Metric-Optimized Example Weights

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Google Research

Motivation: Building a Ranking Model

Goal: positive precision@3 globally, and not negative in any specific locales.

Training Data: Jan - Oct

Testing Data: Nov - Dec

Train with pairwise hinge loss.

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Attempt 3: Upweight **UK** and **India** training data.

- **US** turns negative….

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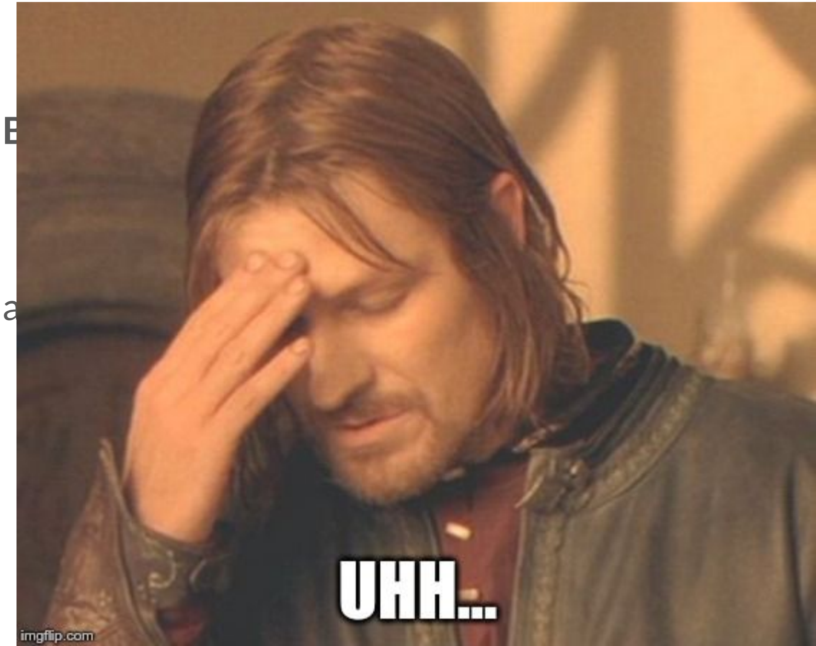
Attempt 4: ...



A Practitioner’s Challenge

Training		Evaluation
Training Distribution		Testing Distribution
(Jan - Oct)	≠	(Holiday Season)
Training Loss		Testing Metric
(Pairwise Hinge)		(Precision@3)

Metric-Optimized Example Weights (MOEW)

MOEW learns the optimal weighting on training examples to **maximize the testing metric**.

- Suitable for ***any*** loss and ***any*** (black-box, non-differentiable) metrics.
- Accompanied by theoretical analysis (generalization bounds etc.).

Formulation

The main model **θ** is an ERM problem with weighted loss:

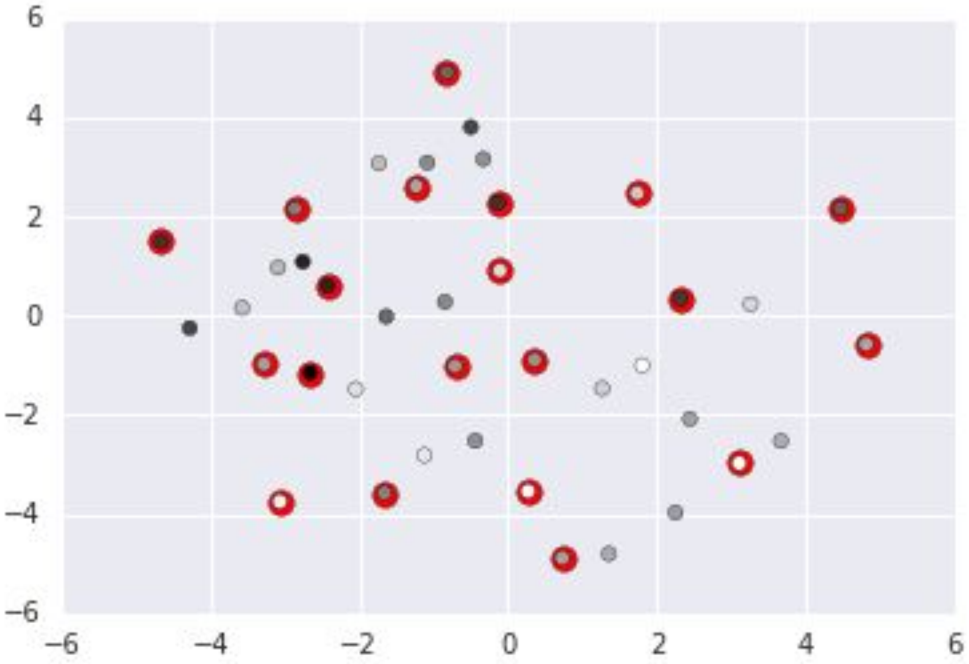
$$\hat{\theta}(\alpha) = \arg\min_{\theta} \sum_{j \in \mathcal{T}} w\left(x_j, y_j; \alpha\right) L\left(h\left(x_j; \theta\right), y_j\right)$$

The weighting model **ω** has one parameter **α** that is learned to maximize validation metric:

$$\hat{\alpha} = \arg\max_{\alpha} \hat{M}(x_{\mathcal{V}}, y_{\mathcal{V}}; \hat{\theta}(\alpha))$$

Iteratively optimize...

A Sneak Peek of MOEW



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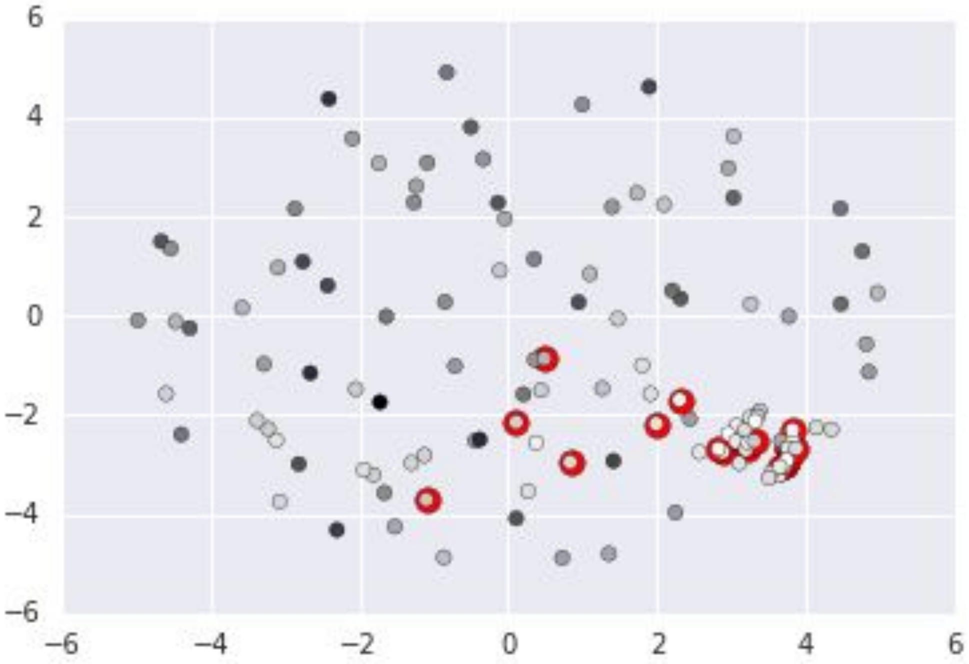

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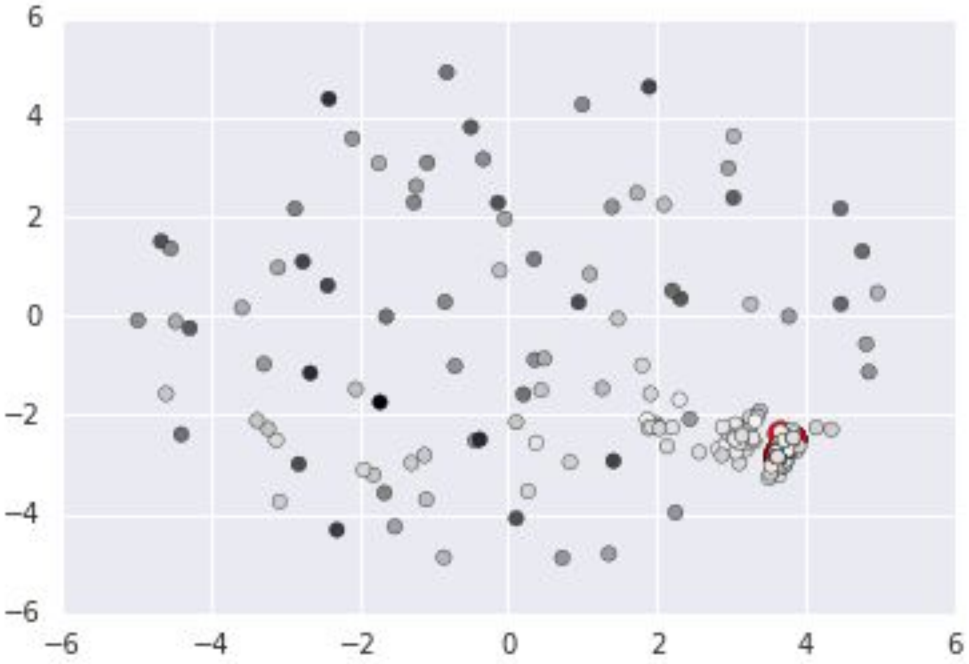

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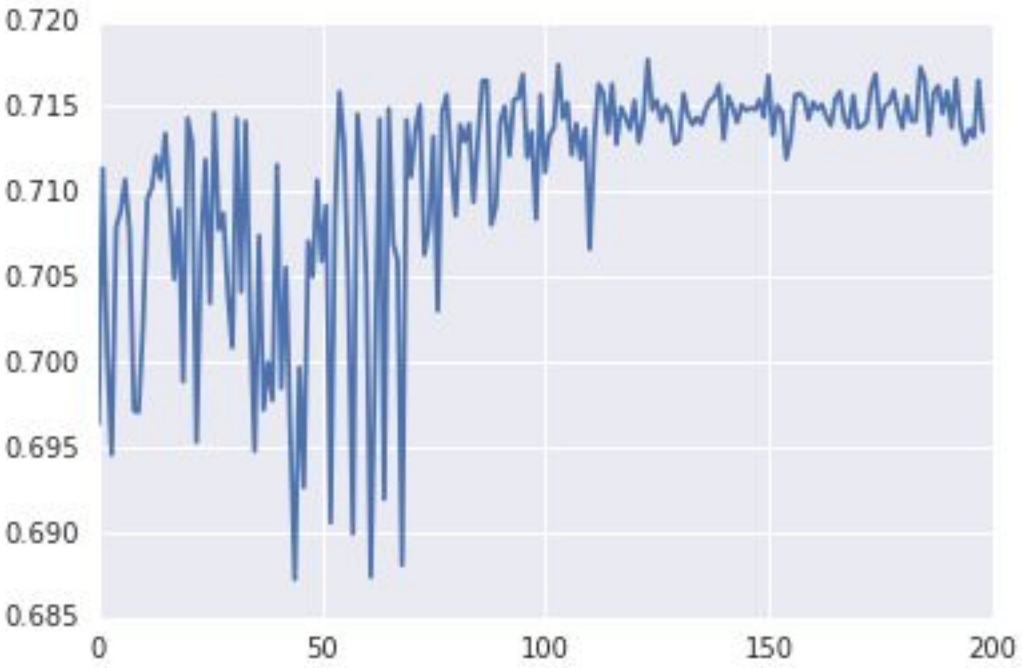

Poster

Tonight 06:30 -- 09:00 PM @ Pacific Ballroom #122