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# Machine Learning System Design

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## Machine Learning Primer

## Video Recommendation

- Problem Statement and Metrics
- Candidate Generation and Ranking Model
- Video Recommendation System Design

## Feed Ranking

## Ad Click Prediction

## Rental Search Ranking

## Estimate Food Delivery Time

## Machine Learning Knowledge

## Machine Learning Model Diagnosis

## Conclusion

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# Problem Statement and Metrics

Learn about the problem statement and metrics for building a video recommendation system.

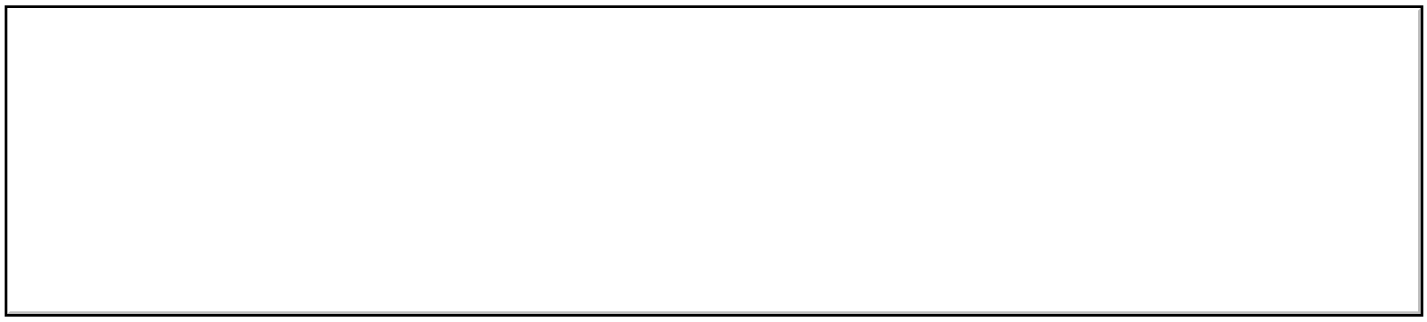
**We'll cover the following**



# Video recommendations#

# 1. Problem statement#

Build a video recommendation system for YouTube users. We want to maximize users' engagement and recommend new types of content to users.



Video recommendation system

# 2. Metrics design and requirements#

## Metrics#

### Offline metrics#

- Use precision, recall, ranking loss, and logloss.

### Online metrics#

- Use A/B testing to compare Click Through Rates, watch time, and Conversion rates.

## Requirements#

### Training#

- User behavior is generally unpredictable, and videos can become viral during the day. Ideally, we want to train many times during the day to capture temporal changes.

### Inference#

- For every user to visit the homepage, the system will have to recommend 100 videos

for them. The latency needs to be under 200ms, ideally sub 100ms.

- For online recommendations, it's important to find the balance between exploration vs. exploitation. If the model over-exploits historical data, new videos might not get exposed to users. We want to balance between relevancy and fresh new content.

# Summary#

| Type | Desired goals |
| --- | --- |
| Metrics | Reasonable precision, high recall |
| Training | High throughput with the ability to retrain many times per day |
| Inference | Latency from 100ms to 200ms |
| | Flexible to control exploration versus exploitation |

Metrics Evaluation

Next

Candidate Generation and Ranking M…

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