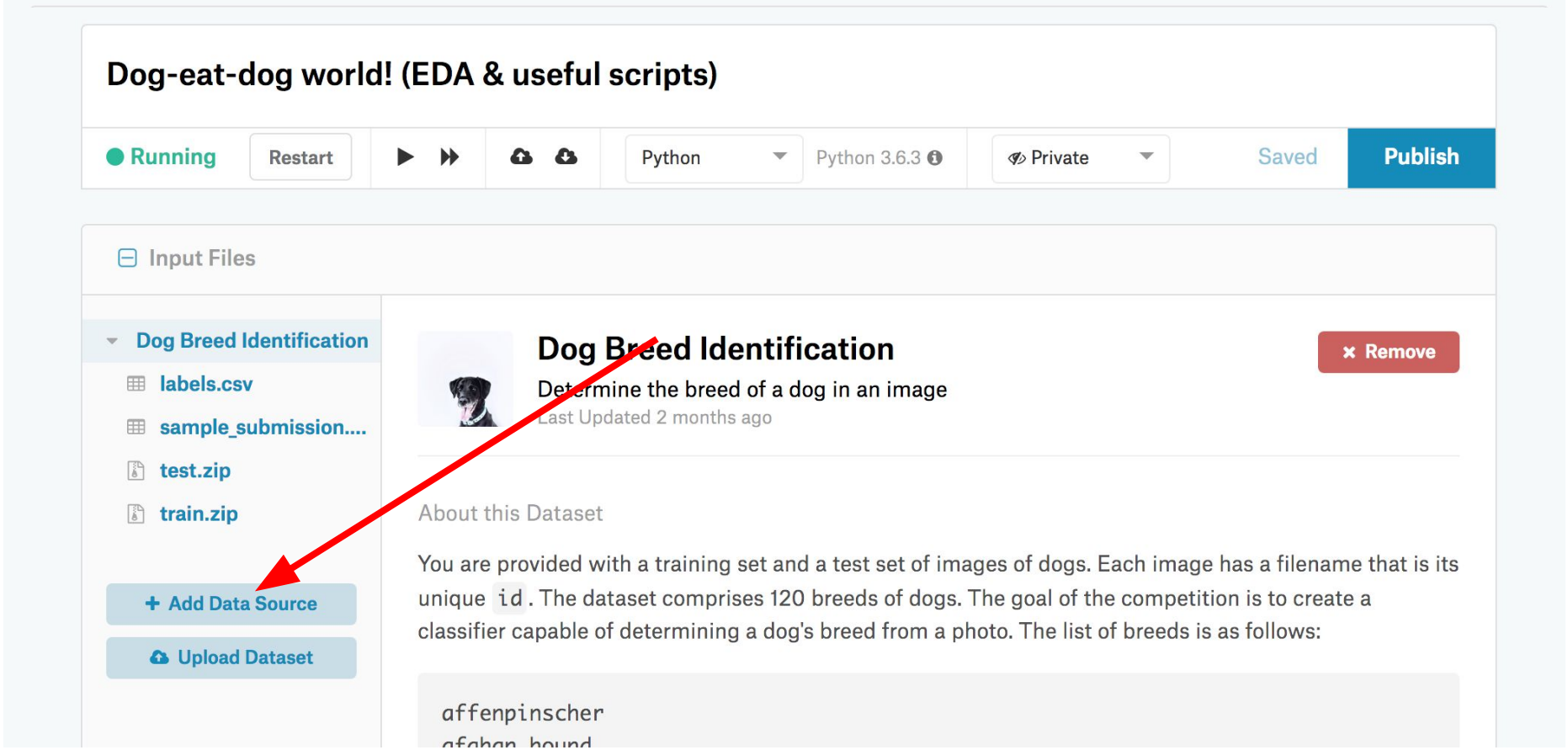
**There are 120 dog breeds in our dataset. The following snippet confirms the fact**

[13]:
```
labels.breed.nunique()
```

```
120
```

[15]:
```
labels.breed.nunique()
type(labels.breed)
```

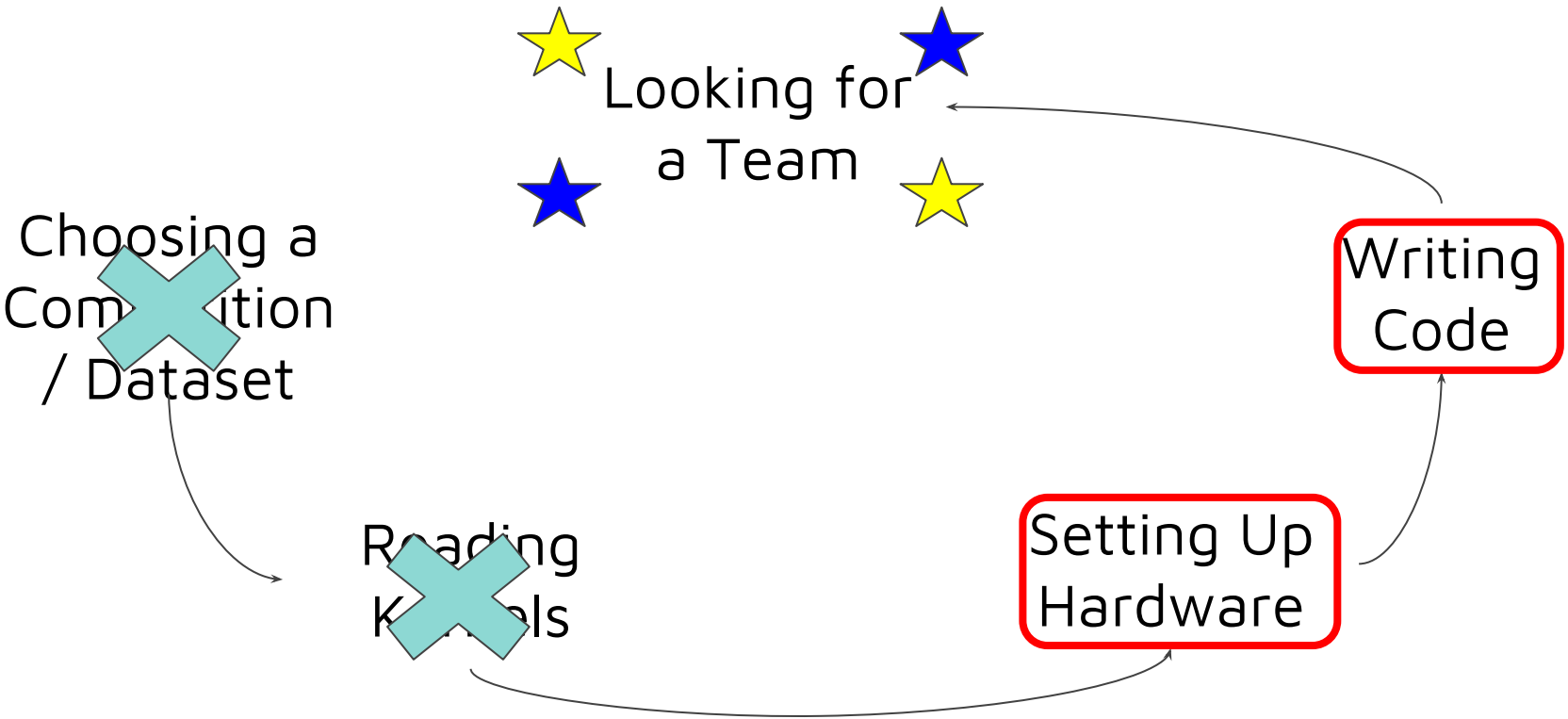
```
pandas.core.series.Series
```



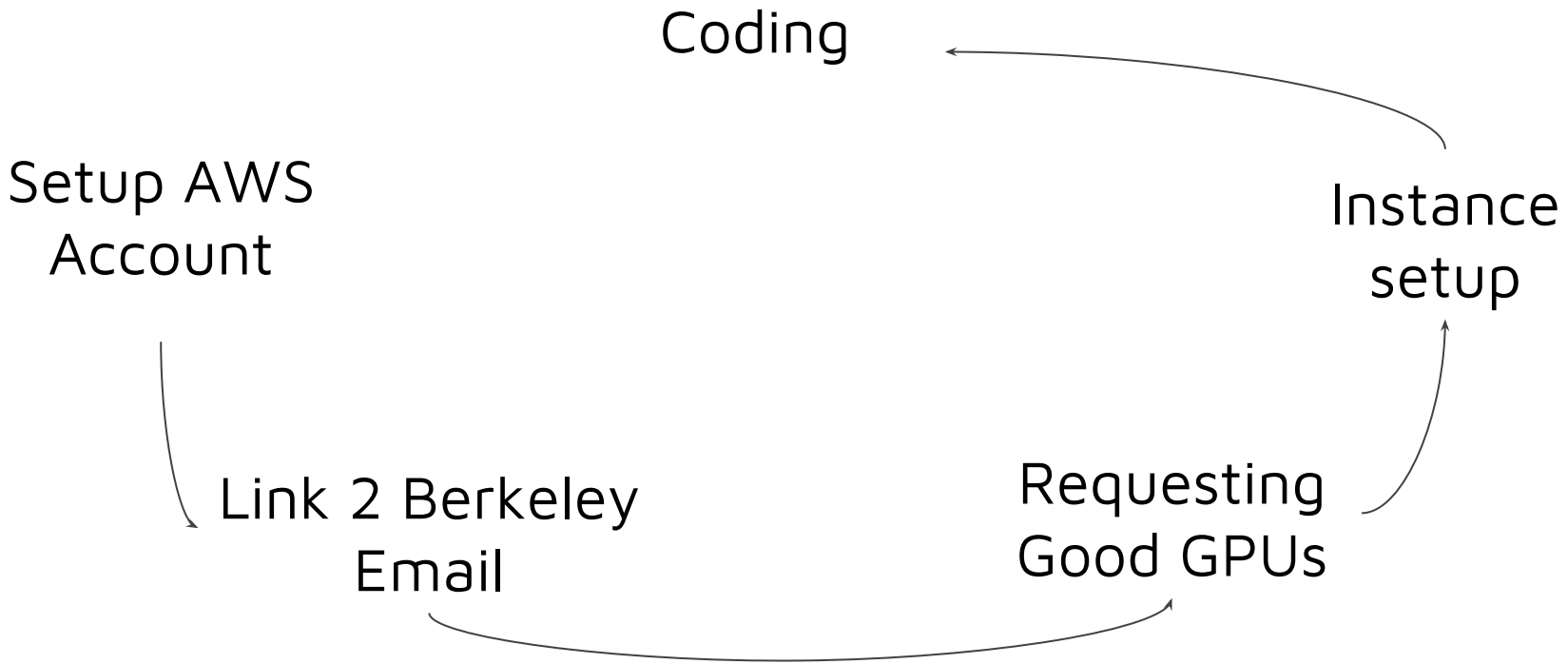

# Last Note: Add extra data

# Setting Up Hardware: AWS EC2 P2 Instances

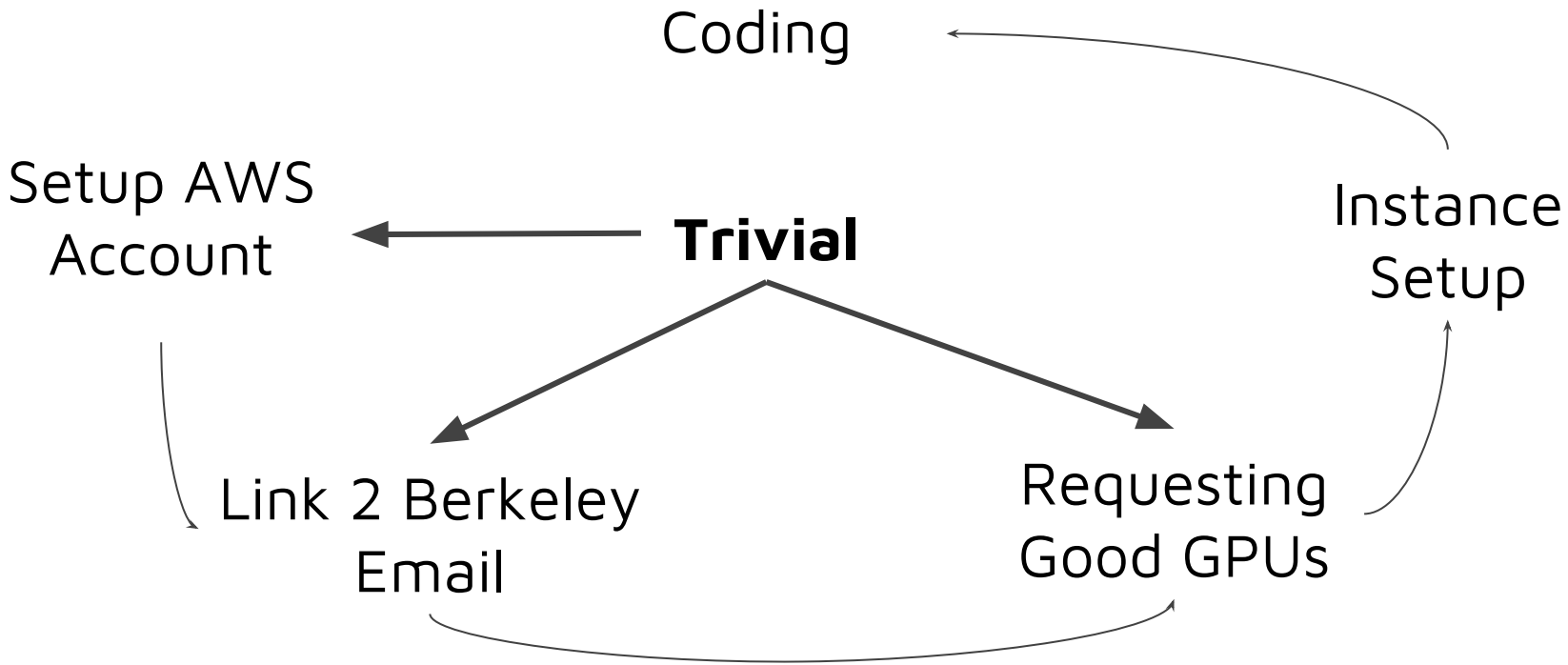
# Kaggle Workflow



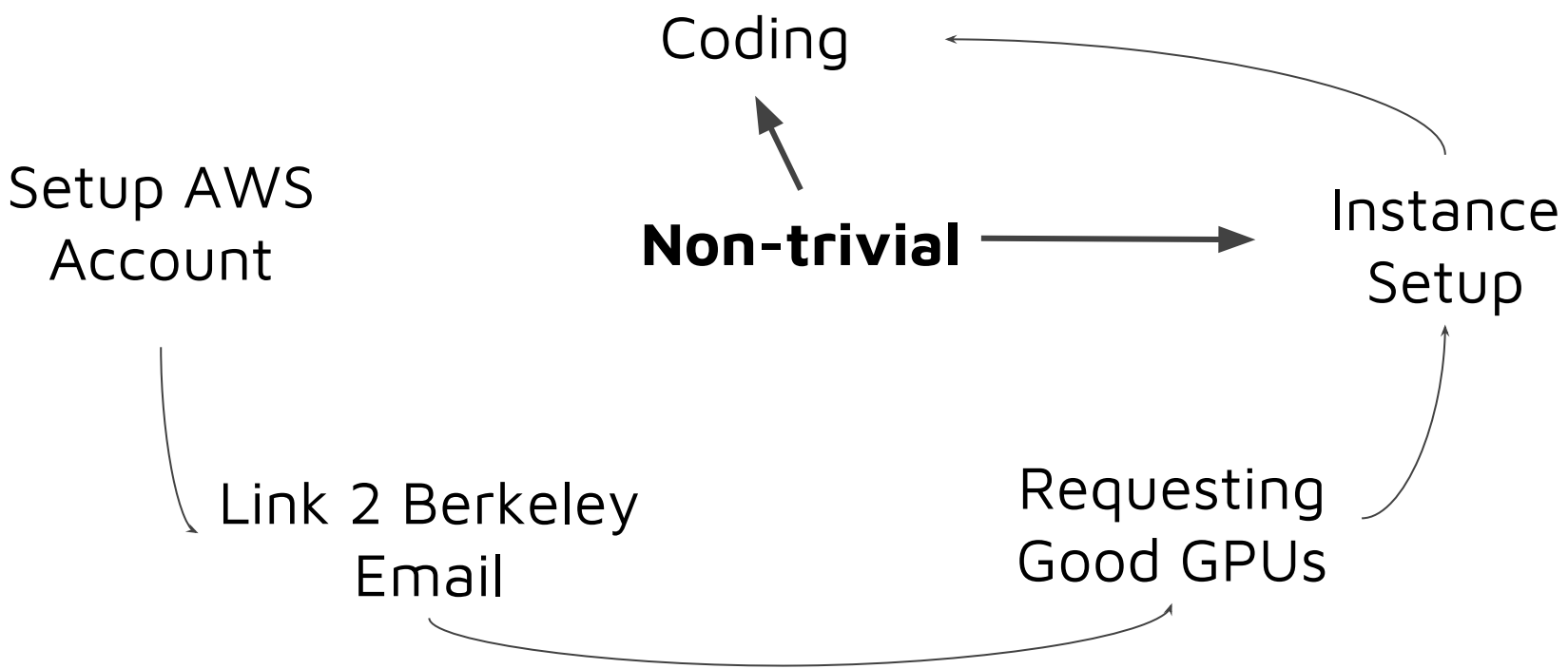
# Hardware


Coding
Instance setup
Requesting Good GPUs
Link 2 Berkeley Email
Setup AWS Account

# Hardware


Coding
Setup AWS Account
Trivial
Instance Setup
Link 2 Berkeley Email
Requesting Good GPUs

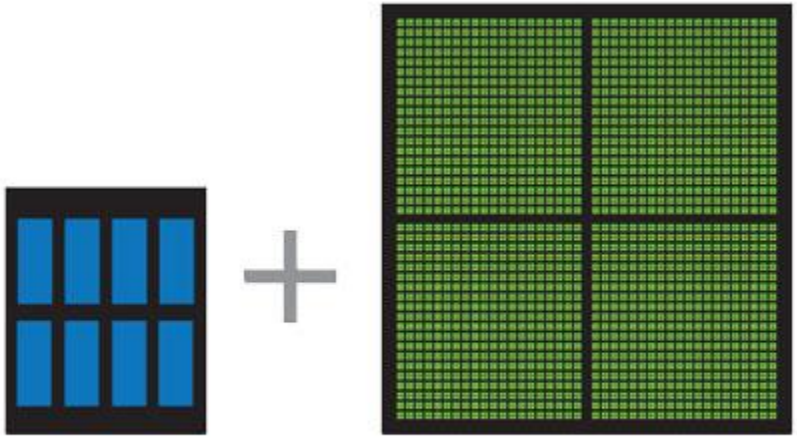
# Hardware

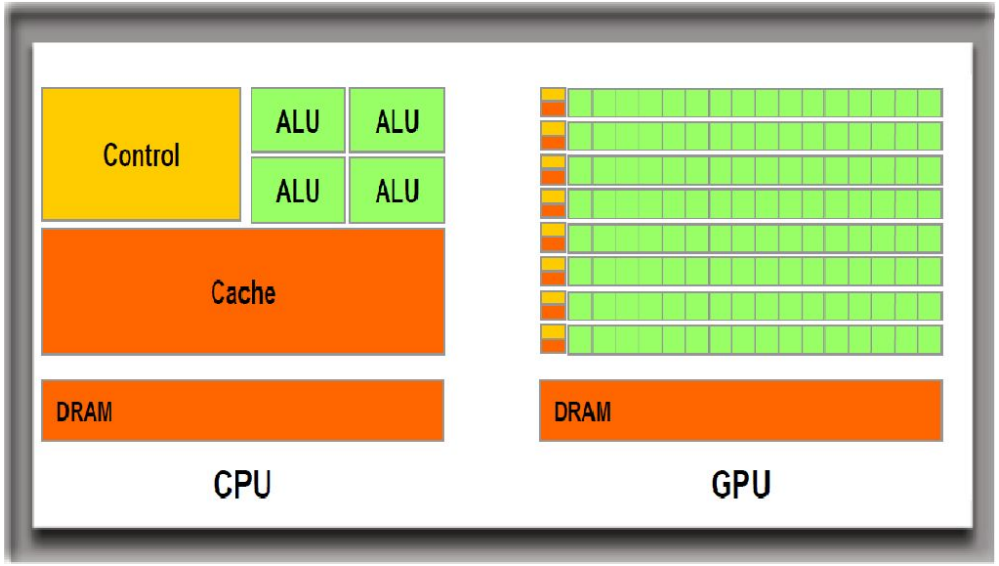

Coding
Setup AWS Account
Non-trivial
Instance Setup
Link 2 Berkeley Email
Requesting Good GPUs

# Graphics Cards

- You cannot do anything useful on big datasets without them
- 100 free credits (per year) from AWS if you create an account with Berkeley email
- Running on a GPU-accelerated instance < $1/hr
- CDiscount ($35k) has train files 58GB... GL processing on CPU

# GPU: Graphics Processing Unit



# AWS: Your Hardware Lifeline

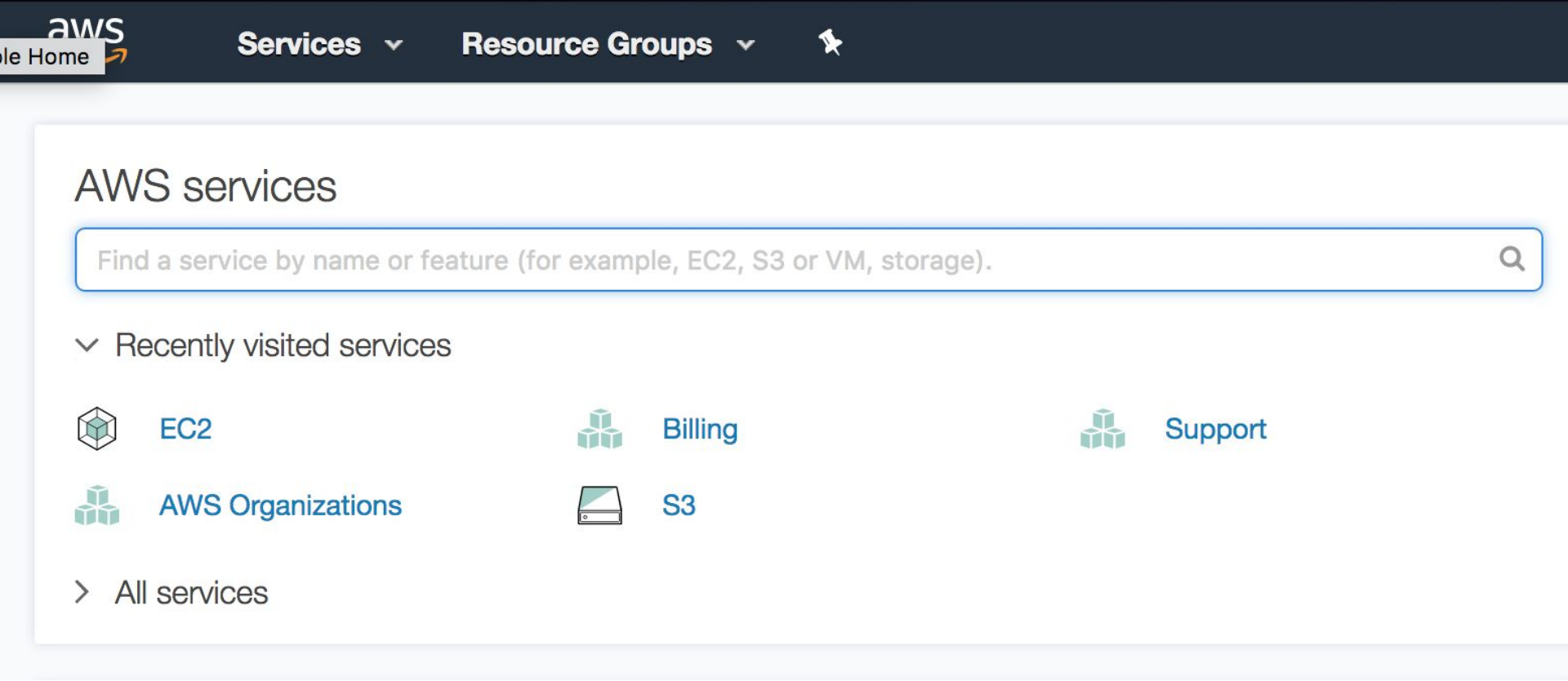
- Amazon Web Services
- Elastic Compute Cloud (EC2)
- Provide on demand creation of servers you can ssh into and run processes on

# AWS: Your Hardware Lifeline

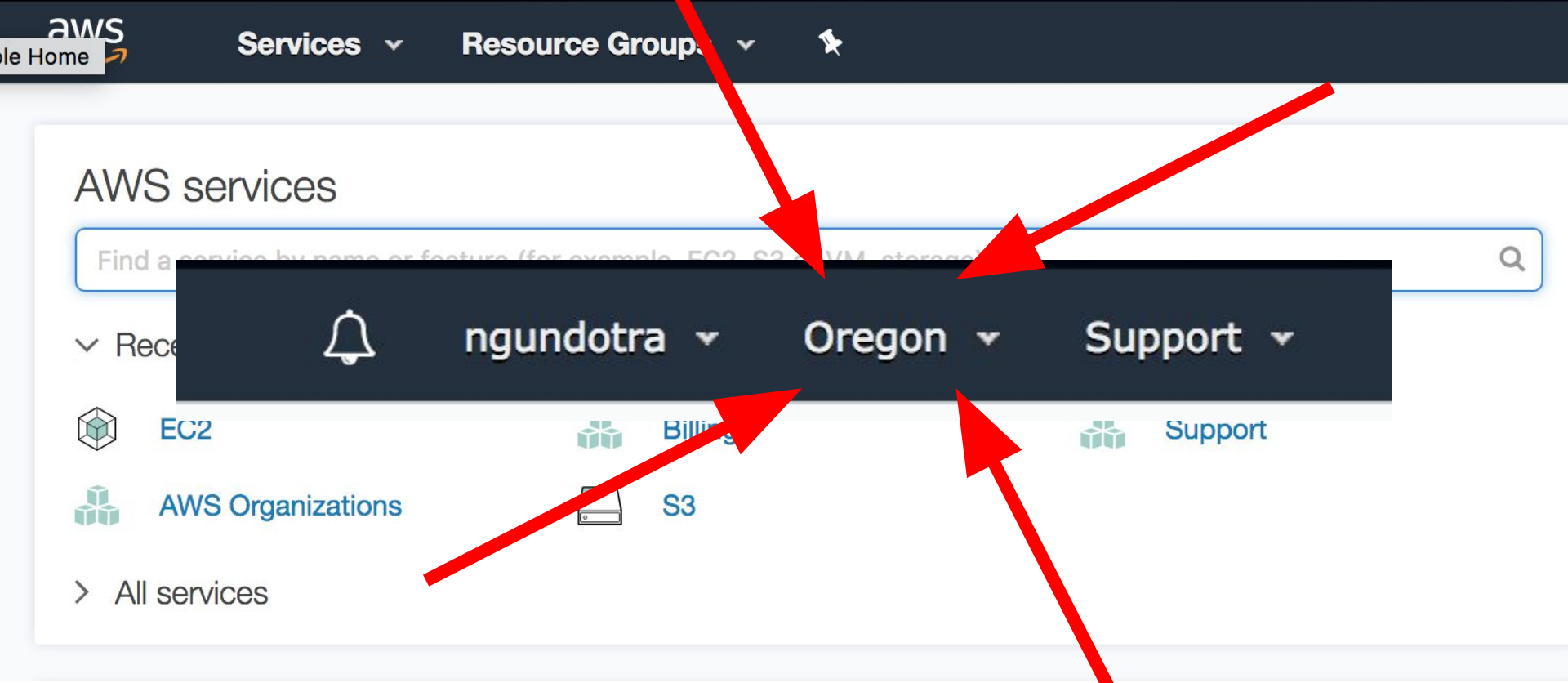
This usually translates to

- Training models
  - Write code locally
  - Test code (mostly) locally
  - Then scp code onto server & run in special process (tmux &/ nohup)
- Data exploration
  - Run Jupyter Notebook on GPU
  - Port forward access to that notebook to your computer & run explorative code on the notebook

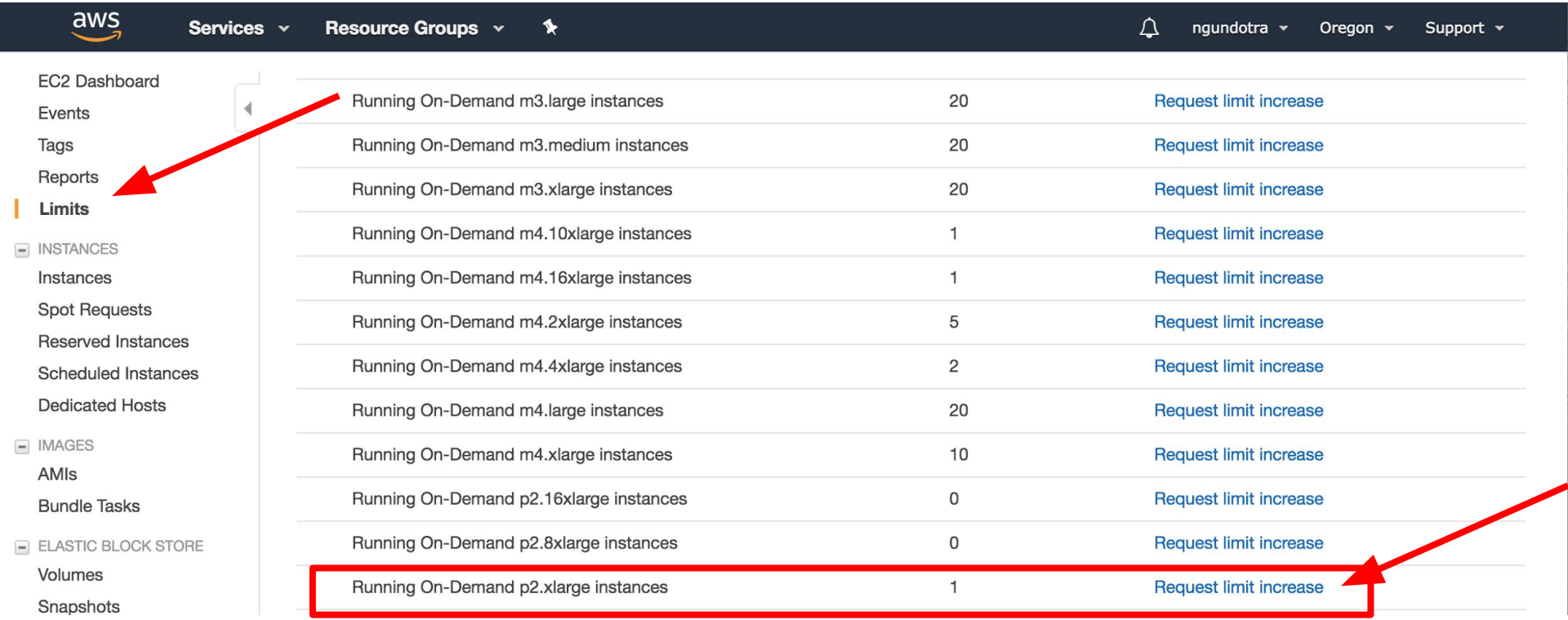
# AWS 1: Sign up for account
# AWS 2: Sign up for AWS educate & link account



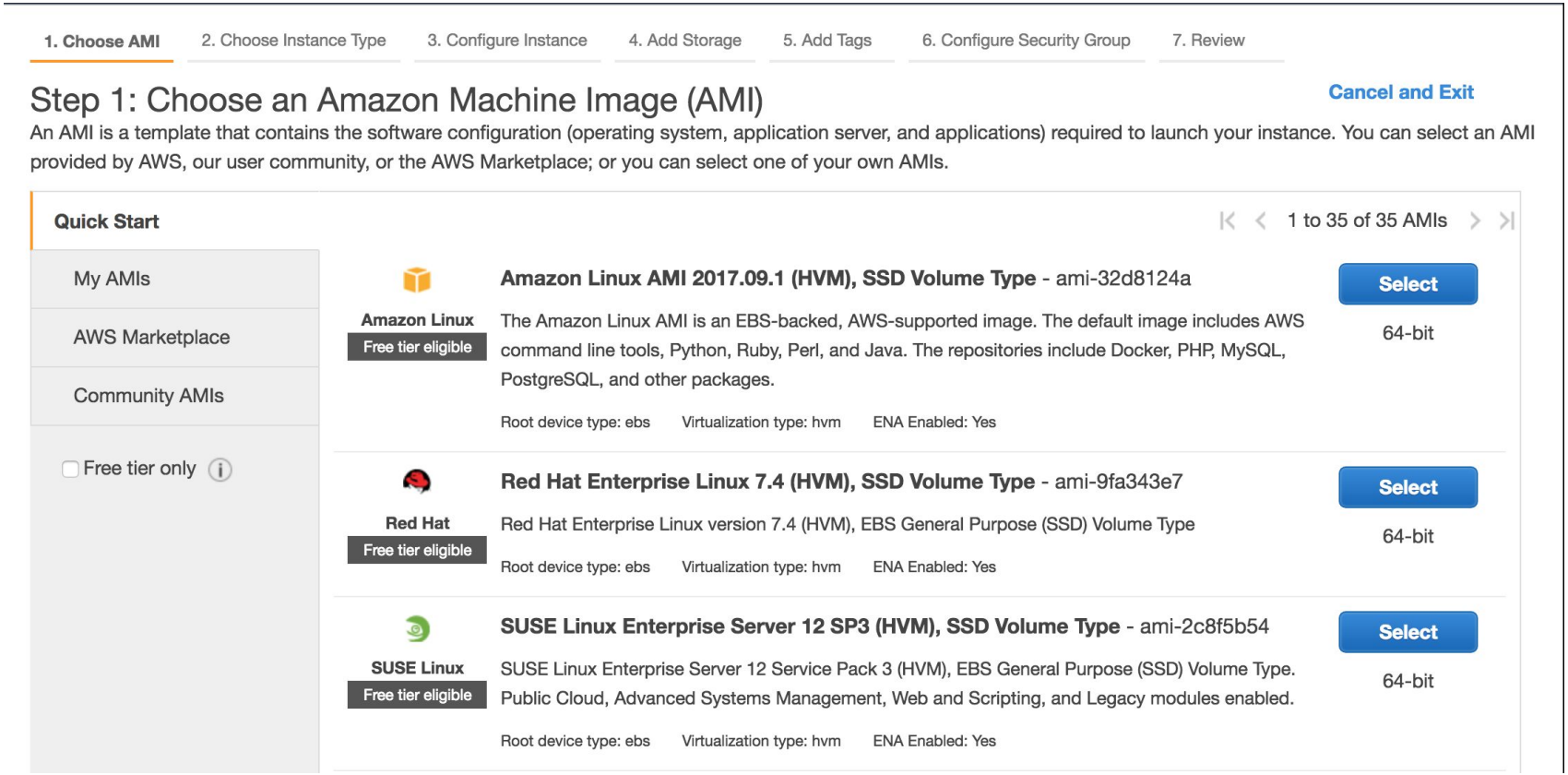

# AWS 3: Requesting Instances



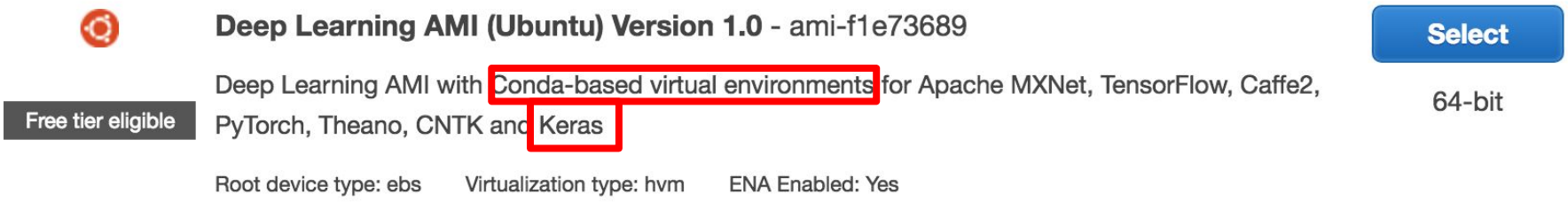

# AWS 3: Requesting Instances




# AWS 3: Requesting Instances




# AWS 3: Requesting Instances




# AWS 3: Requesting Instances

1. Choose AMI | 2. Choose Instance Type | 3. Configure Instance | 4. Add Storage | 5. Add Tags | 6. Configure Security Group | 7. Review

## Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances are virtual servers that can run applications. They have varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the appropriate mix of resources for your applications. Learn more about instance types and how they can meet your computing needs.

**Filter by:** All instance types | Current generation | Show/Hide Columns

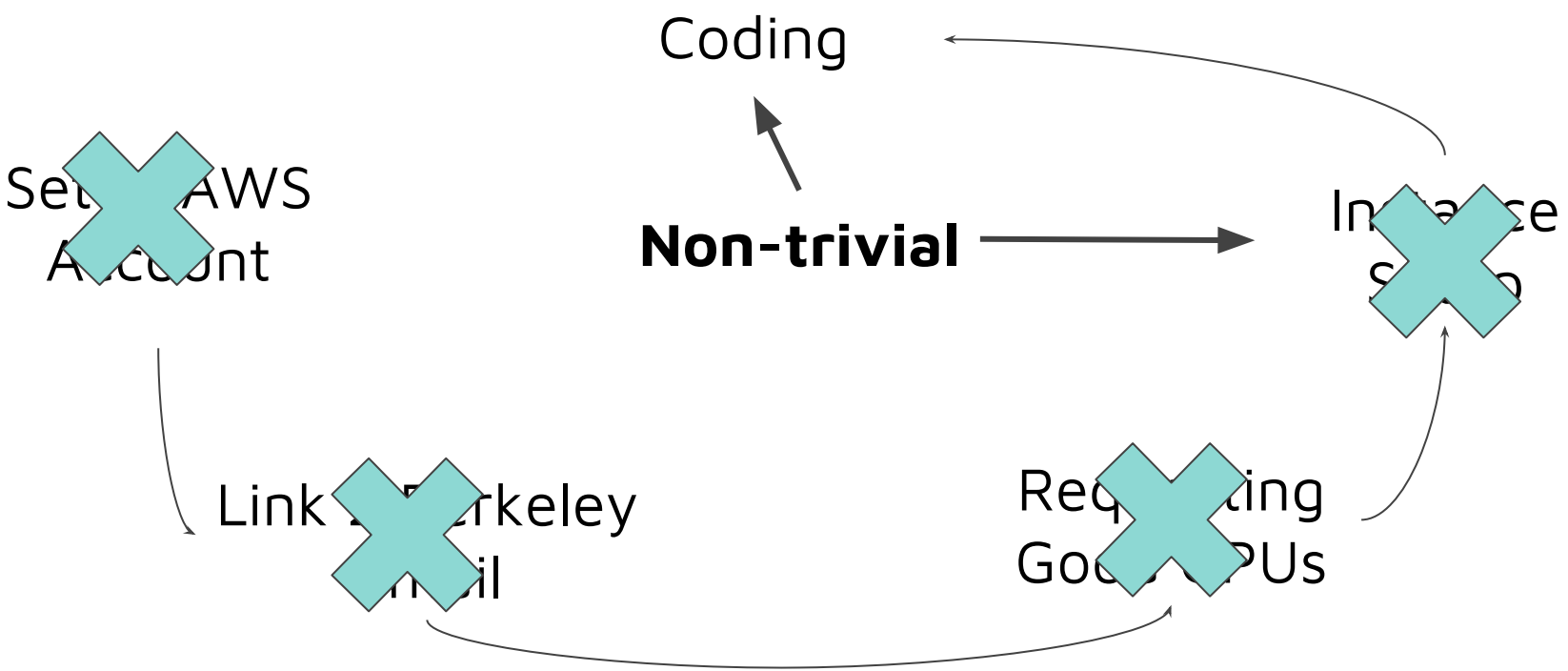
**Currently selected:** t2.micro (Variable ECUs, 1 vCPUs, 2.5 GHz, Intel Xeon Family, 1 GiB memory, EBS only)

| | Family | Type | vCPUs | Memory (GiB) | Instance Storage (GB) | EBS-Optimized Available | Network Performance | IPv6 Support |
|---|---|---|---|---|---|---|---|---|
| ☐ | General purpose | t2.nano | 1 | 0.5 | EBS only | - | Low to Moderate | Yes |
| ☑ | General purpose | t2.micro Free tier eligible | 1 | 1 | EBS only | - | Low to Moderate | Yes |
| ☐ | GPU compute | p2.xlarge | 4 | 61 | EBS only | Yes | High | Yes |

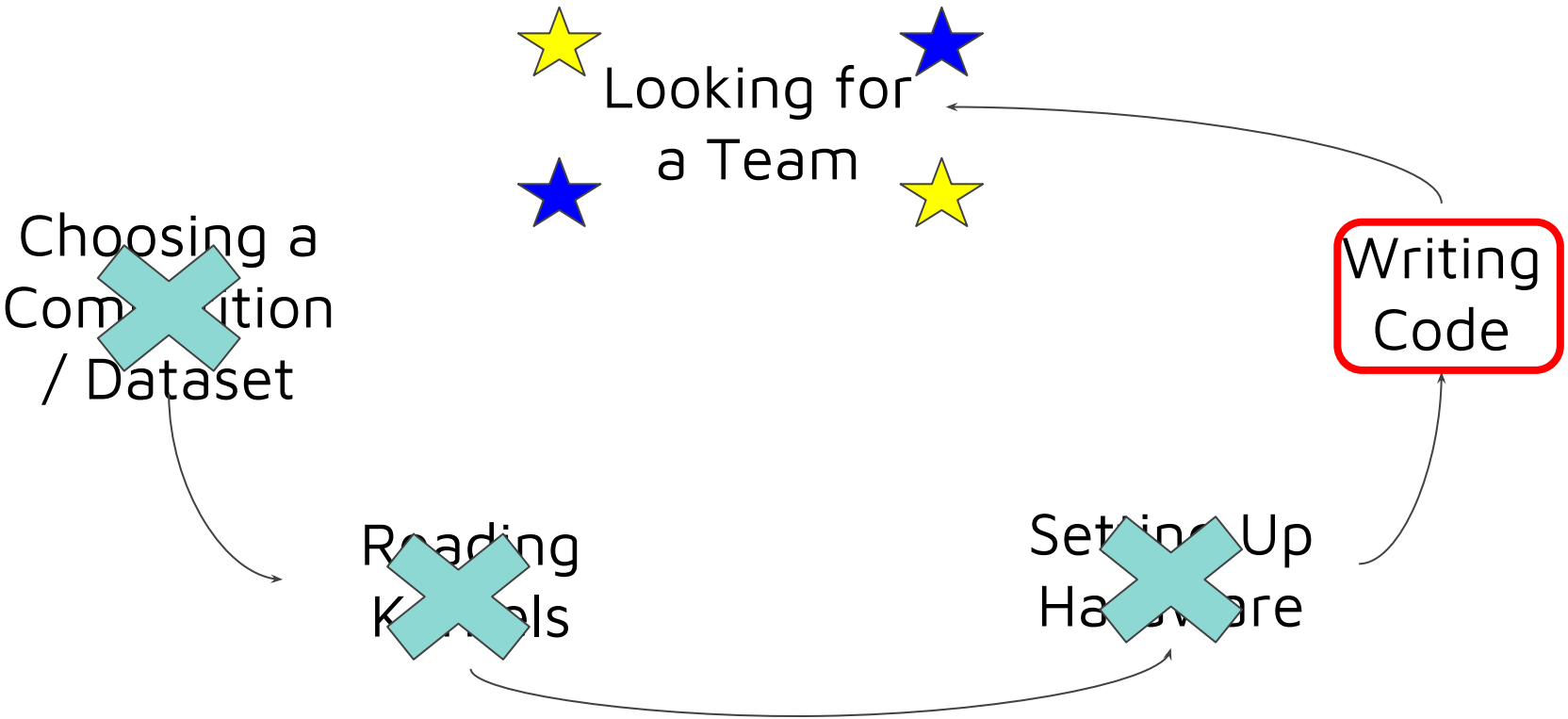
# AWS 3: Requesting Instances

# Momentary Pause: Kaggle -> Hardware -> Instance setup

# Hardware



# Kaggle Workflow



# Kaggle: Deep Learning/Coding :)

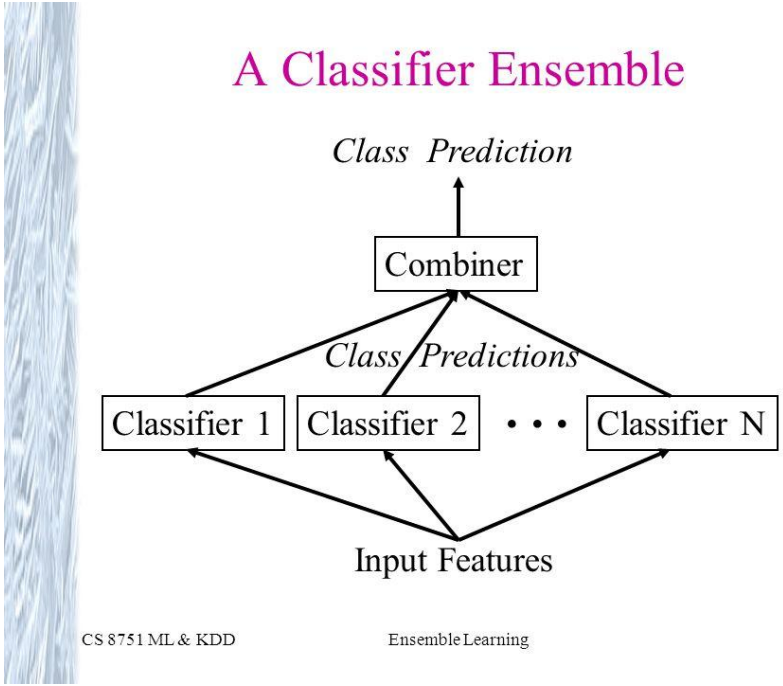
# Deep Learning Approaches:

1. Transfer Learning
2. Ensemble Models

# Transfer Learning (Most Popular)


https://medium.com/owkin/transfer-learning-and-the-rise-of-collaborative-artificial-intelligence-41f9e2950657

# Ensemble Learning: Mash models together



# Transfer Learning (Most Popular)

*[Demo]*