Taking Research Into Production

Anant Nawalgaria

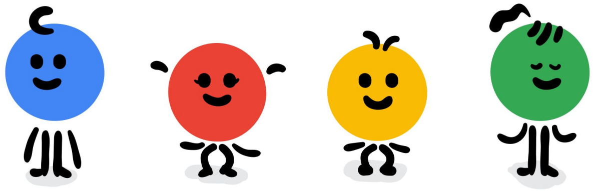
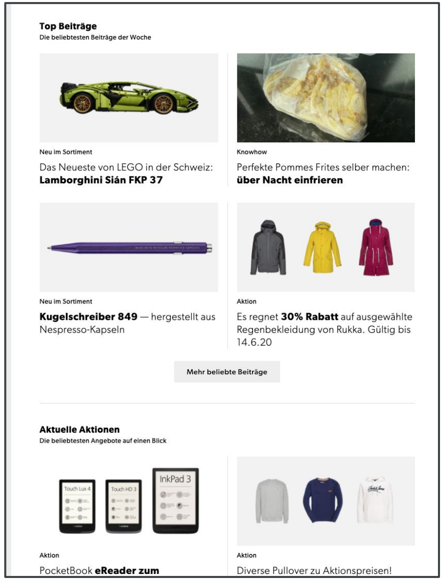


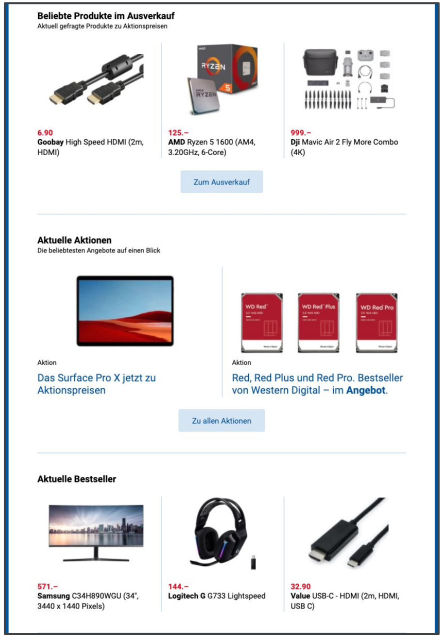
Table of contents

Second Order Personalization with RL..

01

Scoped into a simplified RL problem





12 possible article/ product recommenders to choose from based on the context

Value of Vertex AI

How Digitec Galaxus delivers personalized newsletters with reinforcement learning and Google Cloud

“As a result, even the software engineers on our team without much ML expertise feel confident... The data scientists are able to spend more of their time ..delivering more value to the users and the business”

Christian Sager

Digitec Galaxus AG
- largest online retailer in Switzerland

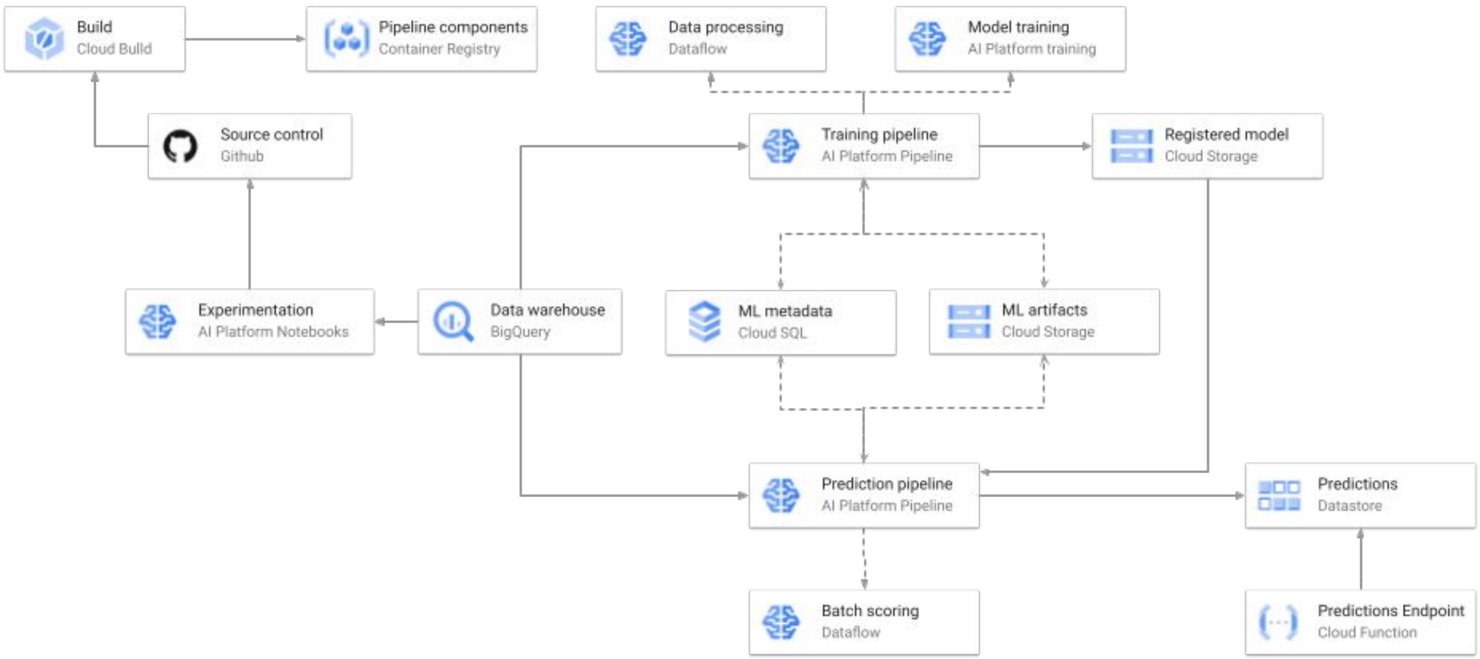
digitec.ch

GALAXUS

- **Galaxus** is the **largest Swiss online shop**
  - steadily growing range of products for almost all daily needs
  - offering consistently low prices
  - fast, reliable and free delivery
  - winners of several awards.

- **Use Case:**
  - Increase the user engagement for their newsletters by finding the best recommenders system to use for each user, and personalizing it.

Target architecture: Full stack on GCP

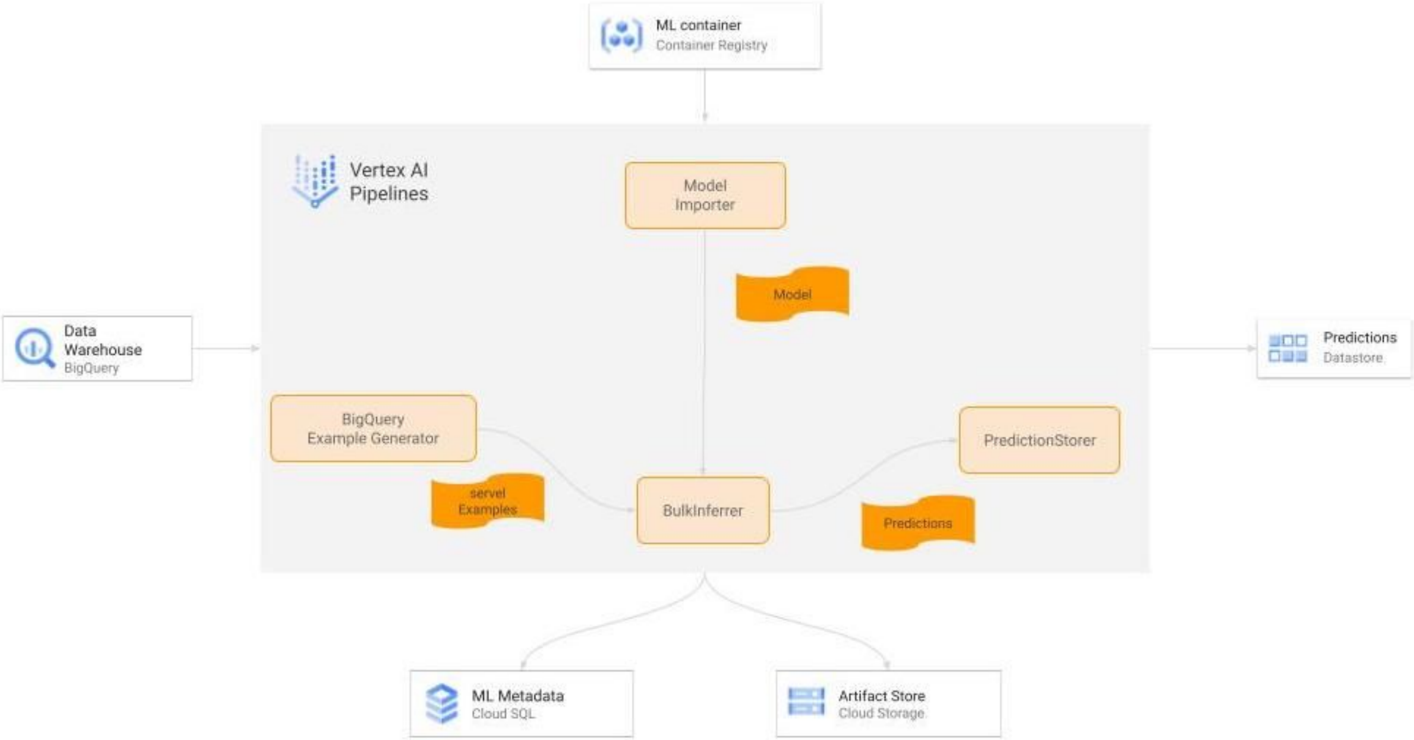


Contextual Bandits with TFX and TF-Agents on GCP

Continuous Training Pipeline (monthly)

Contextual Bandits with TFX and TF-Agents on GCP

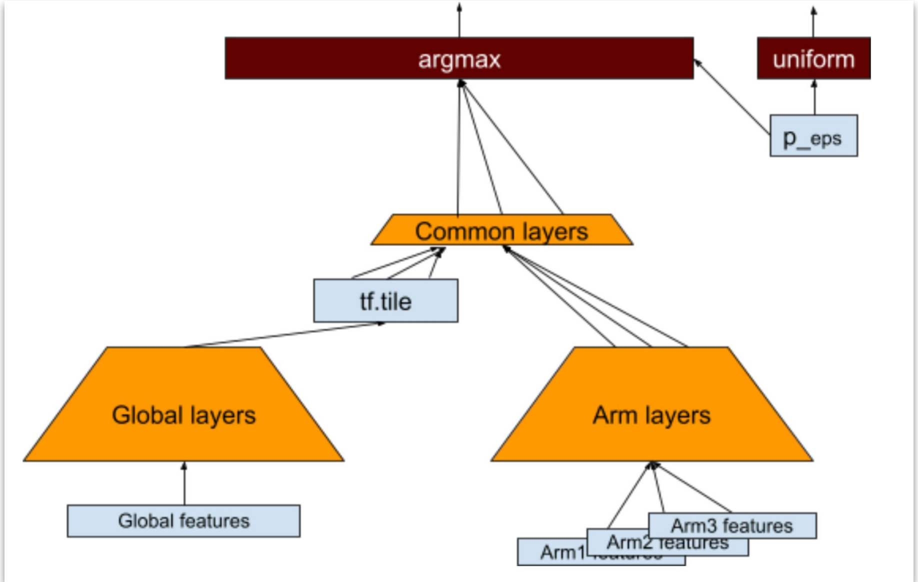
Daily Inference Pipeline



Why Contextual Bandits?

Advantages:

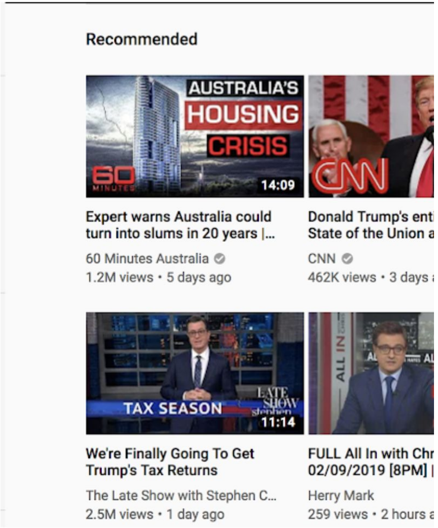
- Model generalizes over items.
- Easy to add new items on the fly.
- Number of actions can vary.
- Exploration strategy takes care of the biases coming from the prod policy.
- Performance guarantees (regret).
- Multi Objective & Constrained Optimization possible
    - E.g. Increase user engagement while keeping keeping opt-outs stable



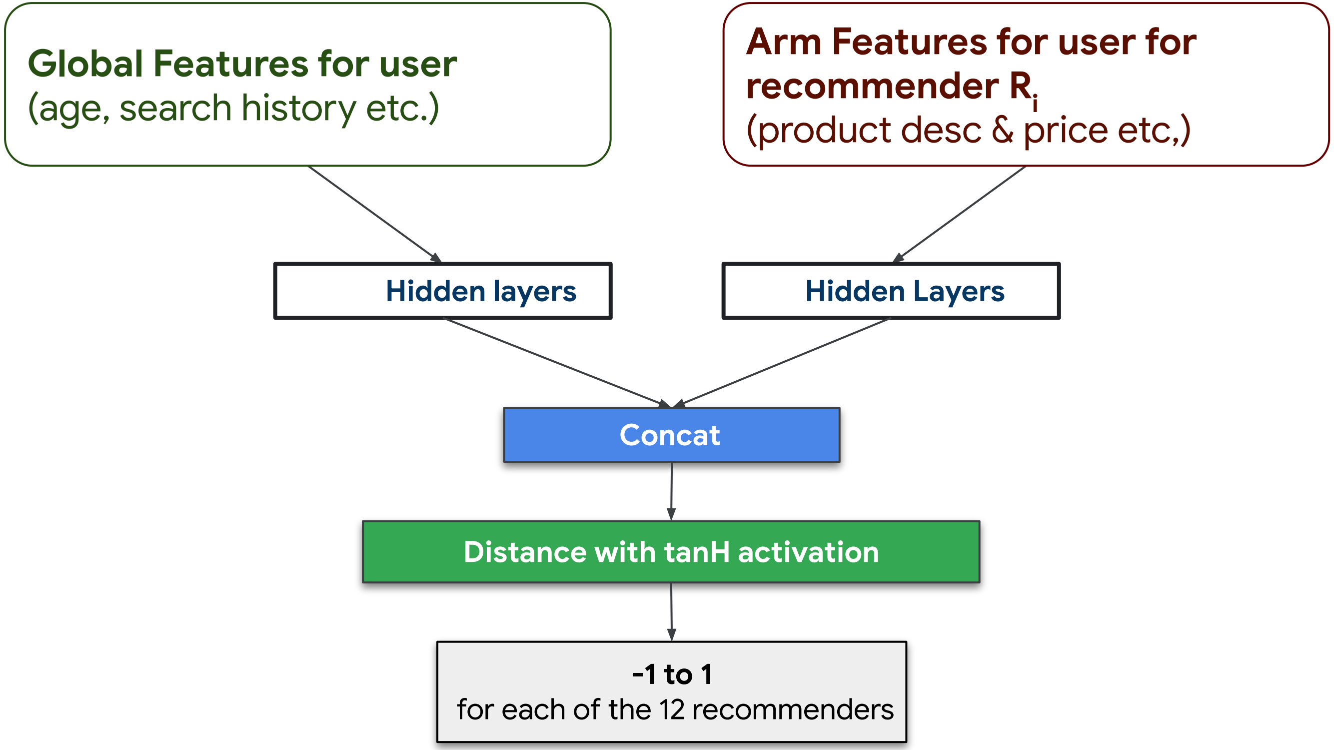
Example for an eps-Greedy model with per arm features

Features for Bandits for Recommendation

- **User Features:**
  - Demographics, Time(Week/Month), Type of user, 1 month, Search history, product bought (different levels of taxonomy) etc
- **Items:**
  - Item features for each of Item1, item2, ...
    - genre, length, popularity, ...
- **Actions:**
  - The type of Recommender based on exploitation
- **Rewards:**
  - CTR, money spent, etc...
  - -1 + unsubscribe, 1 = click



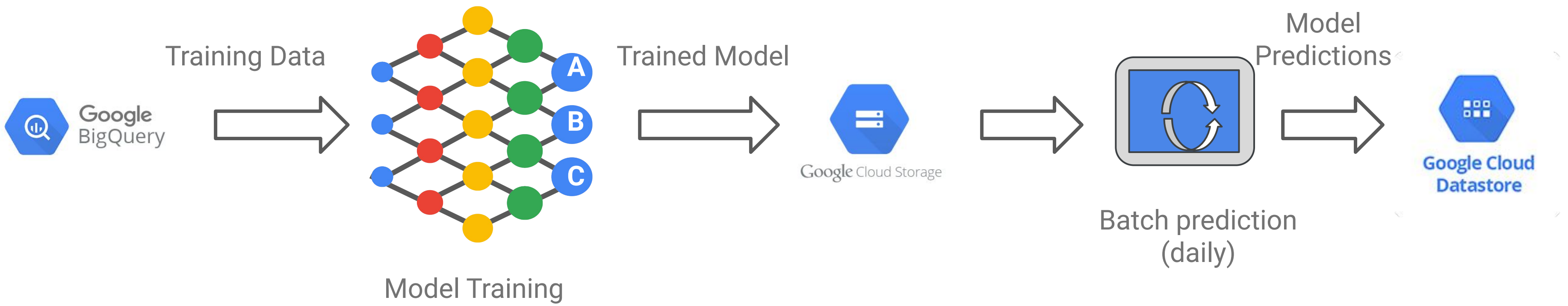
Contextual Bandit Architecture



Contextual Bandits with TFX and TF-Agents on GCP

- **Production-ready** & **scalable** TFX pipeline orchestrated by Kubeflow Pipelines
- Training data extracted from BigQuery
- The training pipeline & batch prediction runs on AI Platform Pipelines
- DataFlow for large-scale data processing
- Batch predictions stored on Datastore

  → Pipeline templates & Technical Design Doc: under development



Highlights

One-Google

Prod: Serving 2 mil weekly

Community · TFX ·

How Digitec Galaxus trains and serves millions of personalized newsletters per week with TFX

August 11, 2021

Posted by Christian Sager (Product Owner, Digitec Galaxus) and Anant Nawalgaria (ML Specialist, Google)

Semi Supervised Semantic Segmentation (S^4)..

02

The Partnership

Google Cloud

Google Research

Munich RE

Taktile

The use case: Geo Spatial Damage Assessment

Challenges

1

Domain Labelling is extremely expensive

2

Very time/cost intensive for developing such models and training them regularly

Accelerated Productionisable results within hours instead of weeks/months

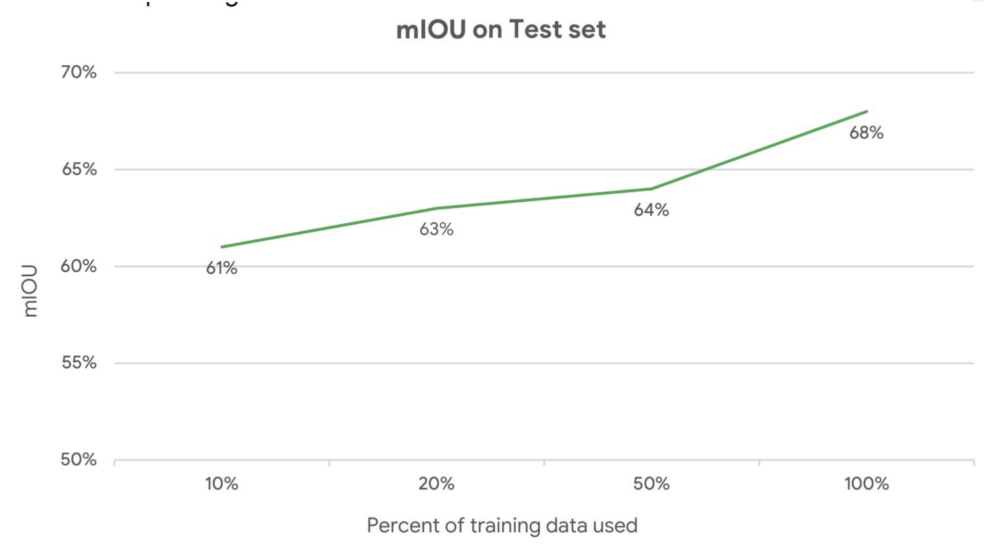


Figure 1: Visual Inspection AI test result.

Challenges with Data Labelling

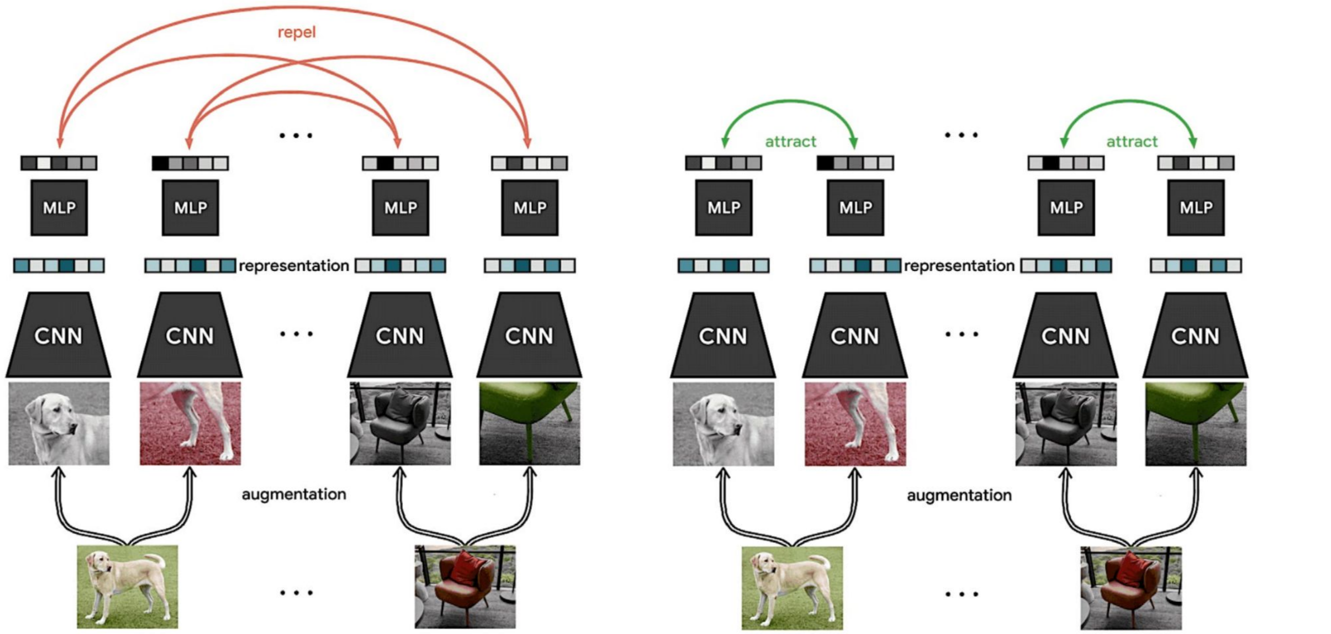
Manual processing

Standard ML is very Data Inefficient and often requires lots of labelled data to work

Labelling requires:

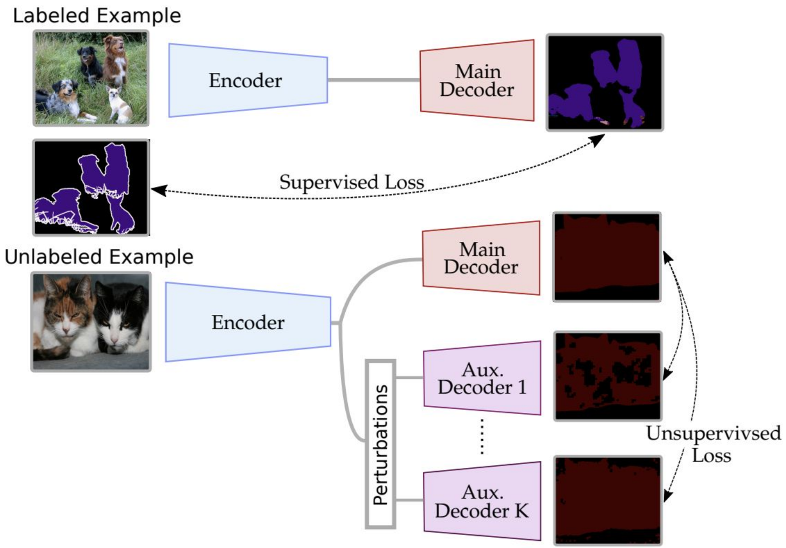
1. Domain Expertise
2. Precise labels
3. $3 or more per label

Enter semi supervised learning: SimCLR



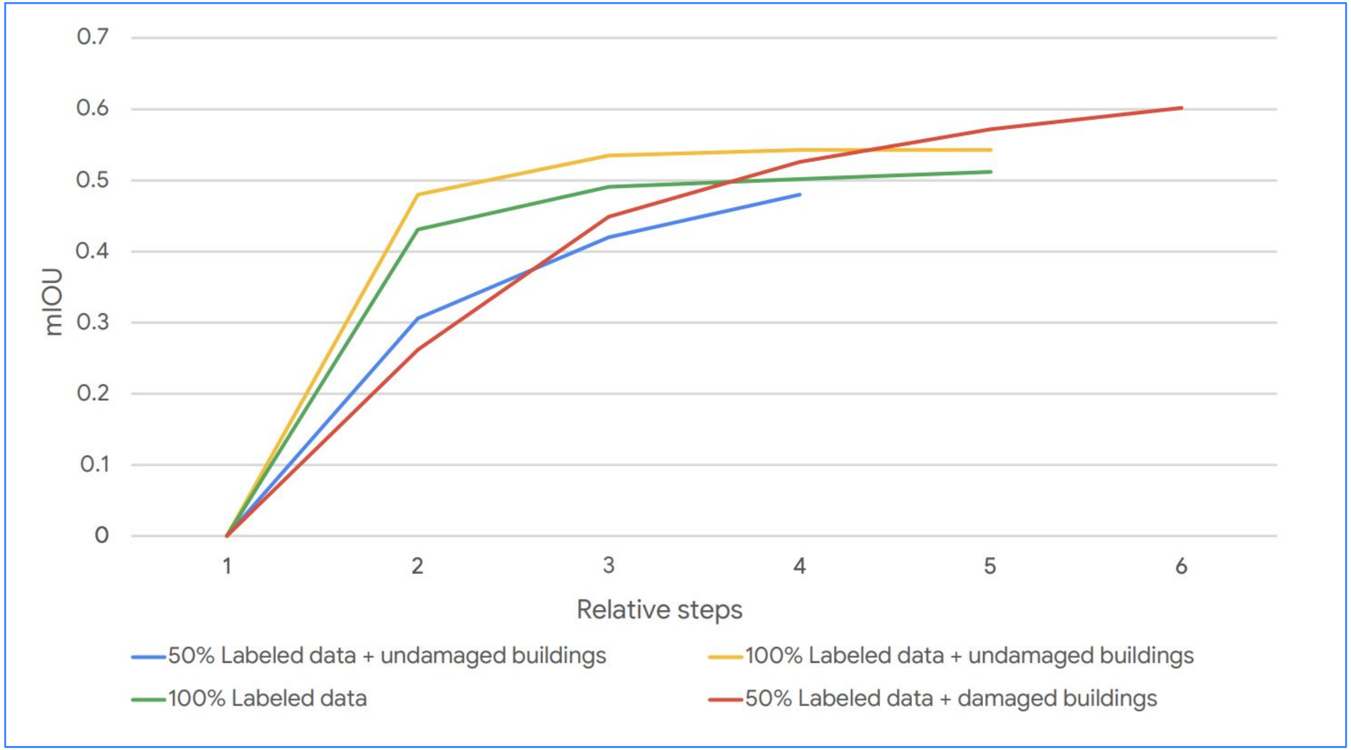
Cutting edge field of research in doing more with less (labels)

SSL using Cross Consistency Training



Reconstruction of Perturbed Latent spaces

Cost savings for Visual Use cases

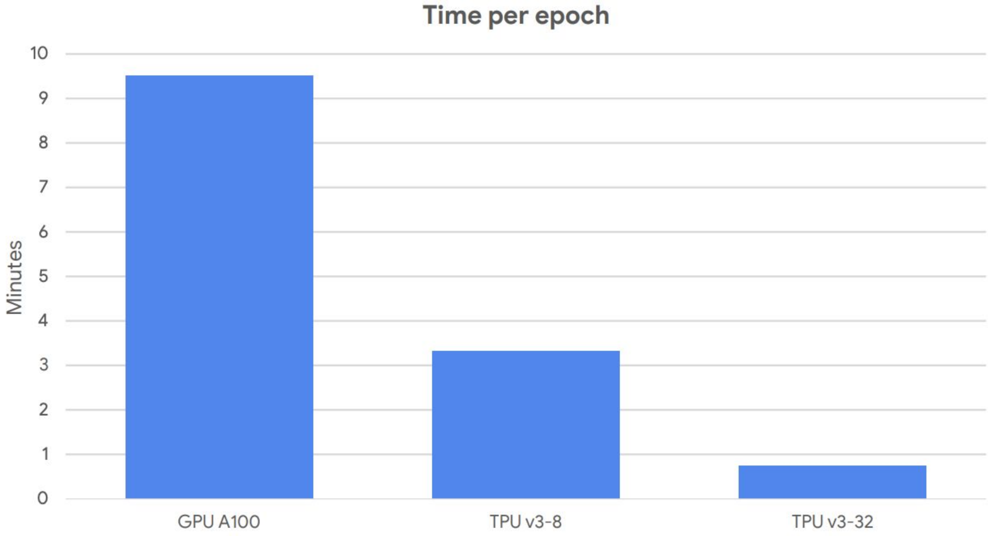


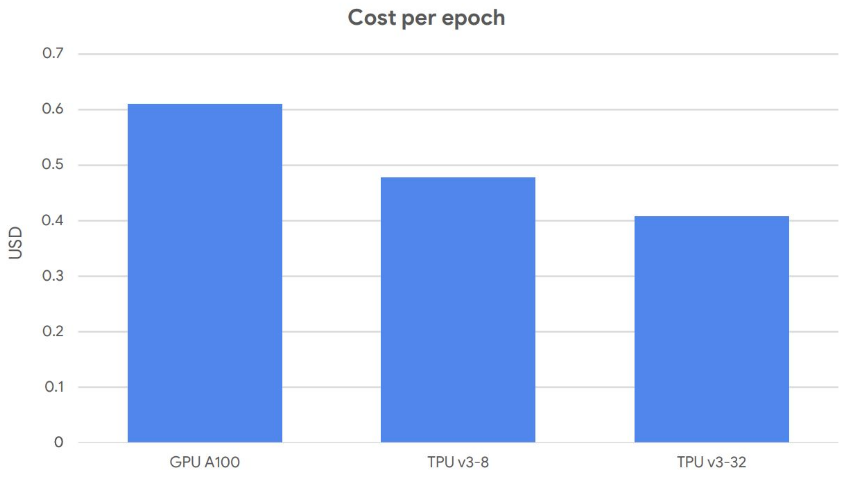
\+ Same performance for half the labels/cost

\- Increased dataset/ training time

Enter: TPUs

Time & cost savings with just the TPU v3-32





= 18.75x perf/TCO. Much more possible with TPU V4

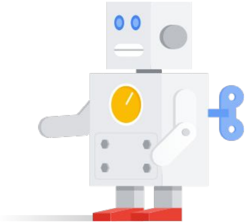
Key takeaways for your Customer

50% Cost savings

For Human labelling

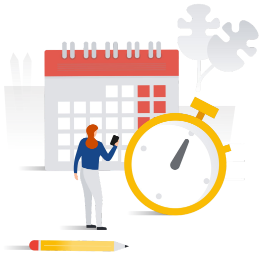
92% Training Time reduction

For Training Semi Supervised Models



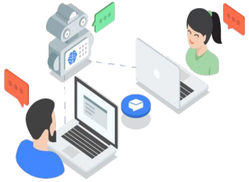
18.75x perf/TCO

Considering the time/cost efficiency of TPUs



Accelerated time to market

With Visual Inspection AI



SOTA collaboration

With Cloud & research to be successful

Next steps

Improving the Speed and Efficiency of AI-Enabled Damage Assessment in Insurance

Authors:

Anant Nawalgaria, Staff ML Specialist Engineer, Google
Johannes Kuhn, Sr. Technical Data Specialist, Munich Re
Dr. Ulrich Nöbauer, Sr. Technical Data Specialist, Munich Re
John McSpedon, ML Engineer, Taktile

Special thanks:

Raviteja Vemulapalli, Research Scientist, Google
Genquan Duan, Sr. Software Engineer, Google
Dr. Henna Karna, Global Insurance, Google

[Technical Whitepaper]

[TPU blogpost featured]

Thank You!