General approaches for metrics optimization

Overview

- Loss vs metric
- Approaches to metrics optimization in general

Loss and metric

- **Target metric** is what *we* want to optimize
  최종적으로 목표 달성 정도를 측정하는 값
- **Optimization loss** is what *model* optimizes
  모델에서 직접적으로 줄이고자 하는 값
  - meric을 직접적으로 최적화하기 어렵기 때문에 metric을 먼저 최적화

Synonyms: loss, cost, objective + error

ex) log loss로 손실을 최적화한 다음에 accuracy score로 결과를 판단

Approaches for target metric optimization

- **Just run the right model!**
  - MSE, Logloss

    직접 최적화할 수 있는 지표
- **Preprocess train and optimize another metric**
  - MSPE, MAPE, RMSLE, ...

    XGBoost에서는 직접 MSPE 최적화(x) -> MSE 최적화

    Resample train -> optimize MSE ~= optimize MSPE
- **Optimize another metric, postprocess predictions**
  - Accuracy, Kappa

    optimize incorrect metric -> post-processing ~= optimize metric
- **Write custom loss function**
  - Any, if you can

    Quadratic-weighted Kappa

Custom loss for XGBoost

XGBoost에서 logloss로 커스텀하는 예

- **Define an 'objective':**
  - function that computes *first and second order derivatives* w.r.t. predictions.

```
def logregobj(preds, dtrain):
    labels = dtrain.get_label()
    preds = 1.0 / (1.0 + np.exp(-preds))
    grad = preds - labels
    hess = preds * (1.0-preds)
    return grad, hess
```

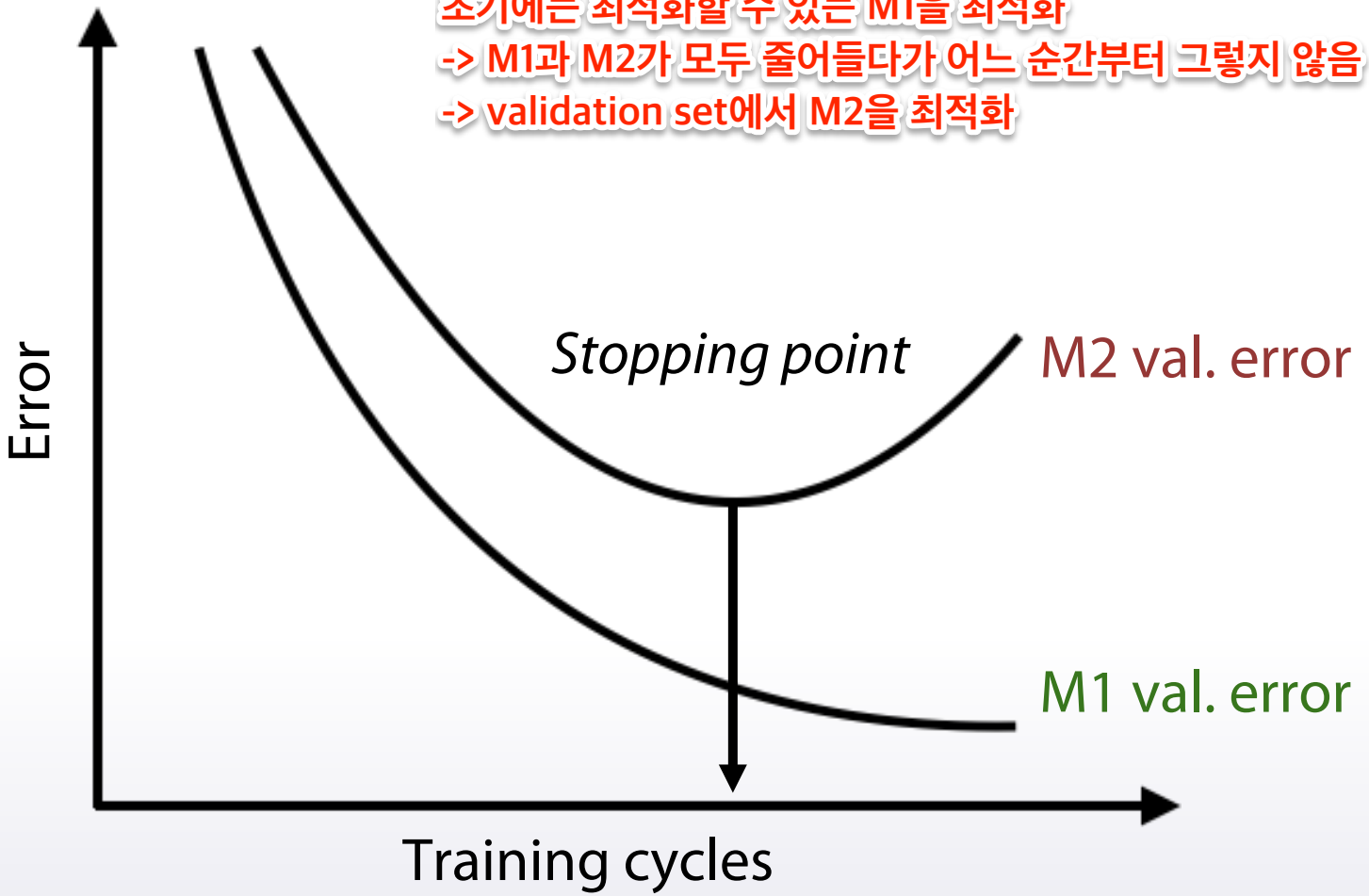
Approaches for target metric optimization

- **Just run the right model!**
  - MSE, Logloss
- **Preprocess train and optimize another metric**
  - MSPE, MAPE, RMSLE, ...
- **Optimize another metric, postprocess predictions**
  - Accuracy, Kappa
- **Write custom loss function**
  - Any, if you can
- **Optimize another metric, use early stopping**
  - Any

Early stopping

- Optimize metric M1, monitor metric M2
  - Stop when M2 score is the best

초기에는 최적화할 수 있는 M1을 최적화
-> M1과 M2가 모두 줄어들다가 어느 순간부터 그렇지 않음
-> validation set에서 M2을 최적화



Conclusion

- **Loss vs metric**
- **Approaches in general:**
  - Just run the right model
  - Preprocess train and optimize another metric
  - Optimize another metric, postprocess predictions
  - Write a custom loss function
  - Optimize another metric, use early stopping