KDD Cup ’22 Workshop

Predicting Query-Item Relationship using Adversarial Training and Robust Modeling Techniques

10th Place Solution in Product Substitute Classification task

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1. Problem
2. Solution
   a) Validation Strategy
   b) Model Structure
   c) Training Techniques
   d) Diversity-based Ensemble
3. Conclusion

Pretrained Transformers

LSTM Head with Different LR

Multi-Sampled Dropout

Adversarial Training

Exponential Moving Average

Learning Rate Scheduling

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Problem

- Predicting relationship between a query and an item
- Query is never seen before during inference

Query

White Vans

Item Meta Data (ex. Title)

Vans Sneakers, Navy

Substitute?

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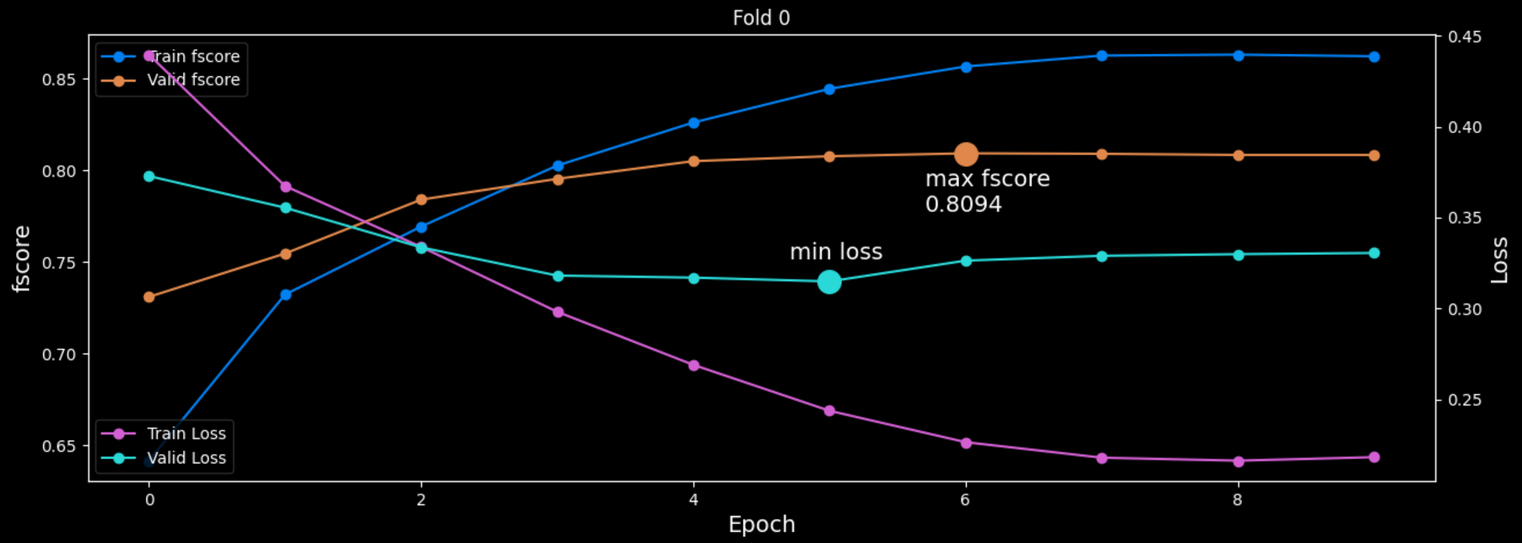
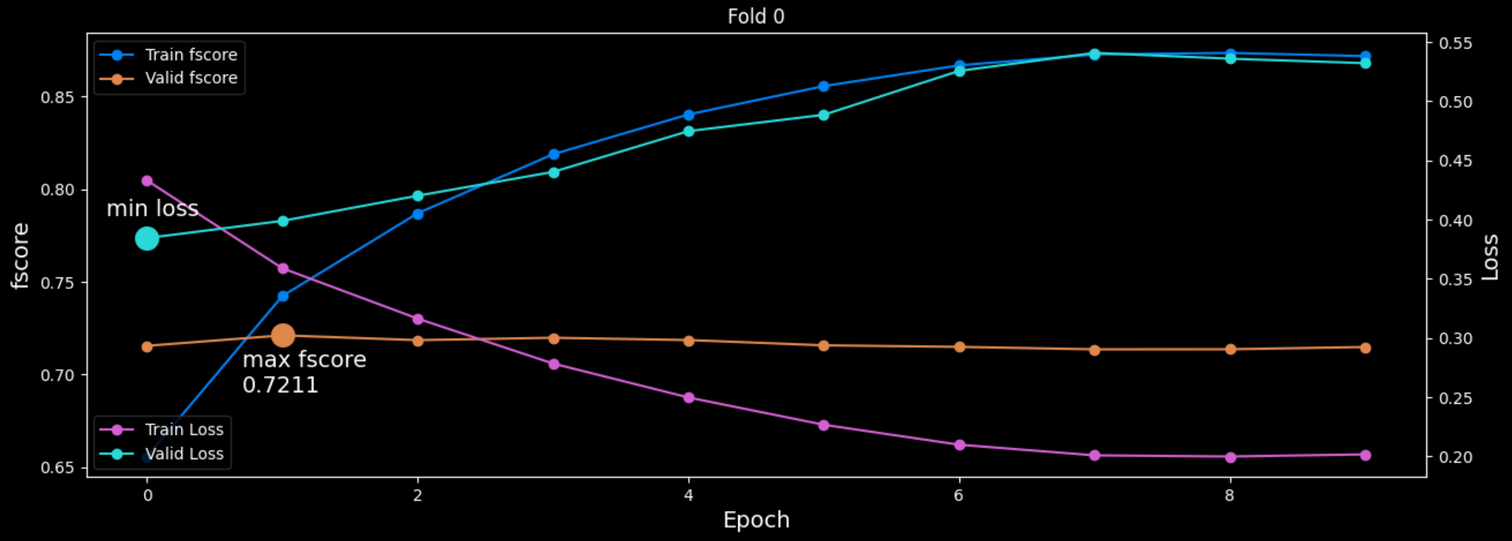
Validation Strategy

KFold



Public LB: 0.850

GroupKFold



Public LB: 0.855

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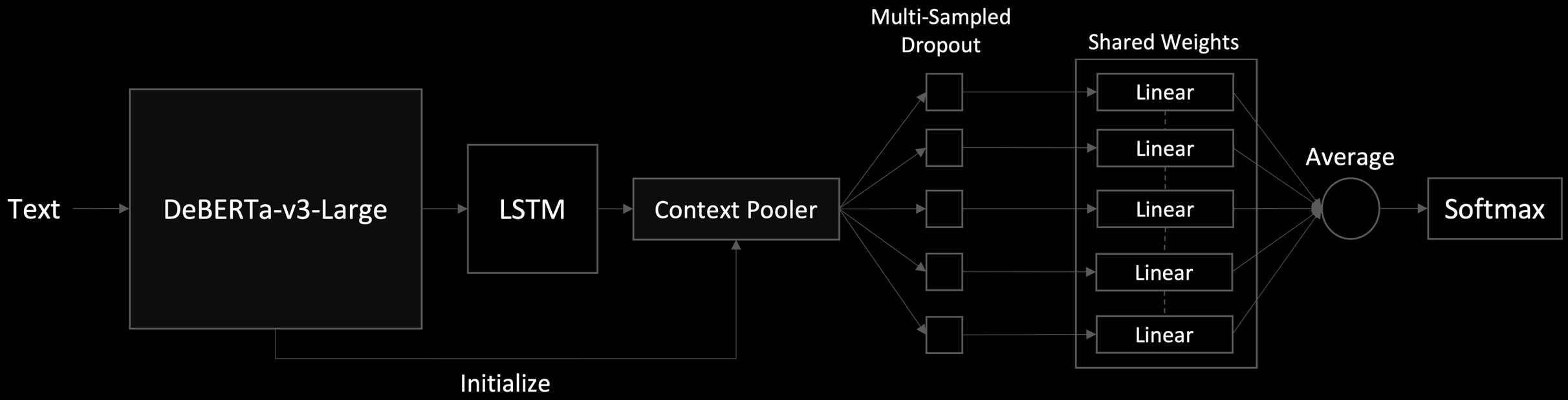
Model Structure

- Pre-trained Transformers
- LSTM Head with Different Learning Rate
- Multi-Sampled Dropout
- Adversarial Weight Perturbation (AWP)
- Exponential Moving Average of Weights
- Learning Rate Scheduling



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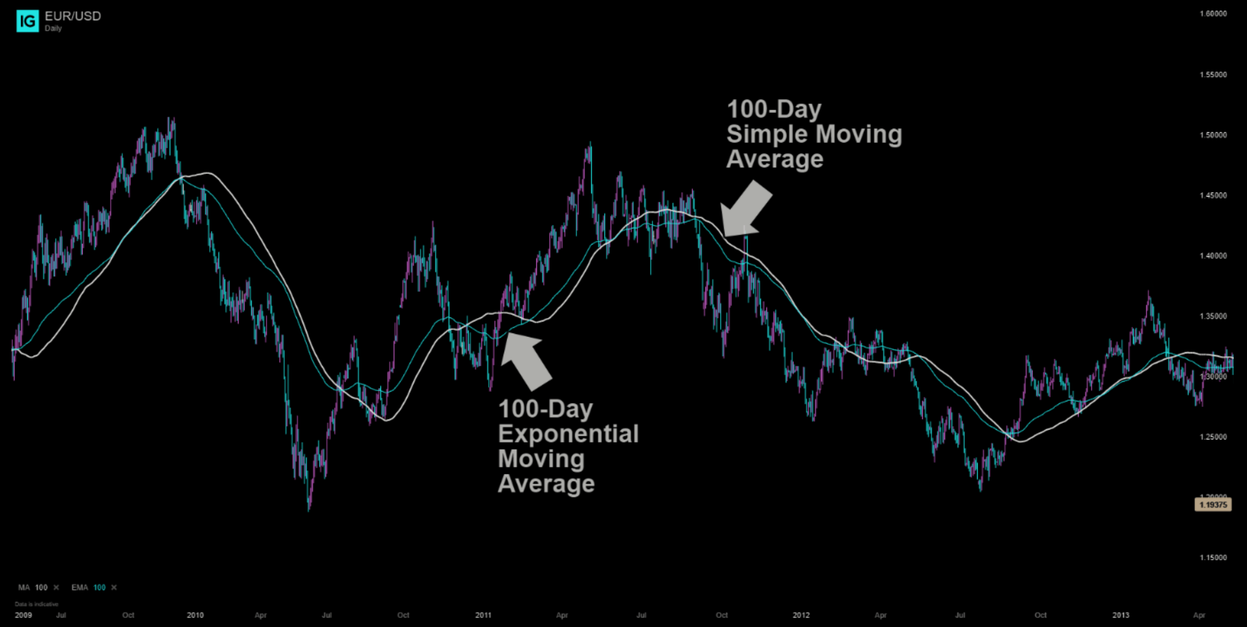
Training Techniques

- Adversarial Weight Perturbation (AWP)
- Exponential Moving Average of Weights
- Learning Rate Scheduling



[1] https://www.dailyfx.com/education/moving-averages/simple-vs-exponential-moving-average.html

Diversity-based Model Ensemble

- Model Diversity
  - DeBERTa-v3-Large + RemBERT + XLM-RoBERTa-Large
  - Adding a different backbone with relatively lower cross validation score helped increase leaderboard score
- Data Diversity
  - DeBERTa-v3-Large validated on Fold 0, RemBERT validated on Fold 2…

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Accelerated Inference

- Inference Times on 277044 samples using DeBERTa-v3-Large Model

Sequence Length	Float32 Precision	Float16 Precision
78	23 minutes	10 minutes
256	82 minutes	36 minutes

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Summary of All Techniques

Technique	**Cross Validation Micro F1 Score**	**Relative Gain/Loss vs. Control Model**
DeBERTa-v3-Large (Baseline)	0.8229	+0.0000
Add LSTM Head	0.8226	-0.0003
Add LSTM Head with higher LR	0.8234	+0.0005
Adversarial Training	0.8262	+0.0028
Exponential Moving Average	0.8265	+0.0003
Multi-Sampled Dropout	0.8267	+0.0002
Cosine LR Schedule → Step LR Schedule	0.8267	+0.0005
Diversity-based Model Ensemble	-	-

Conclusion

- Built upon a solid validation strategy, we used a simple model structure of pretrained transformers, LSTM and Multi-Sampled Dropout to effectively prediction query-item relationship.
- All our strategies focus on increasing robustness of deep learning models and can be expanded to any other task that uses deep learning.

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E.O.D

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