

# Intro to ML Sys Design

## 1. Business & ML objective

Data Scientist: Care abt ML metrics

Companies: Care abt Business metrics

Ultimate Goal: Either Increase Profit or Decrease cost - Directly or Indirectly

Amt of ad revenue,  
# Monthly active users,  
Purchase thru rate  
Take rate

## 2. Requirements of ML Systems

Reliability

Continue to perform the correct fun at the desired level of performance even in the face of faults

Scalability

Model Size

Volume

# of Models

Maintainability

Different Teams involved

Adaptability

Adapt to shift in data distribution & business requirement

## 3. Iterative Process

1. Choose metrics to optimize
2. Collect data & obtain label
3. Engineer Feature
4. Train Model
5. Error analysis leads to relabel
6. Train model again
7. Error analysis lead to class imbalance
8. Train model
9. Model worse for recent data
10. Train Model
11. Optimize CTR instead of Impression

Structure

Chp 3: Data Engineering  
Chp 4: Sampling & generating labels  
Chp 5: Feature Engineering  
Chp 6: MModel Selection, training & evaluation  
Chp 8: Monitoring  
Chp 9: Continual Learning

## 5. Objective Functions

Obj Fn guides learning process

Ex: MAE, RMSE, Cross Entropy

Decoupling Objectives

Combined loss  
Train one model

loss = a \* quality loss + b \* engagement loss

Two loss  
Two different models

Easier to Tweak  
Easier to Maintain  
Different Schedule

a \* quality score + b \* engagement score

## 4. Framing ML Problems

Classification Vs Regression

Example conversion  
Reg -> Class: By bucketizing  
Class -> Reg: By O/p to 0-1

House Prediction  
email Classification

Binary Vs MultiClass

When Class is high:  
\* Data collection is Problem  
one Approach - Hierarchical Classification

MultiClass Vs Multilabel

Multilabel as Multiclass - Set of binary  
Multilabel Limitation  
- Label annotation  
- Varying # classes

Multiple ways to Frame a problem]

Predict the app a user will open next  
1. As classification  
2. As Regression (extensible)