Metrics optimization

Lesson overview

In this video:

- **Metrics:**
  - Why there are so many
  - Why should we care about them in competitions

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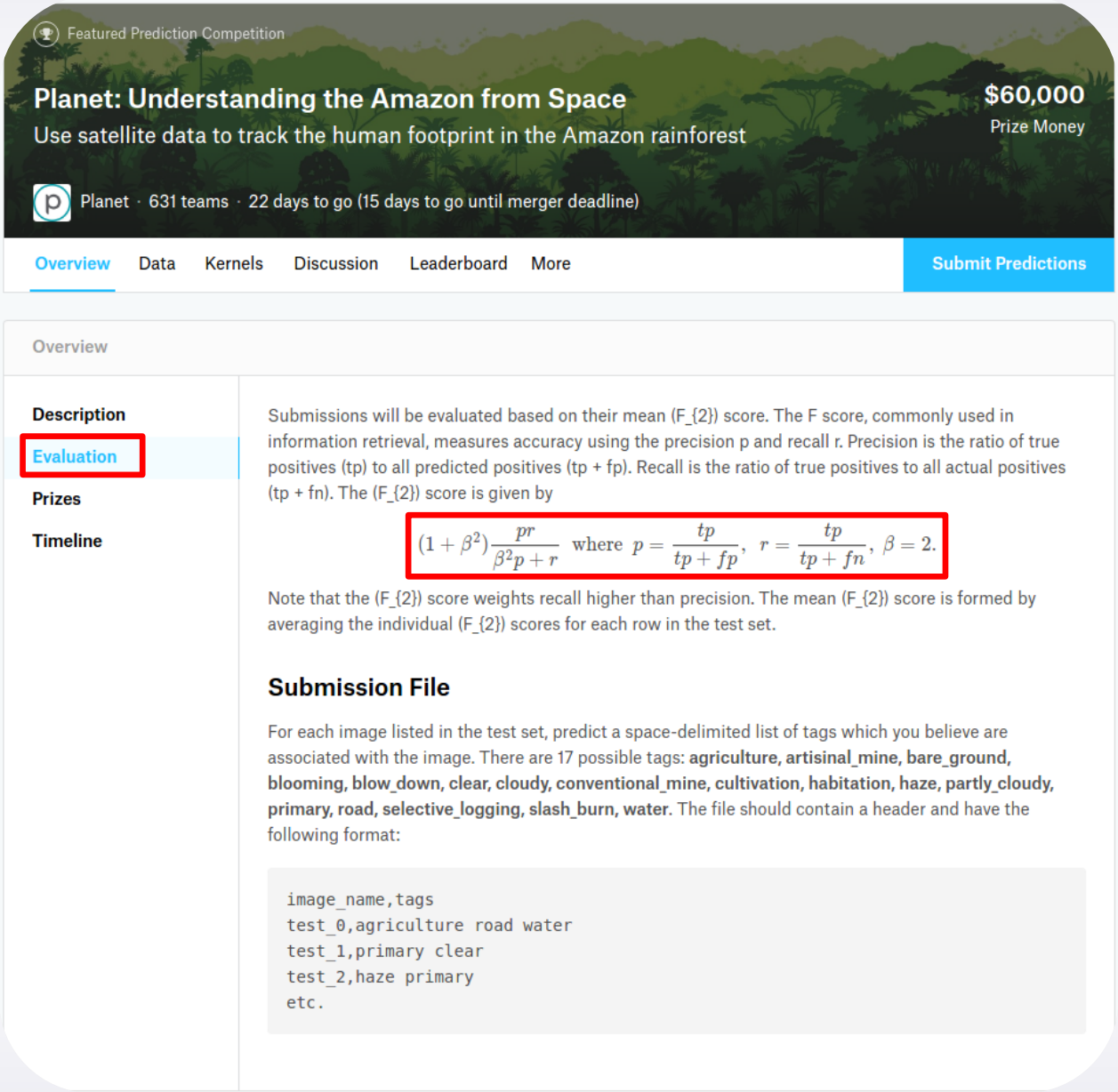
In the following videos:

- **Loss versus metric**
- **Review the most important metrics**
  - For classification and regression tasks
  - Discuss baseline solutions for their optimization
- **Optimization techniques for the metrics**

Metrics



Featured Prediction Competition

Planet: Understanding the Amazon from Space

Use satellite data to track the human footprint in the Amazon rainforest

$60,000
Prize Money

Planet · 631 teams · 22 days to go (15 days to go until merger deadline)

Overview | Data | Kernels | Discussion | Leaderboard | More | Submit Predictions

Overview

- **Description**
- **Evaluation**
- **Prizes**
- **Timeline**

Submissions will be evaluated based on their mean (F_{2}) score. The F score, commonly used in information retrieval, measures accuracy using the precision p and recall r. Precision is the ratio of true positives (tp) to all predicted positives (tp + fp). Recall is the ratio of true positives to all actual positives (tp + fn). The (F_{2}) score is given by

$$(1+\beta^2)\frac{pr}{\beta^2 p + r} \text{ where } p = \frac{tp}{tp+fp}, \quad r = \frac{tp}{tp+fn}, \quad \beta = 2.$$

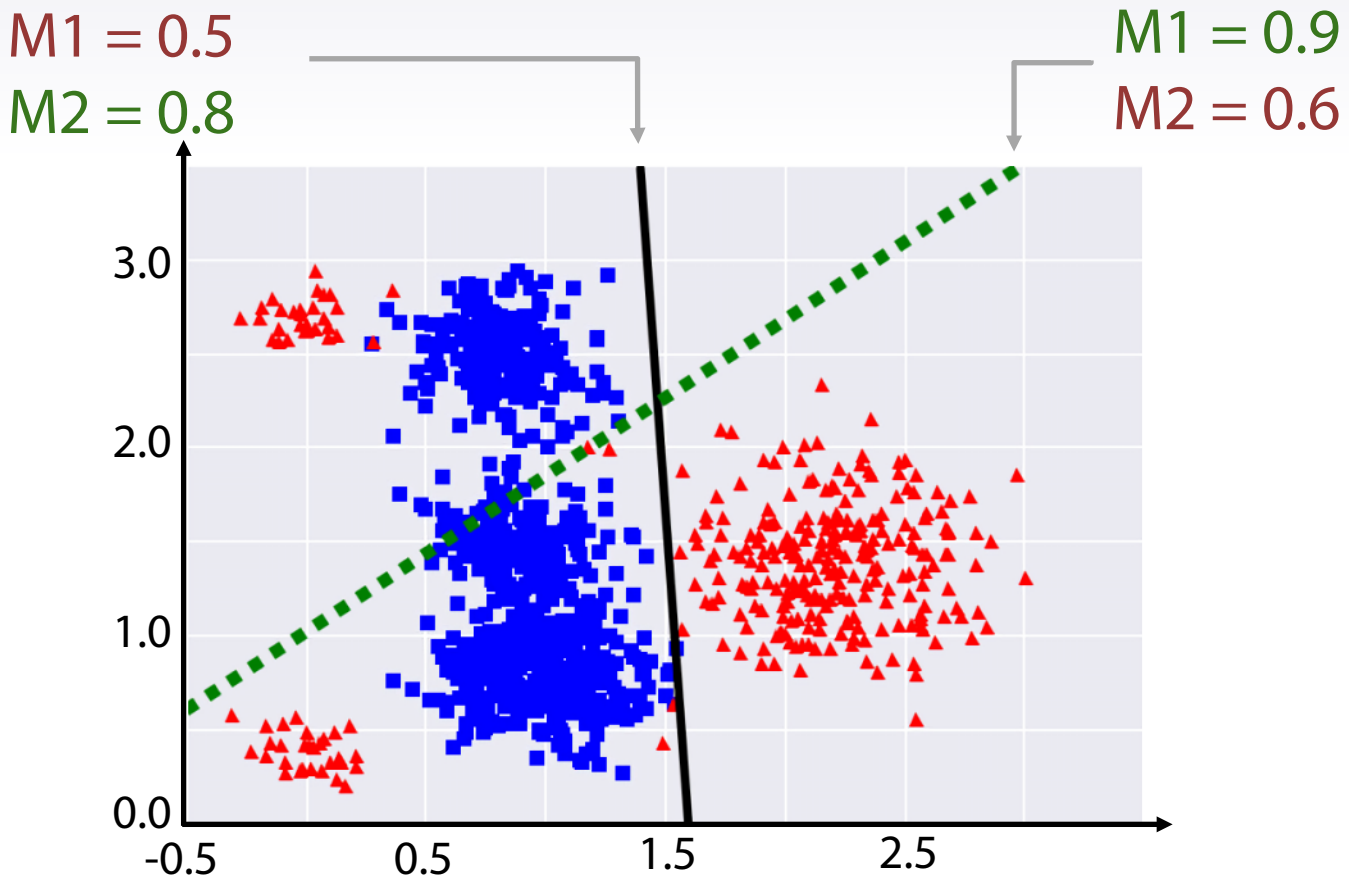
Note that the (F_{2}) score weights recall higher than precision. The mean (F_{2}) score is formed by averaging the individual (F_{2}) scores for each row in the test set.

Submission File

For each image listed in the test set, predict a space-delimited list of tags which you believe are associated with the image. There are 17 possible tags: **agriculture, artisinal_mine, bare_ground, blooming, blow_down, clear, cloudy, conventional_mine, cultivation, habitation, haze, partly_cloudy, primary, road, selective_logging, slash_burn, water**. The file should contain a header and have the following format:

```
image_name,tags
test_0,agriculture road water
test_1,primary clear
test_2,haze primary
etc.
```

Motivation



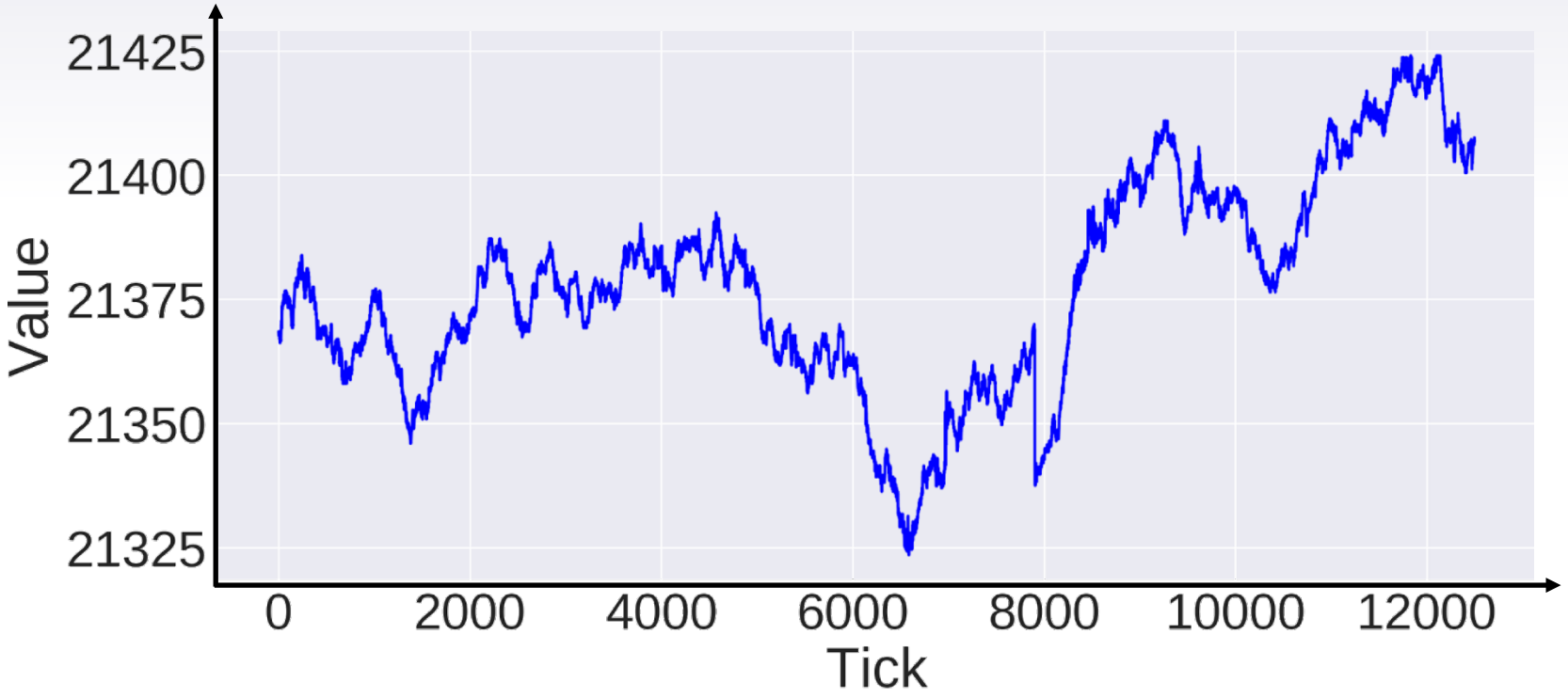
Chosen metric determines optimal decision boundary

Image from "Scalable Learning of Non-Decomposable Objectives", Eban et al. AISTATS, 2017

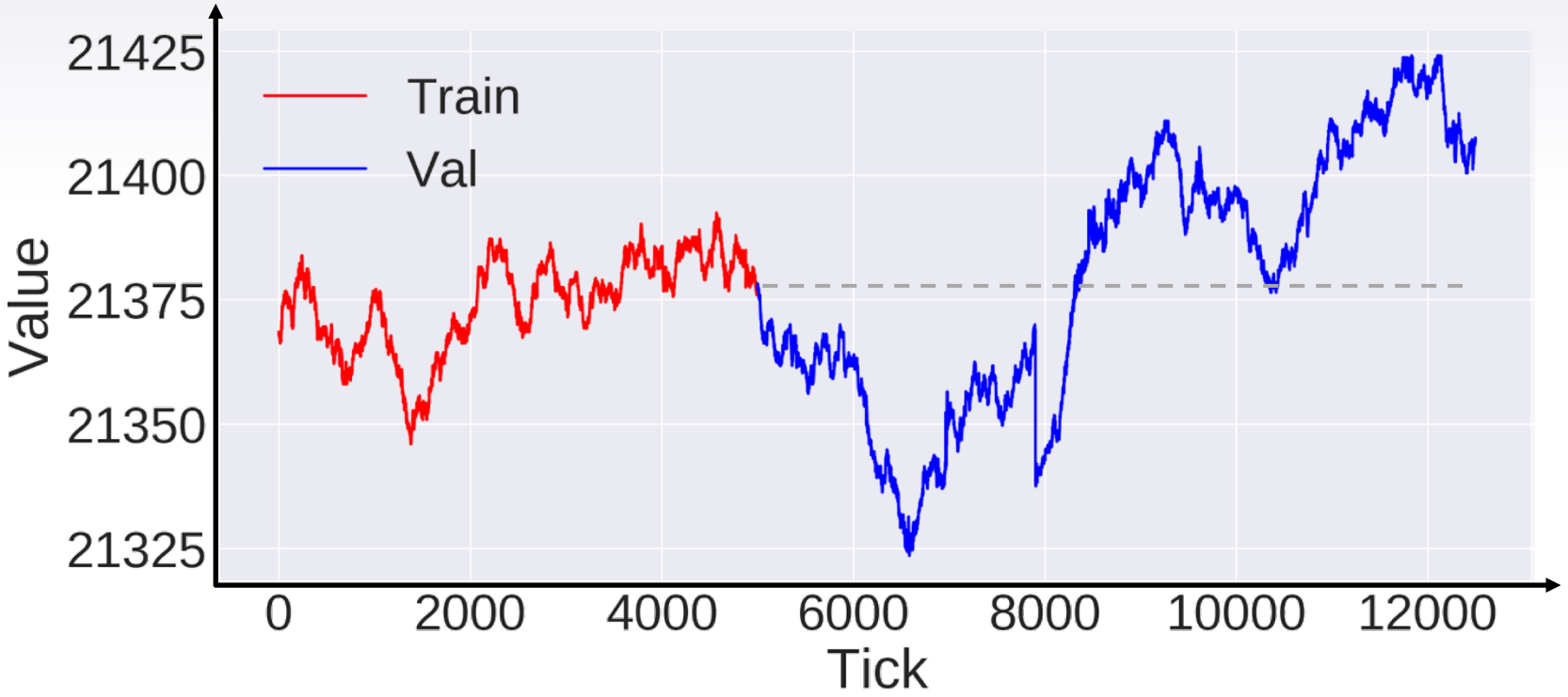
Take-away point

If your model is scored with some metric, you get best results by optimizing exactly that metric

Motivation 2

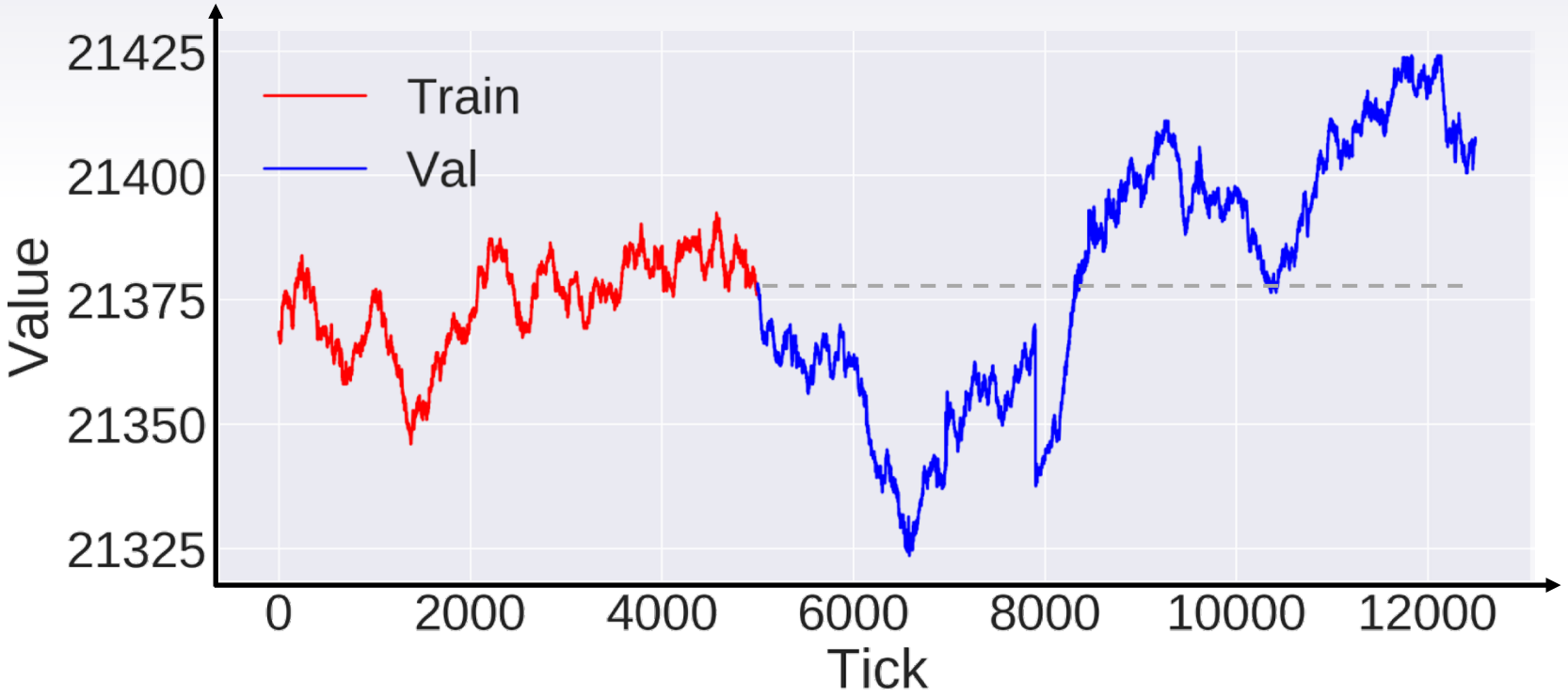


Motivation 2



$$Loss(\hat{y}_i; y_i) = \begin{cases} |y_i - \hat{y}_i|, & \text{if trend predicted correctly} \\ (y_i - \hat{y}_i)^2, & \text{if trend predicted incorrectly} \end{cases}$$

Motivation 2



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Predict *trend* instead of the values:

Predict $y_{last} + 10^{-6}$

or $y_{last} - 10^{-6}$

Conclusion

- **Why there are so many metrics?**
  - Different metrics for different problems

- **Why should we care about metric in competitions?**
  - It is how the competitors are ranked!