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Automating machine learning pipelines with AWS Lambda

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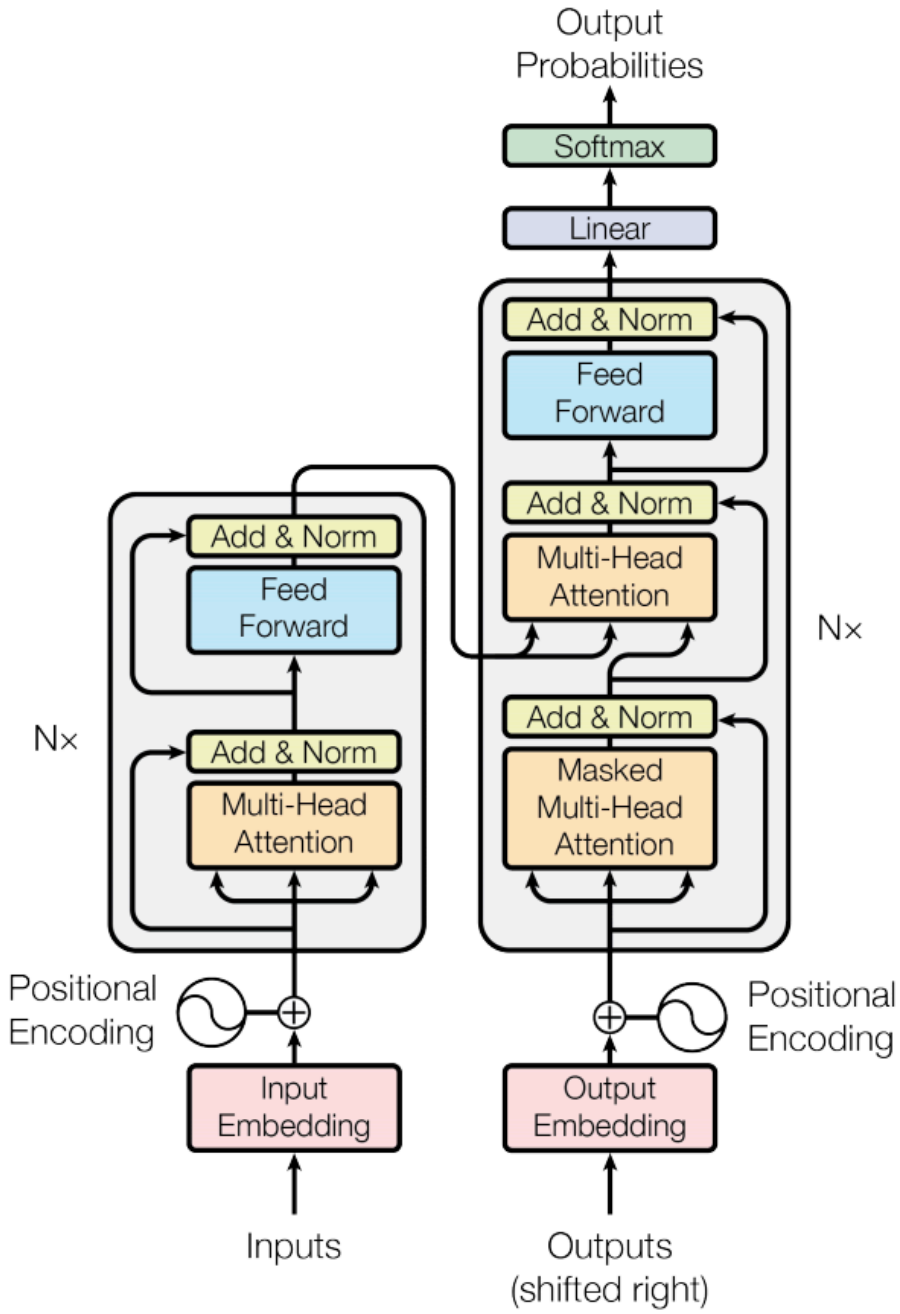
February 2019

Today's Topics

- Going from research to production with ML
- Two problems: big models and big data
- Why Lambda?
- What we're doing now



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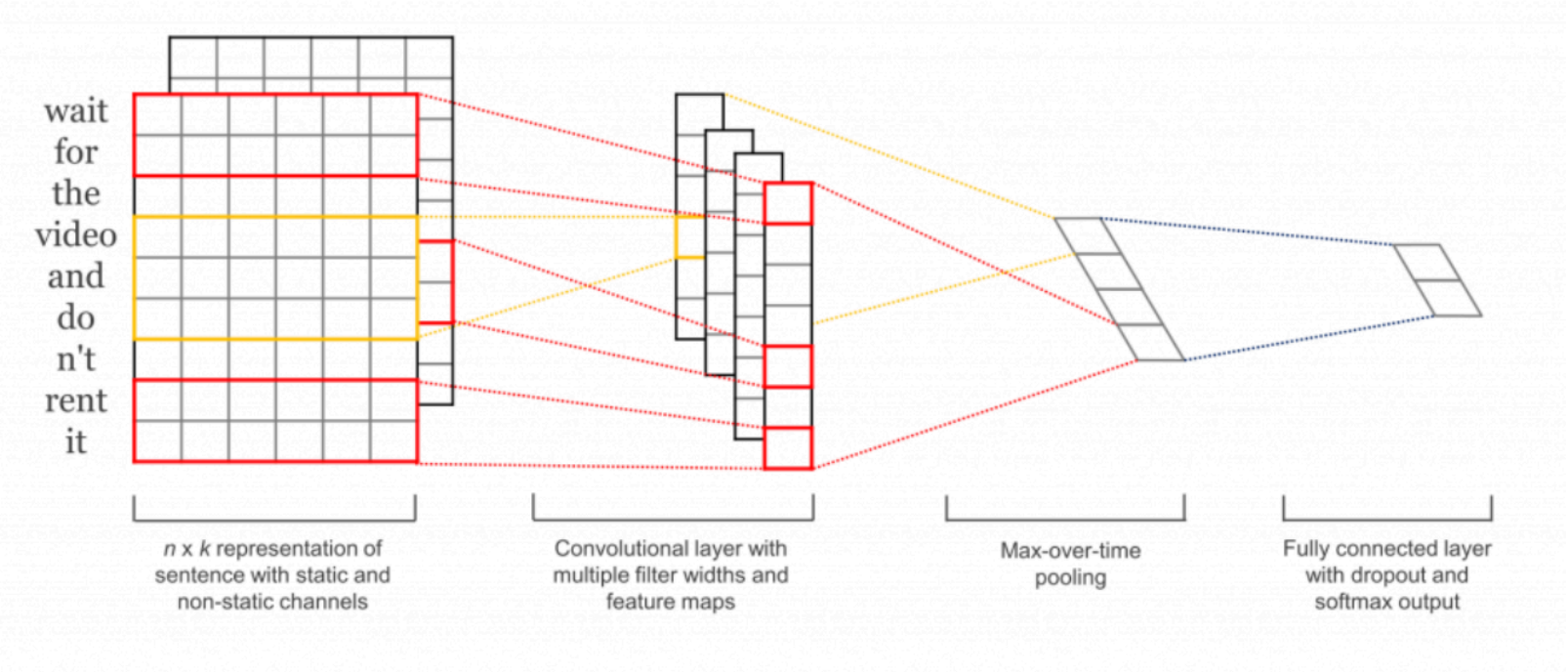
Okay, so what are we researching?

- Dense representations of documents



Source: Kim, Y. (2014). Convolutional Neural Networks for Sentence Classification

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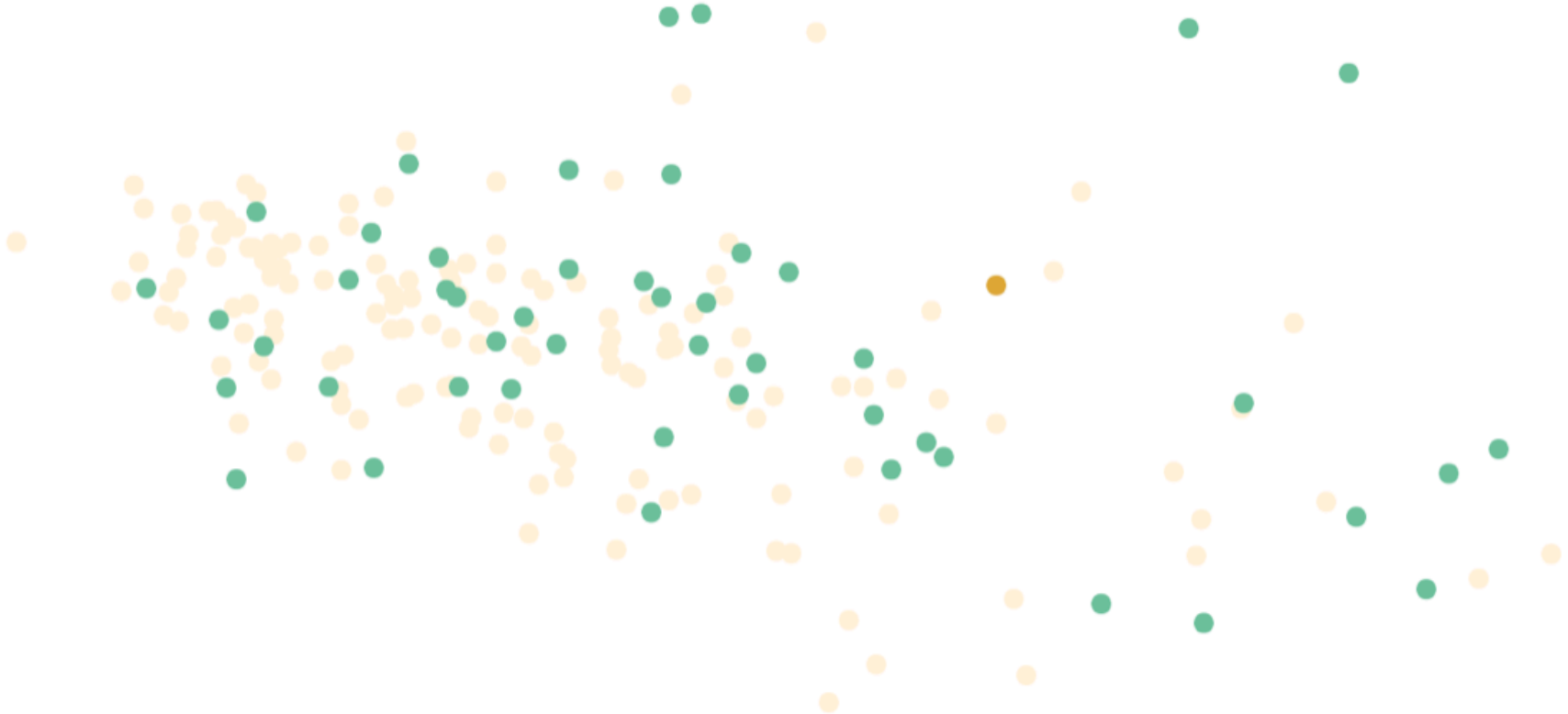
Okay, so what are we researching?



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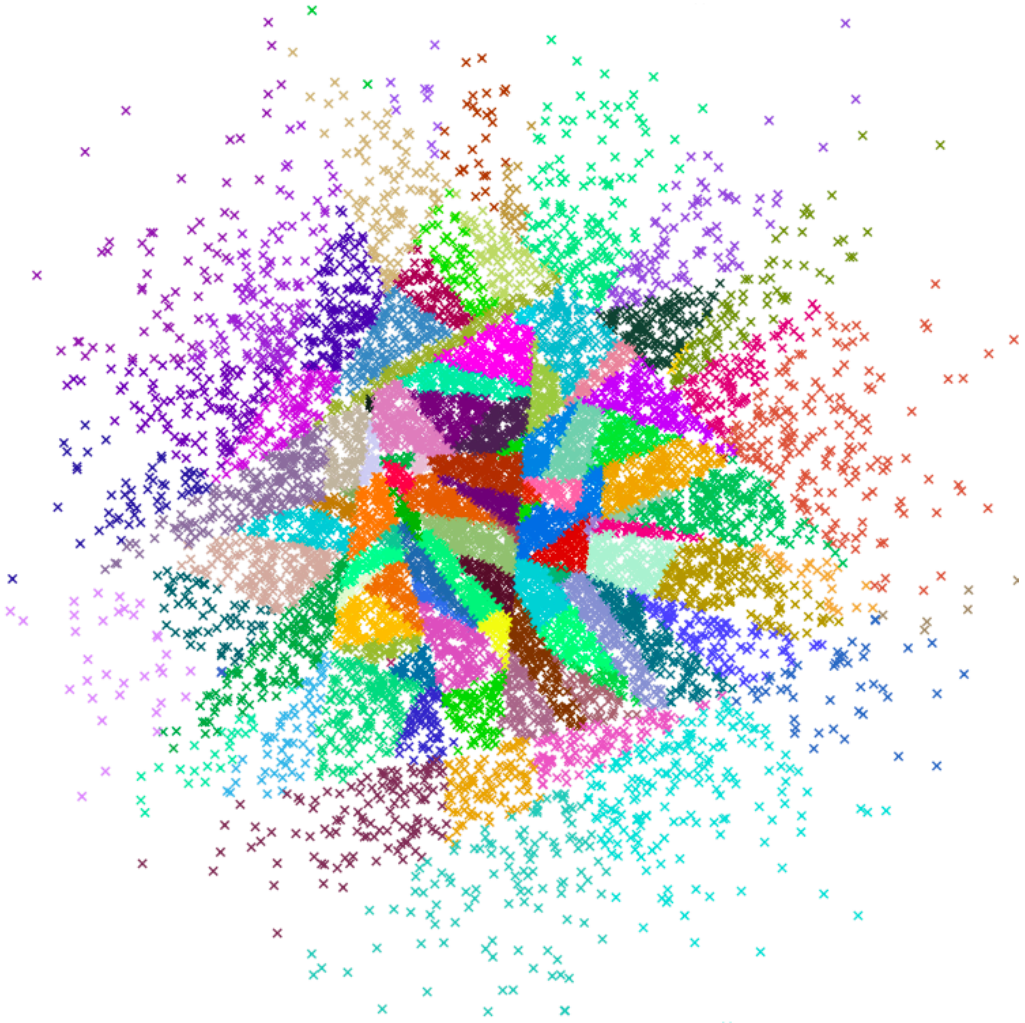
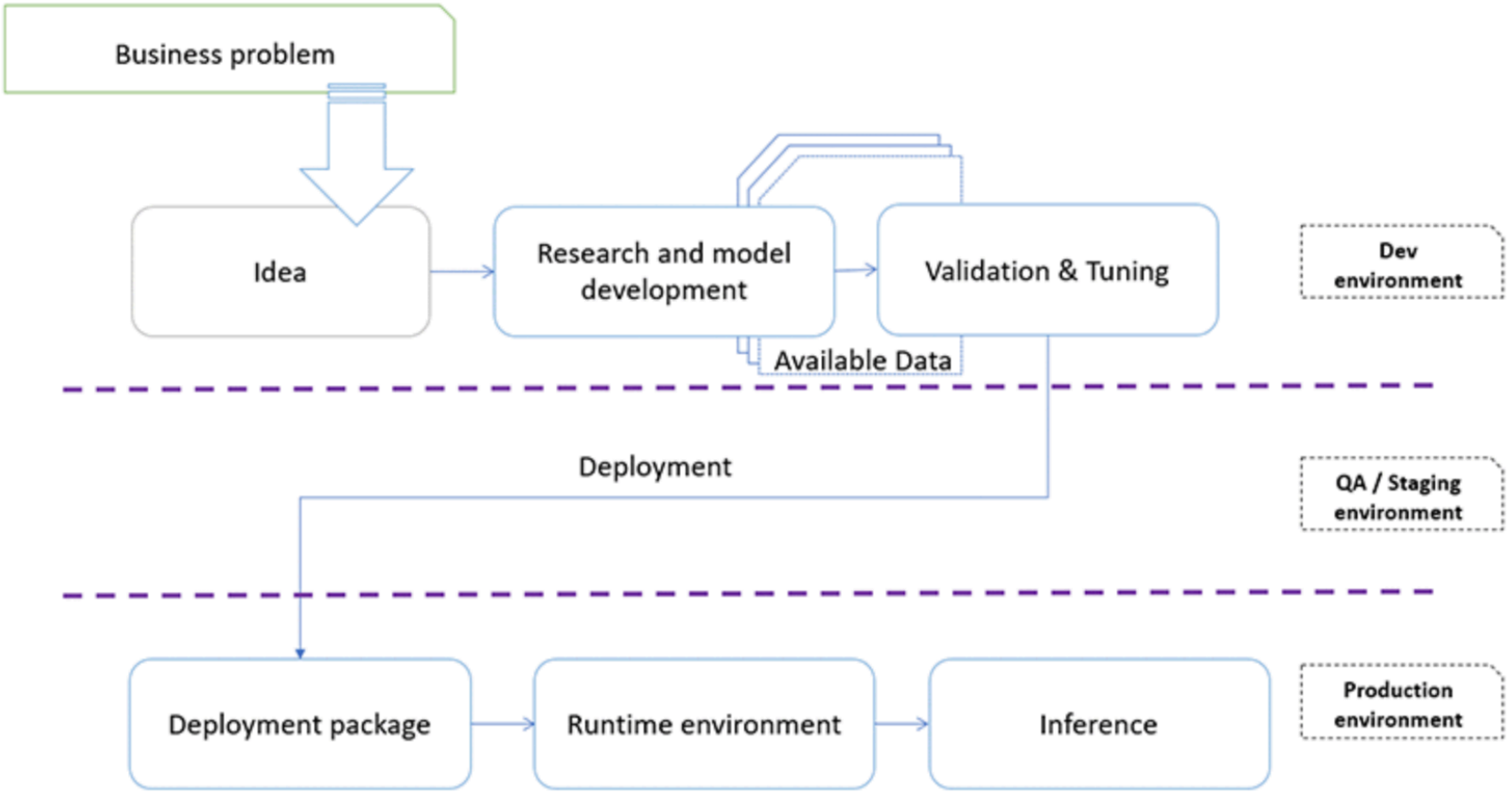
And how are we using it?

- Simple approximate nearest neighbours
- Embedding documents on the fly
- Visualising in two-dimensional space



An ideal world



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But I can train ImageNet on 512 GPUs in 2.5 minutes!

Not so fast

- Efficient use of GPUs for NLP is getting much better, but still way slow
- Models take days to run a single epoch on 8xV100s.
- Concept is still the same: we want to cut models and put them in S3 manually, then trigger inference to deployment

What do we need?

A database

Somewhere to hold the documents, metadata, representations, and dim-reduced representations.

Training instance

We need somewhere to train our ML models.

API

Other applications need to interact with the models and data.

Model storage

Trained models need to go somewhere.

Cutting-edge ML in six easy steps (it's a piece of cake)

- Train
- Test (and benchmark)
- Version
- Deploy
- Publish new model
- Repeat

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What do we really need?

- A data warehouse
- A production database
- A data lake
- ETL for data prep
- Deep learning training instances
- Deep learning inference instances for batch/streaming
- ANN index building instance
- PCA training instance
- Benchmarking
- RESTful API for document embedding (with GPU)
- RESTful API for nearest neighbours (without GPU)
- Secrets management
- Autoscaling
- CI/CD for models and code

What do we actually really need?

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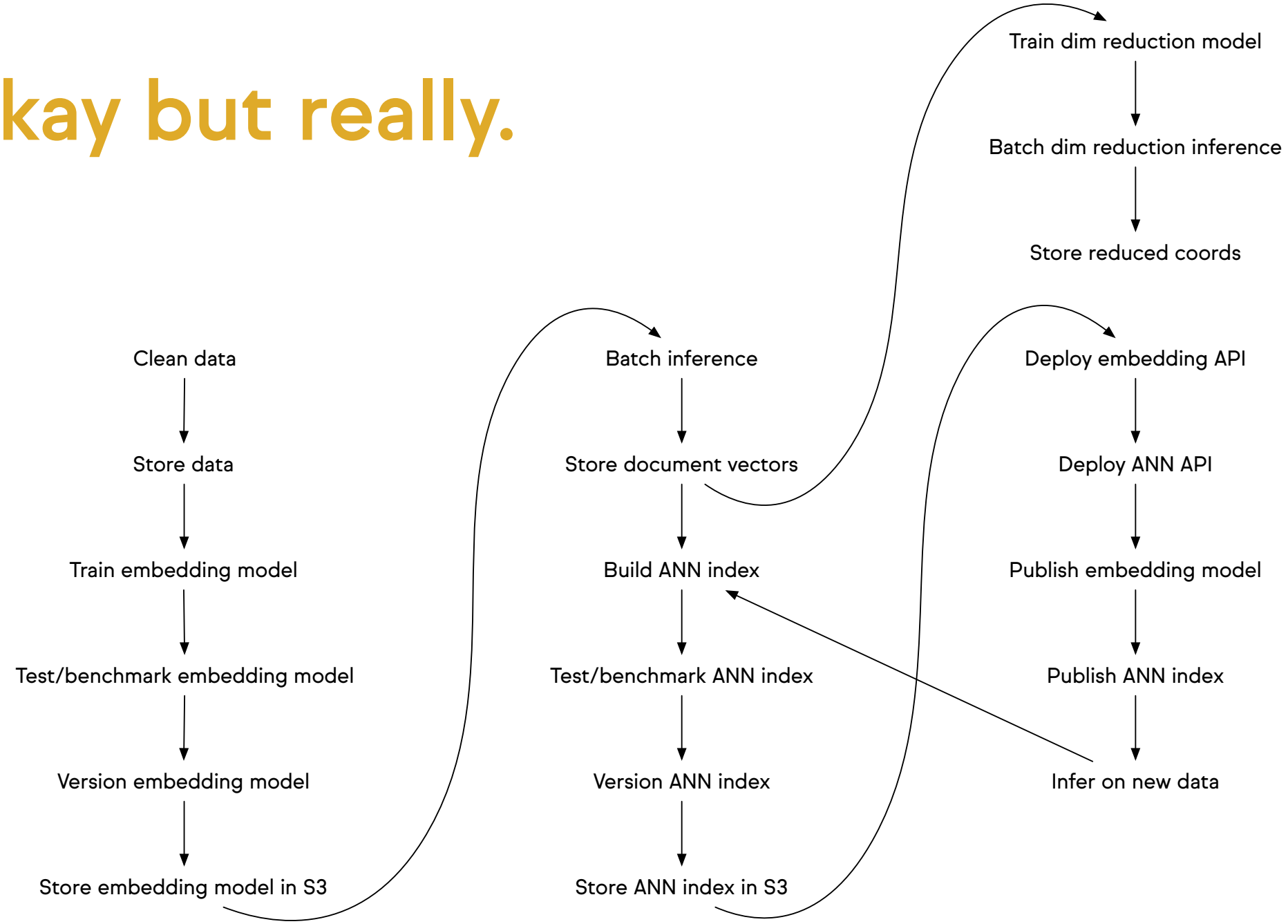
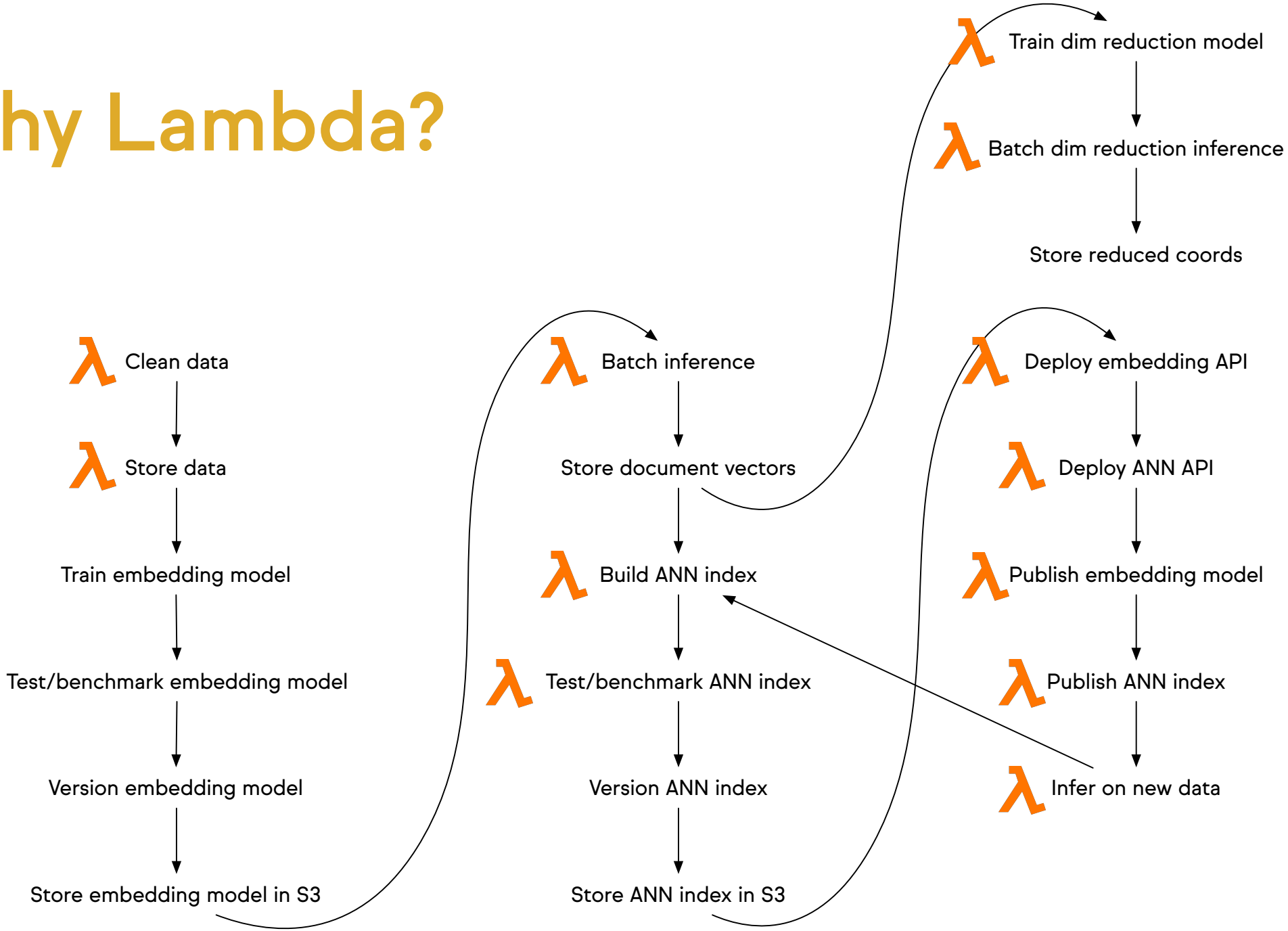
Okay but really.



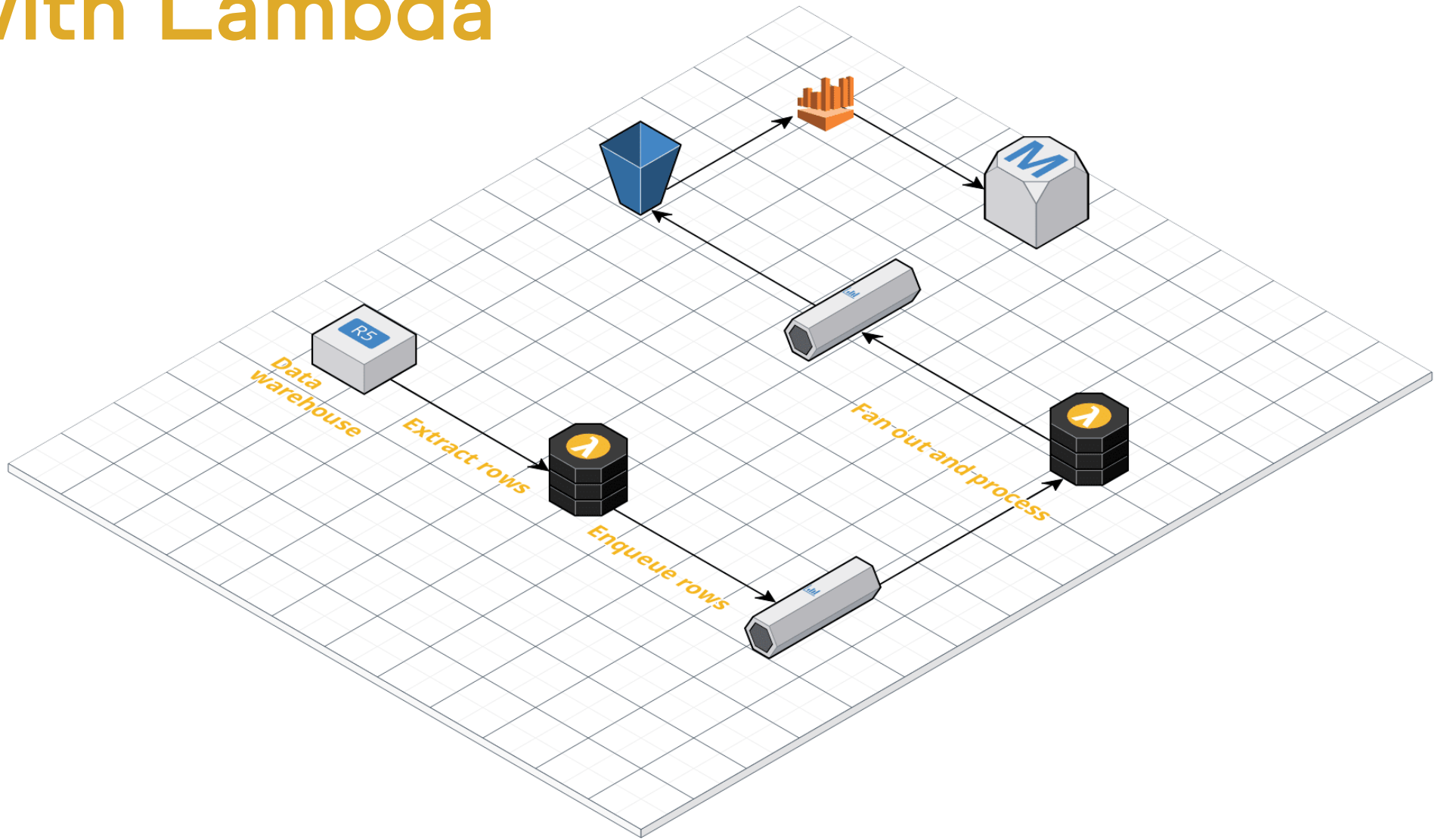
Why Lambda?

- Why not:
  - Ansible?
  - CloudFormation?
  - Jenkins?
  - Airflow?
  - Whatever else?

Why Lambda?


Clean data
Store data
Train embedding model
Test/benchmark embedding model
Version embedding model
Store embedding model in S3
Batch inference
Store document vectors
Build ANN index
Test/benchmark ANN index
Version ANN index
Store ANN index in S3
Train dim reduction model
Batch dim reduction inference
Store reduced coords
Deploy embedding API
Deploy ANN API
Publish embedding model
Publish ANN index
Infer on new data

ETL with Lambda



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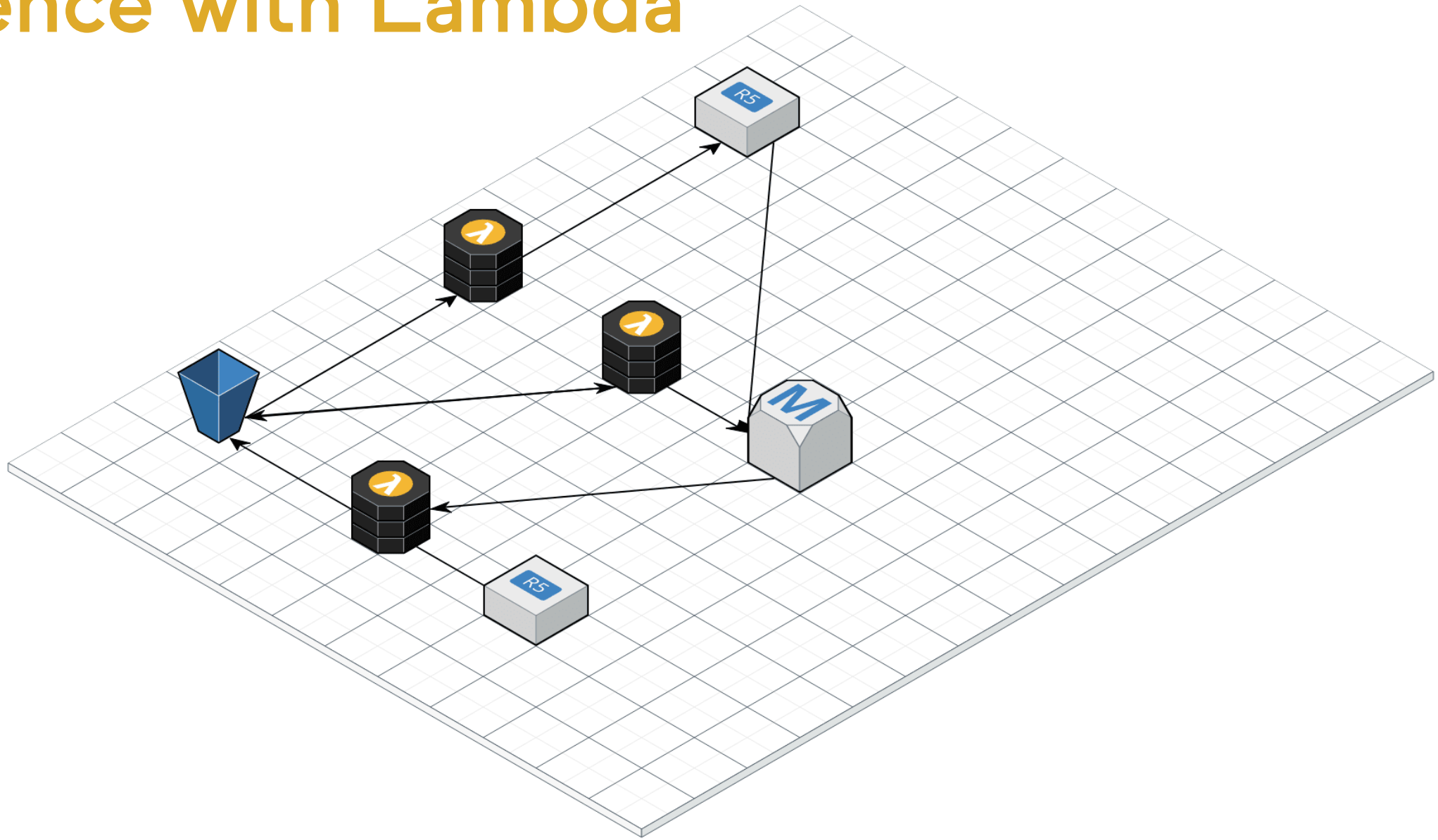
Inference with Lambda



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