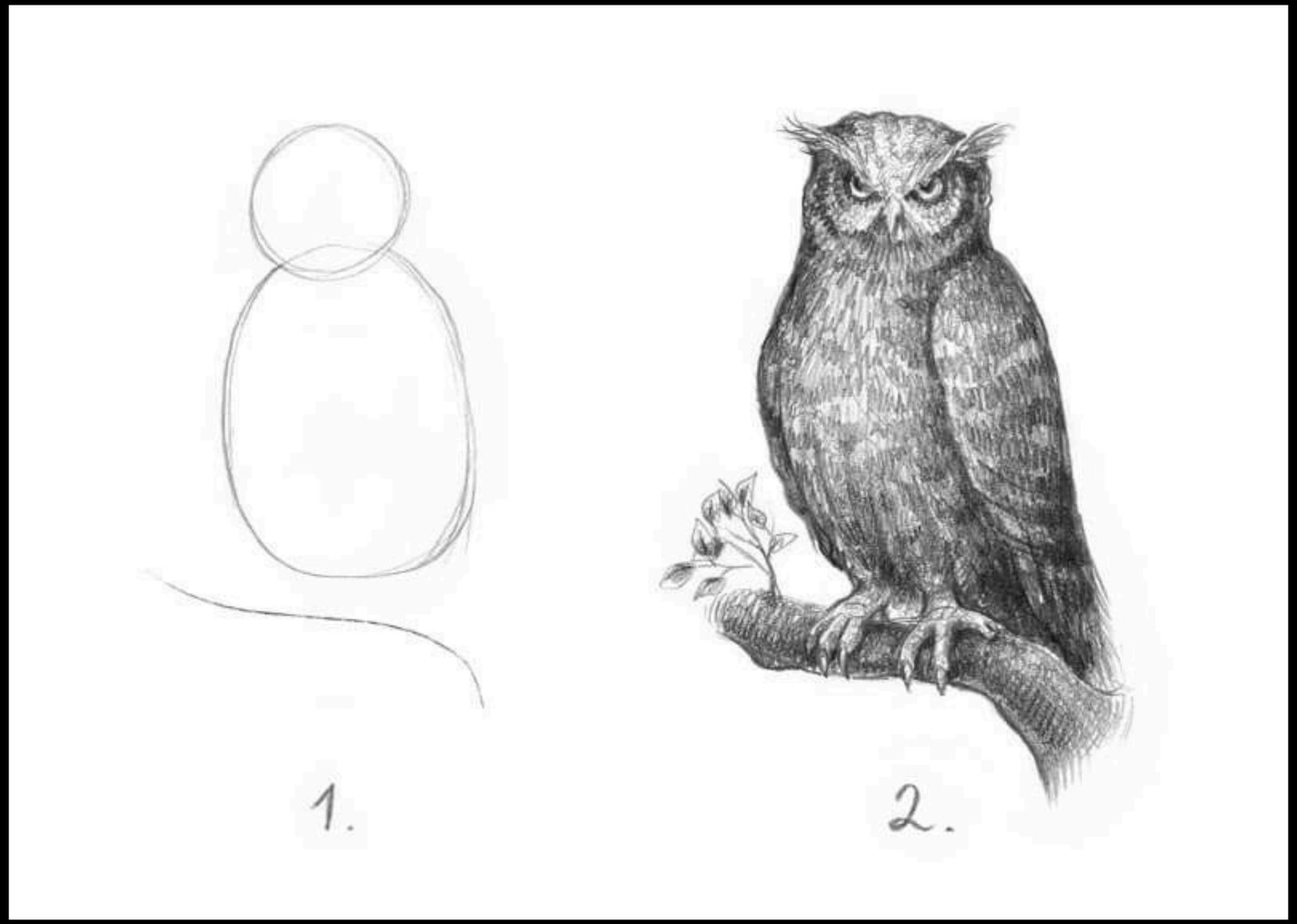
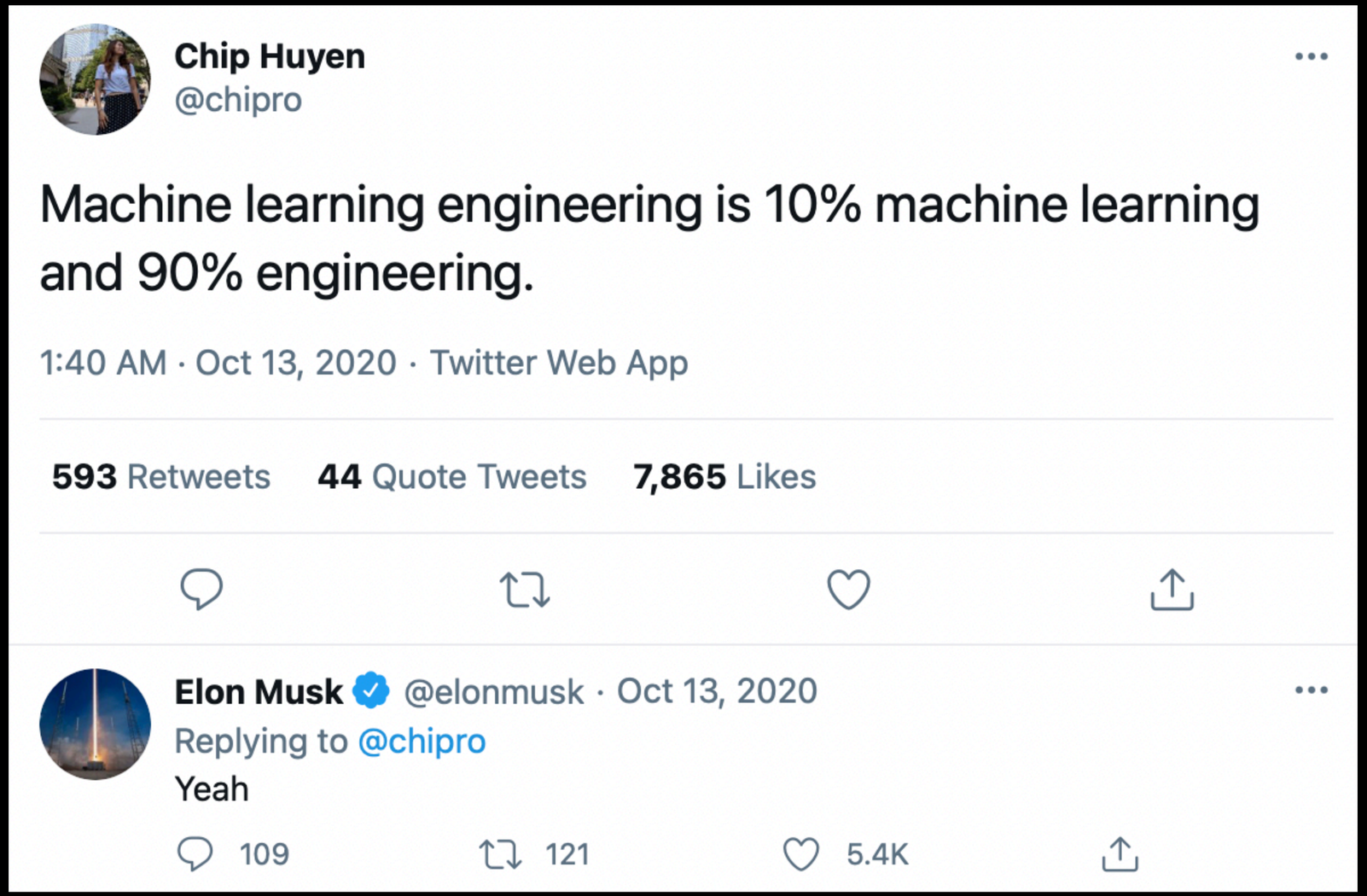
Beginning

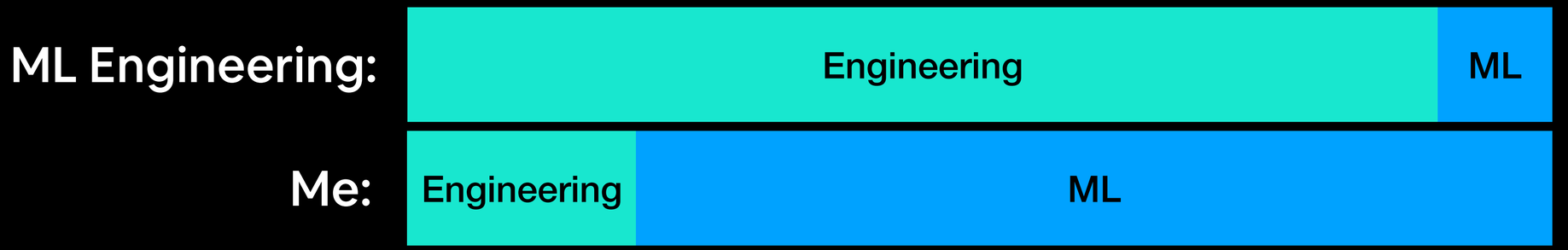
Deploying ML models



1. Build the model

2. Deploy it


Chip Huyen
@chipro
Machine learning engineering is 10% machine learning and 90% engineering.
1:40 AM · Oct 13, 2020 · Twitter Web App
593 Retweets
44 Quote Tweets
7,865 Likes
Elon Musk @elonmusk · Oct 13, 2020
Replying to @chipro
Yeah
109
121
5.4K


ML Engineering:
Engineering
ML
Me:
Engineering
ML

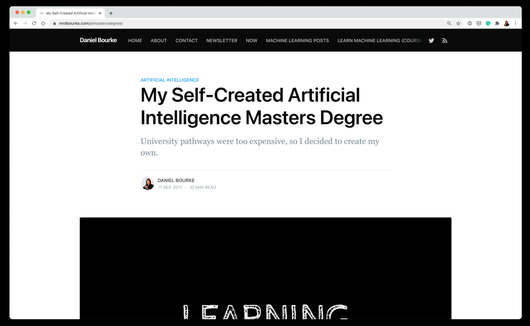
also me...

4.94 ⭐

small apps: yes

large apps: not yet

🥑👨‍🔬🎓



Max Kelsen

what I'm up to now: https://www.mrdbourke.com/now

Get all the stuff

https://dbourke.link/cs329s-ml-tut

Note: README.md still work in progress
(will fix after tutorial)

Food Vision 🍔👁 ML Deployment Recipe

Ingredients

(~10 mins)

- Data: ~10 Food Classes from Food 101
- TesnorFlow/PyTorch model(s)
- Bunch of Python scripts
- Makefile/Dockerfile

Utensils

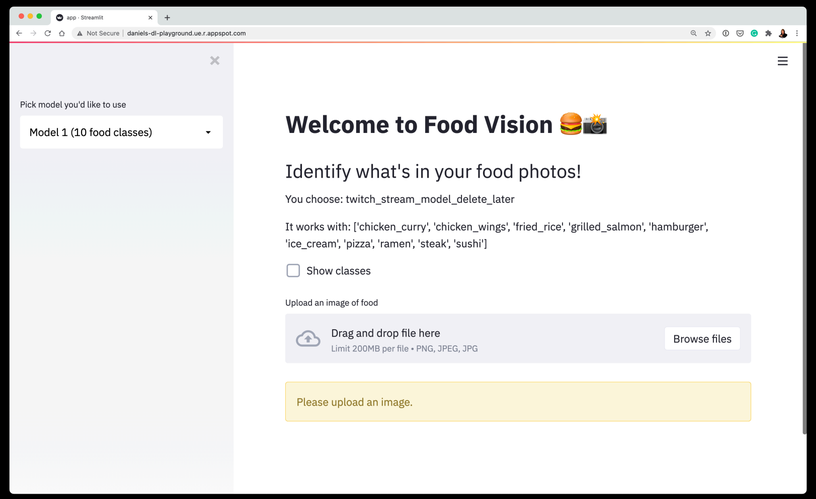
(40-50 mins?)

- Streamlit
- gcloud SDK (CLI tool)
- Google Cloud Project
- Google Storage
- Google AI Platform
- Docker
- Google Container Registry
- App Engine

Method

1. Get the app working locally
2. Deploy the model to AI Platform
3. Deploy the app to App Engine
4. ?????
5. Solve all the bugs
6. PROFIT

Outcome



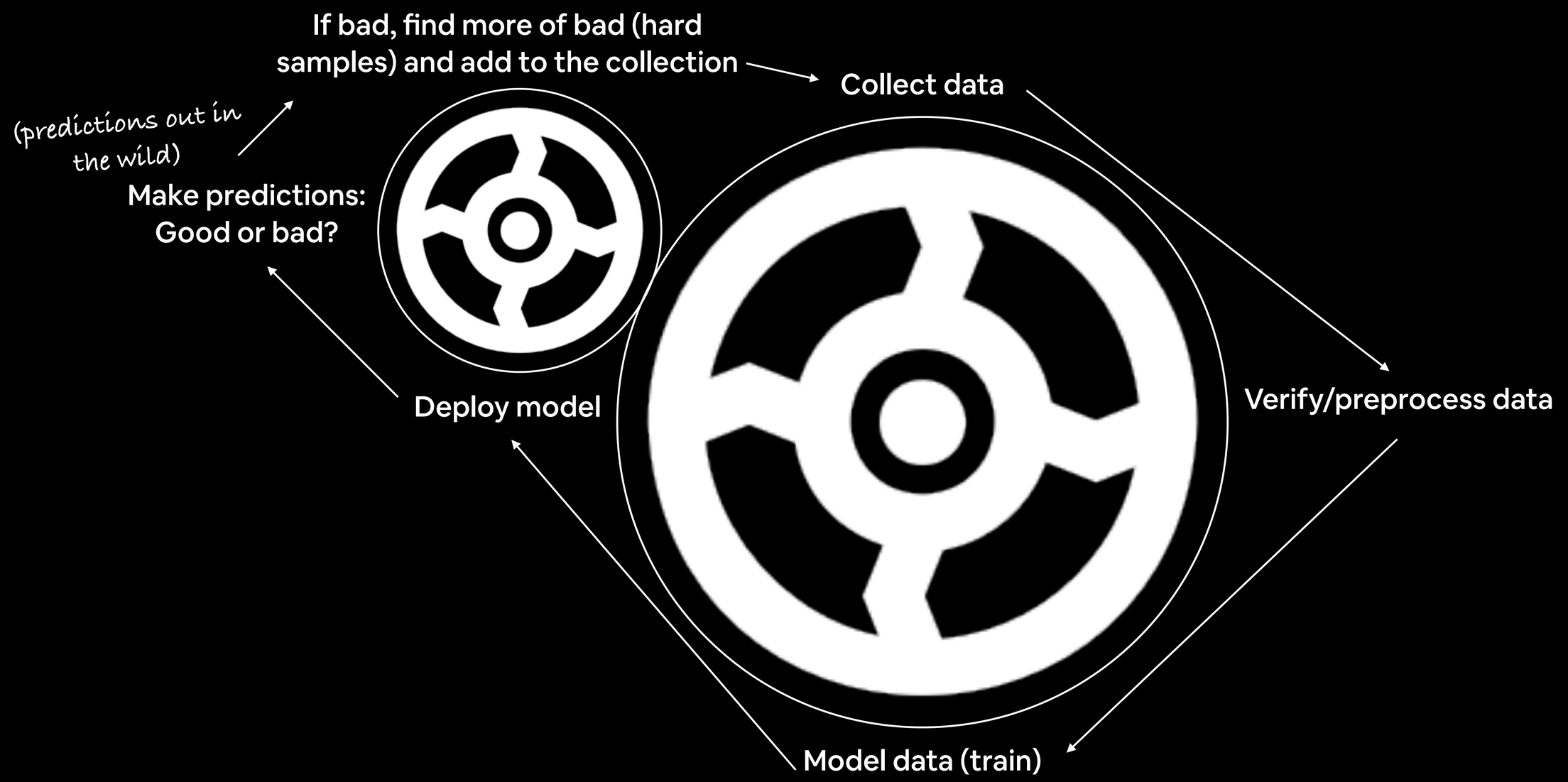
+

Google Cloud services cost 💰
No credits = 💸

Ask questions whenever you feel like it
(we’ll do QA at the end too)

Objective: Build a data flywheel

(the holy grail of ML)

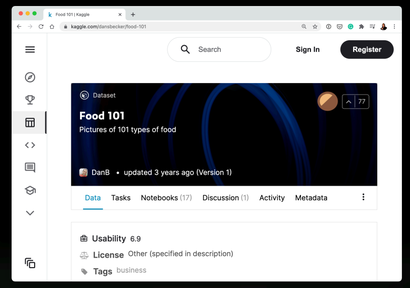


Tesla’s data flywheel

Source: https://youtu.be/Ucp0TTmvqOE

Food Vision 🍔👁️'s data flywheel

DATA SOURCE

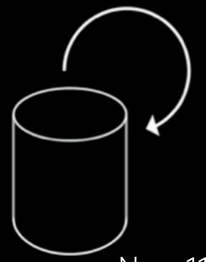


Started with 10/101 classes

DEPLOY

EfficientNetB0

TRAIN



Now 11/? classes (added donut)

LABEL

INACCURACY

Predict: sushi 🚫

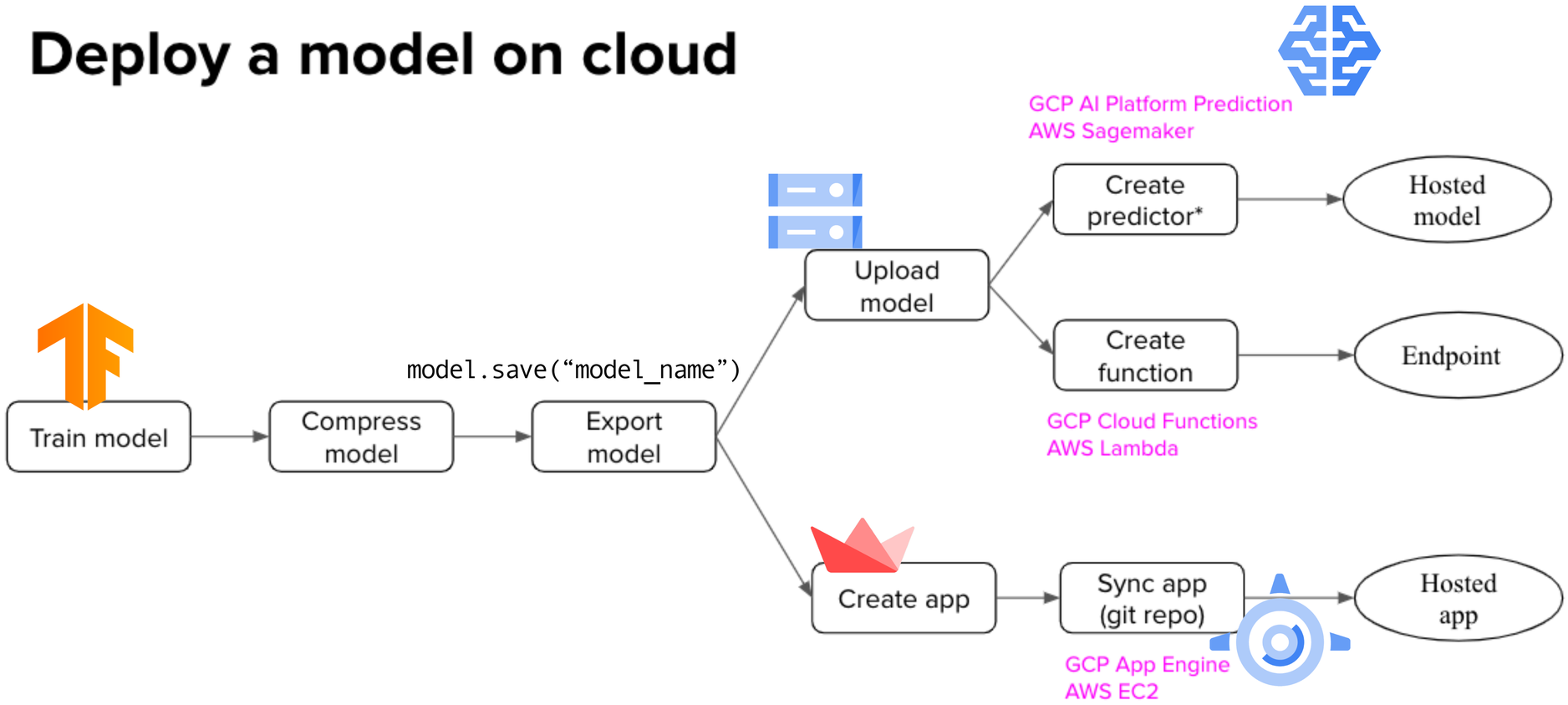
BOOST

UNIT TESTS

Source: https://youtu.be/Ucp0TTmvqOE + my own flavouring

Middle

Deploy a model on cloud



Source: Chip's Slides

model building == model deployment

(sort of)

Lego blocks of layers...

- Conv2D
- Conv2D
- MaxPool2D
- Conv2D
- Conv2D
- MaxPool2D
- Dense

TinyVGG

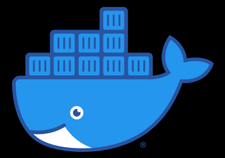
TensorFlow model on Google Storage

Lego blocks of tools...

Model hosted on AI Platform

App built with Streamlit

App wrapped up in Docker container

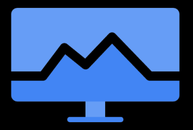


Docker container deployed to GCR

GCR = Google Container Registry

GCR hosted container deployed to App Engine

App monitored with Google Monitoring



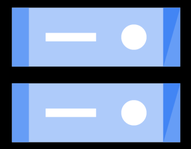
Method

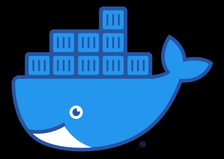
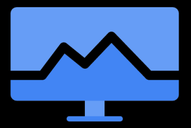
1. Get the app working locally
2. Deploy the model to AI Platform
3. Deploy the app to App Engine
4. ?????
5. Solve all the bugs
6. PROFIT

model building == model deployment

(sort of)

Start here

- ✅  Build model/MVP style app
- ✅  Upload model to Google Storage
- ✅  Host model on AI Platform
- ✅  Create Service Account to access model

- ✅  Wrap app in Docker container
- ✅  Push Docker container to GCR
- ✅  Deploy GCR container to App Engine
- ✅  Monitor app with Monitoring

Finish here

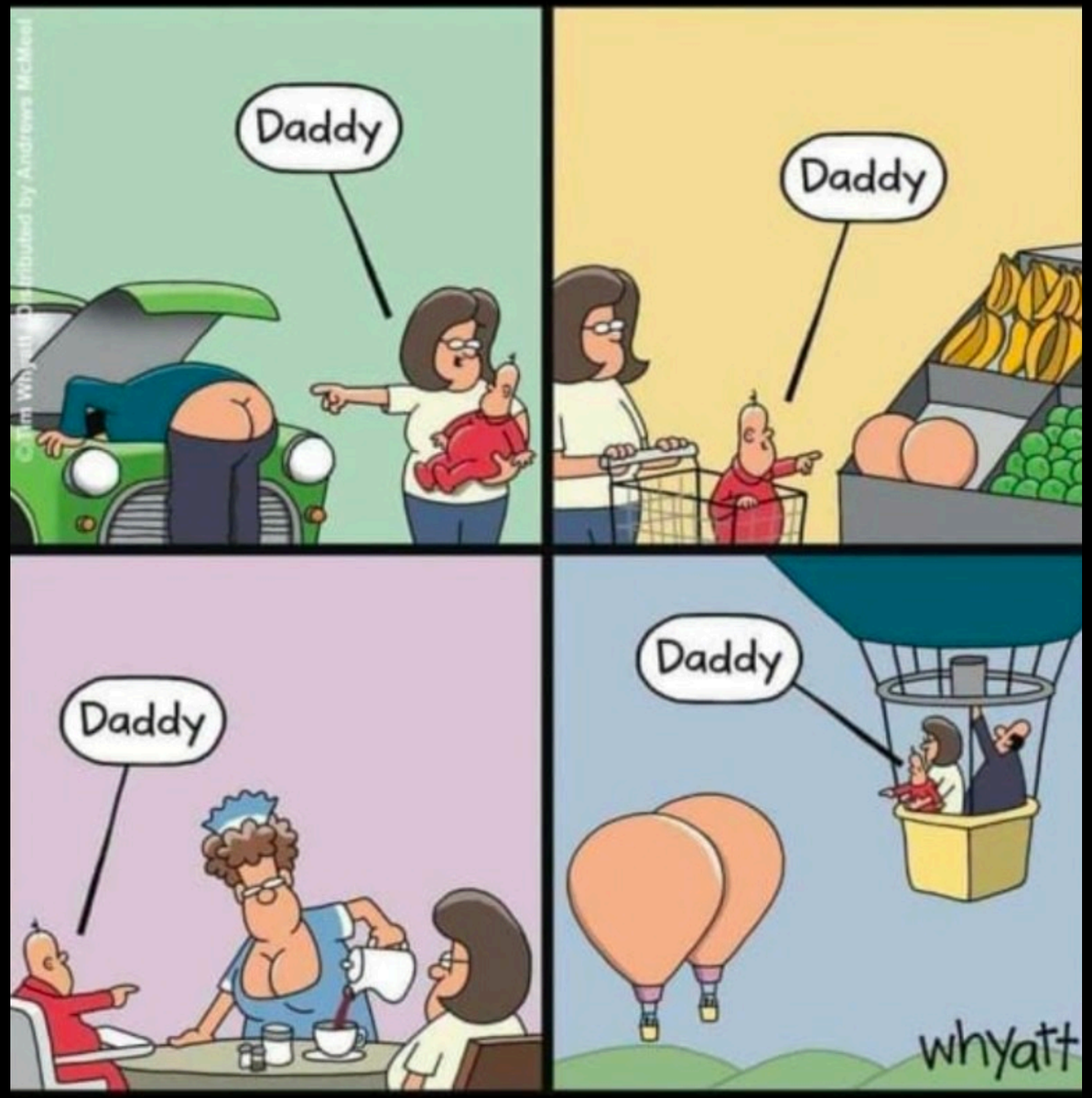
“Everything works nicely until you deploy your model into the wild…”

- Smart Machine Learning Engineer

Problems you're going to run into...

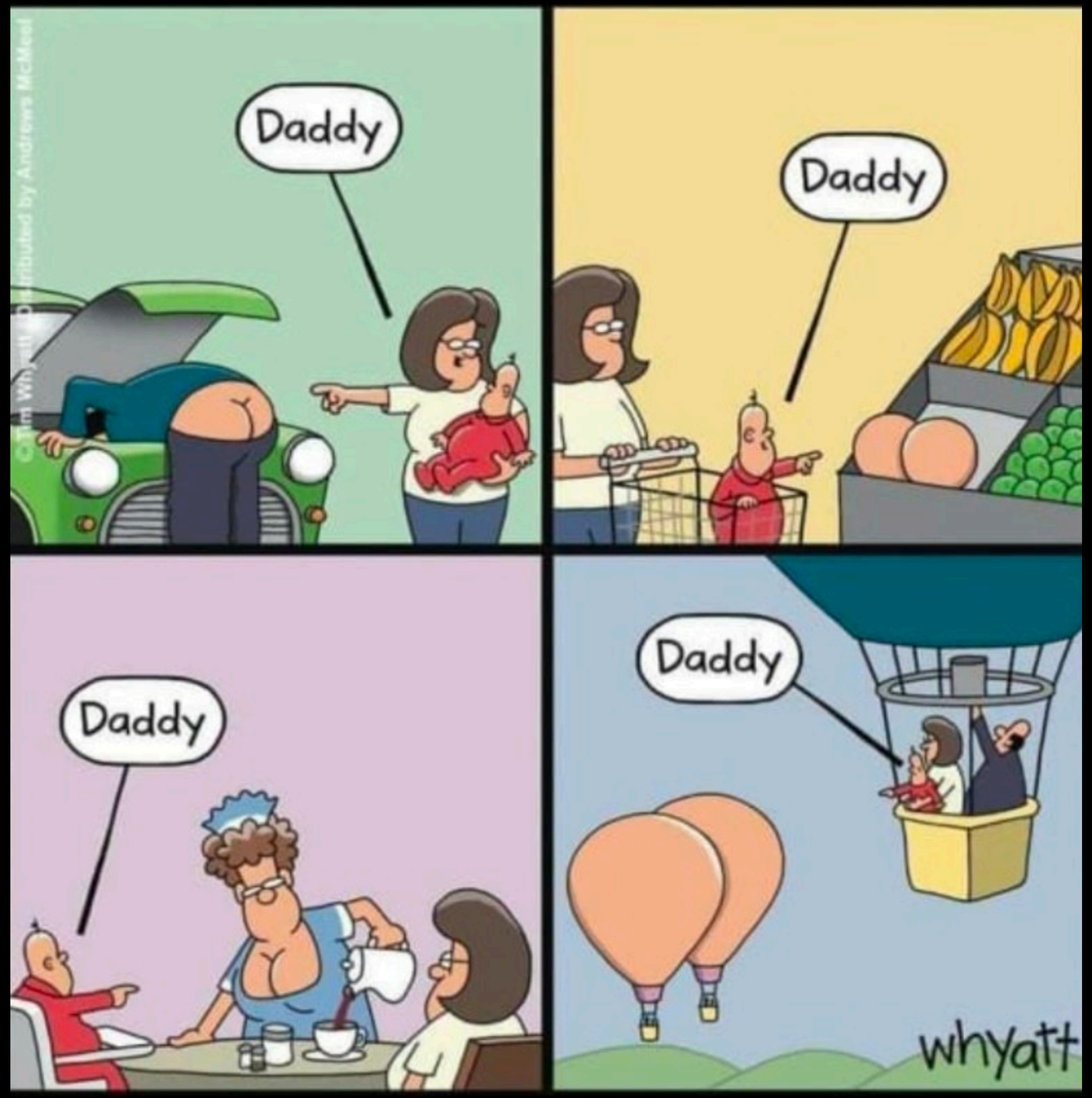
- What do you do when your model fails (when not if)...
- What shape does your data come in? (JPEG vs PNG)
- ML Engine hard limit: 1.5MB
- What do you do when your user has a class you've never seen?
  - When do you retrain your model?
- What do you do when a user has a class not even in your scope?

MACHINE LEARNING



Problem #1 (everything looks like Daddy)

MACHINE LEARNING

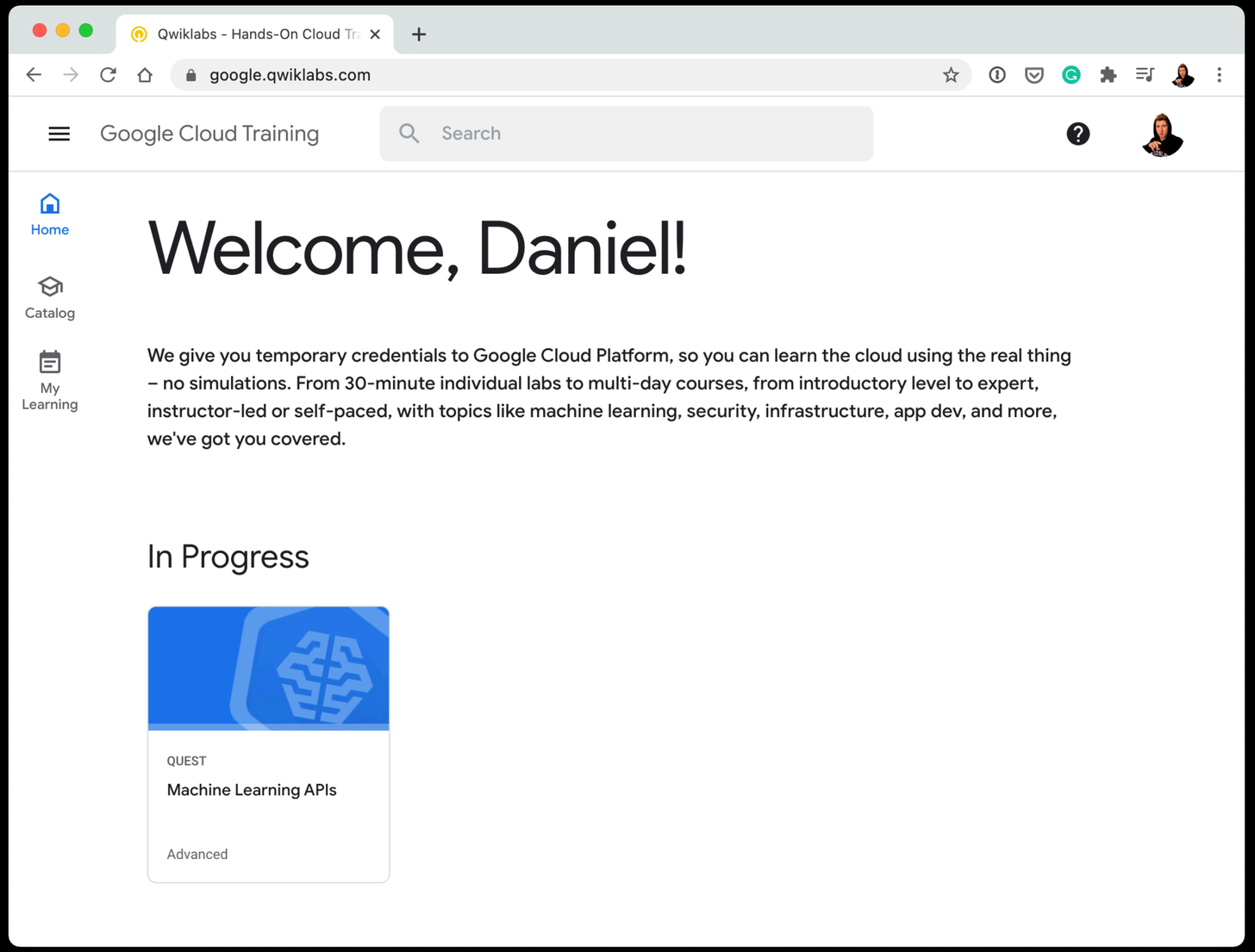


Problem #2 (everything still looks like Daddy)

End

Google Cloud services cost 💰
No credits = 💸
Shut everything down!

Learn GCP... where?



Extensions

- CI/CD (make a change... app updates automatically)
- Codify everything! (we did a lot of clicking around...)
- Actually log the data from your app (e.g. save logs to BigQuery/Google Storage)