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Machine Learning System Design

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Machine Learning Primer

- Introduction
- Feature Selection and Feature Engineering
- Training Pipeline
- Inference
- Metrics Evaluation

Video Recommendation

Feed Ranking

Ad Click Prediction

Rental Search Ranking

Estimate Food Delivery Time

Machine Learning Knowledge

Machine Learning Model Diagnosis

Conclusion

Mark Module as Completed

Inference

Learn common techniques to scale inference in production environments.

We'll cover the following

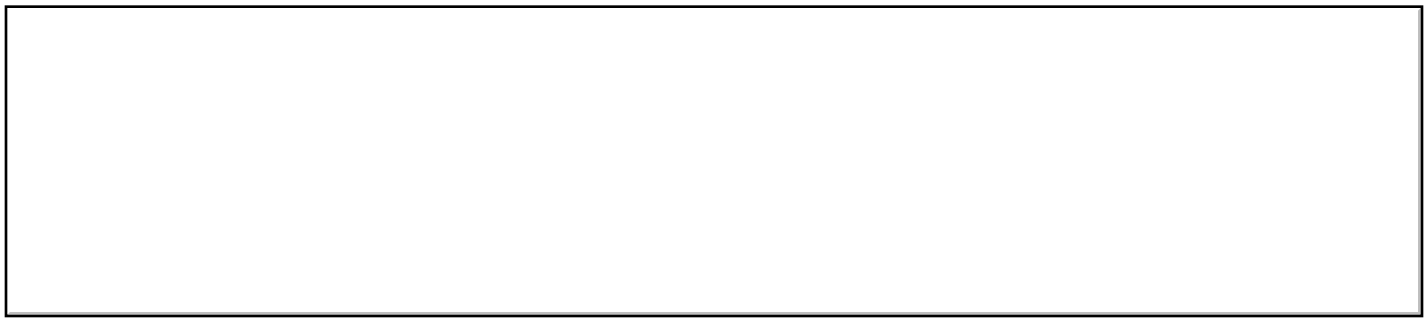
- Inference
  - 1. Imbalance workload
    - Serving logics and multiple models
  - 2. Non-stationary problem
  - 3. Exploration vs. exploitation: Thompson Sampling

Inference#

Inference is the process of using a trained machine learning model to make a prediction. Below are some of the techniques to scale inference in the production environment.

1. Imbalance workload#

- During inference, one common pattern is to split workloads onto multiple inference servers. We use similar architecture in Load Balancers. It is also sometimes called an Aggregator Service.



Dispatcher diagram

1. Clients (upstream process) send requests to the Aggregator Service. If the workload is too high, the Aggregator Service splits the workload and sends it to workers in the Worker pool. Aggregator Service can pick workers through one of the following ways:

   a) Work load

   b) Round Robin

   c) Request parameter

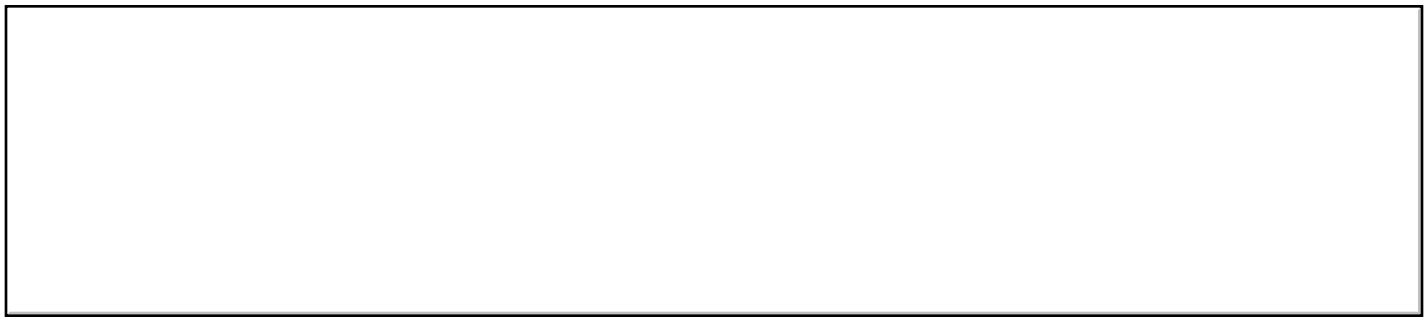
2. Wait for response from workers.

3. Forward response to client.

Serving logics and multiple models#

- For any business-driven system, it's important to be able to change logic in serving models. For example, in an Ad Prediction system, depending on the type of ad

candidates, we will route to a different model to get a score.



Combine multiple models in Inference

2. Non-stationary problem#

- In an online setting, data is always changing. Therefore, the data distribution shift is common. So, keeping the models fresh is crucial to achieving sustained performance. Based on how frequently the model performance degrades, we can then decide how often models need to update/retrain. One common algorithm that can be used is the Bayesian Logistic Regression.

3. Exploration vs. exploitation: Thompson Sampling#

- In an Ad Click prediction use case, it's beneficial to allow some exploration when recommending new ads. However, if there are too few ad conversions, it can reduce company revenue. This is a well-known exploration-exploitation trade-off. One common technique is Thompson Sampling where at a time, t, we need to decide which action to take based on the reward.

Training Pipeline

Next

Metrics Evaluation

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