

Reel Recommendations:

Leveraging Reinforcement Learning for
Tailored LetterBoxd Recommendations

Luke Benham, Michael Fatemi, Kasra Lekan

Opportunity

LetterBoxd, a popular movie logging / reviewing website, has extensive data and review text from users.



Solution

Leverage **RL** and **Language Models** to perform movie recommendations



LetterBoxd

RL

Data

- LetterBoxd User Data
 - roughly 6500 top LetterBoxd users

```
{
  "date": "2016-10-02",
  "film_slug": "orpheus",
  "rating": 4.5,
  "review": "It was a struggle wondering
},
{
  "date": "2016-10-01",
  "film_slug": "the-umbrellas-of-cherbo
  "rating": 4.0,
  "review": "A loving homage to America
},
{
  "date": "2016-10-01",
  "film_slug": "blast-of-silence",
  "rating": 3.0,
  "review": "When a film starts with a
},
{
  "date": "2016-09-18",
  "film_slug": "mystery-train",
  "rating": 5.0,
  "review": "Jarmusch makes films the v
}
```

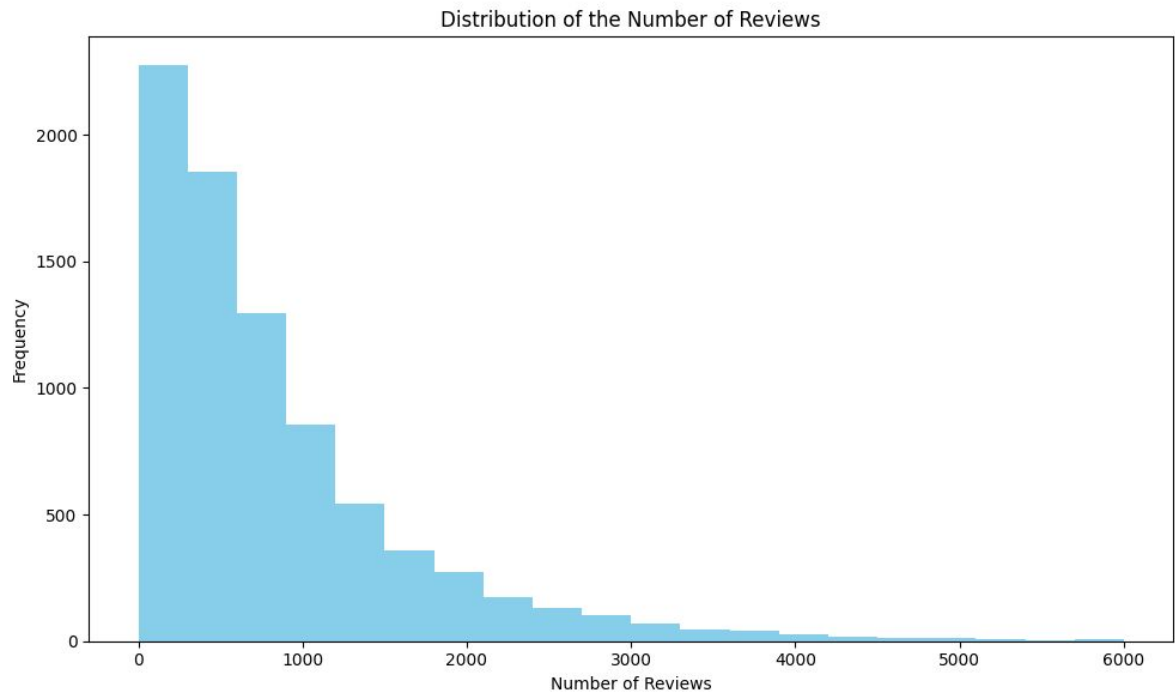
```
{
  "date": "2016-10-27",
  "film_slug": "carmen-jones",
  "rating": 3.5,
  "like": true,
  "rewatch": true,
  "review": true
},
{
  "date": "2016-10-26",
  "film_slug": "la-haine",
  "rating": 4.5,
  "like": true,
  "rewatch": true,
  "review": true
},
{
  "date": "2016-10-24",
  "film_slug": "naz-maalik",
  "rating": 2.5,
  "like": false,
  "rewatch": true,
  "review": false
}
```

Data

- LetterBoxd User Data
 - roughly 6500 top LetterBoxd users
- Movie Data
 - Kaggle Dataset (2022)
 - TMDB API

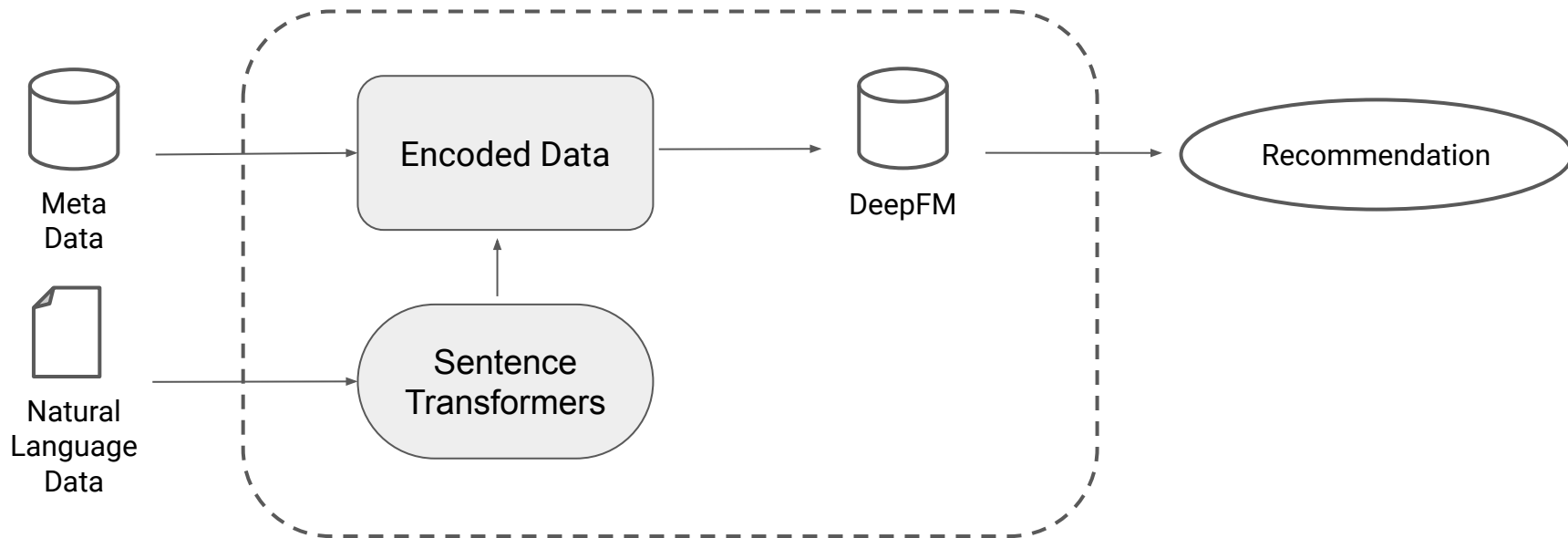
```
{
  "adult": false,
  "backdrop_path": "/xPTefQ4CZpWapxiEsAZsxtidS49.jpg",
  "genre_ids": [
    10751,
    878
  ],
  "id": 682075,
  "original_language": "en",
  "original_title": "The Adventure of A.R.I.: My Robot Friend",
  "overview": "A teenager summons the courage to help a friendly ...",
  "popularity": 533.07,
  "poster_path": "/txcjXiyhBvsSFyZtgCHWW7CyIeN.jpg",
  "release_date": "2022-01-13",
  "title": "The Adventure of A.R.I.: My Robot Friend",
  "video": false,
  "vote_average": 7.1,
  "vote_count": 8
}
```

User Review Data Distribution

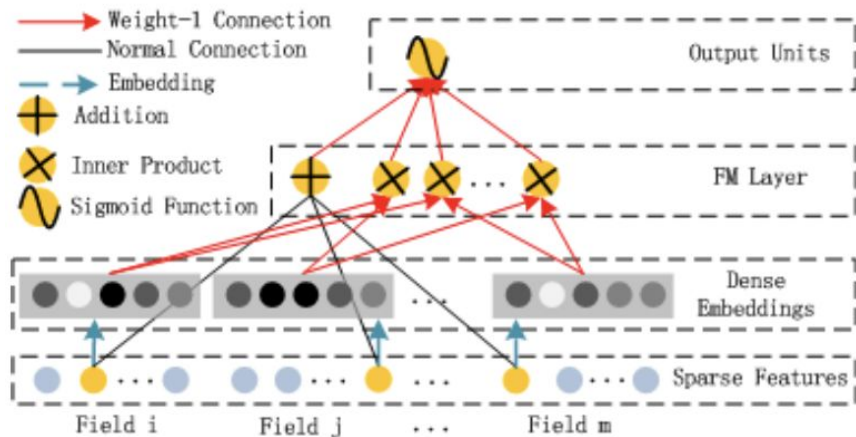


	Ratings Pages	Reviews
count	4747	8139
mean	32.8	868
std	35.2	979
min	1	0
25%	15	267
50%	25	588
75%	42	1130
max	1208	17184

Approach: Overview

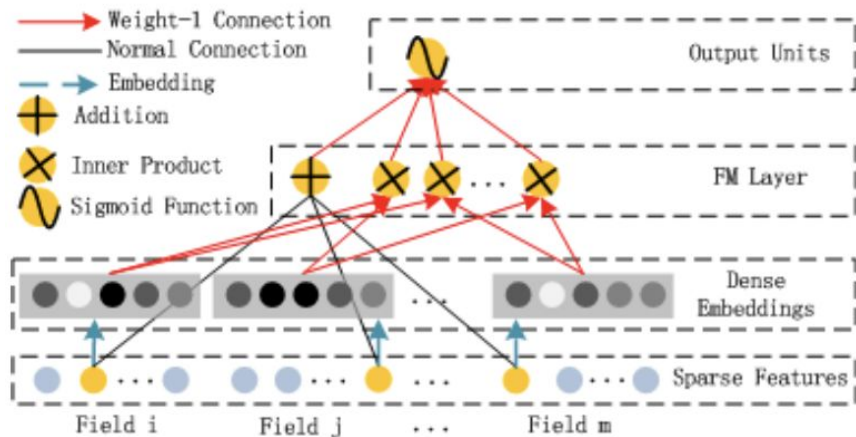


Approach 1: Recommendations with DeepFM¹



- Dense features constructed by sparse features.

Approach 1: Recommendations with DeepFM¹



- Dense features constructed by sparse features.
- Trained User Vectors given a set of Movie Vectors
 - Movie Vectors were generated during our preprocessing

Experiment 1: Results (Raw Prediction)

Split	Acc. (No Personalization)	100 Epoch Acc. (train)	200 Epoch Acc. (train)	100 Epoch Acc. (test)	200 Epoch Acc. (test)
30 train, 0 test	0.7106	0.9040	0.9889	-	-
500 train, 100 test	0.769	0.7860	0.8430	0.5695	0.5732
1000, 150 test	0.745	0.6030 (degrad.)	0.9040	0.5170	0.5369
9000 train, 1000 test	0.7322	0.8437	0.8878	0.5641	0.5662

Future Work

- Residual Exp. 1 Predictions
- Train GPT-2 for AutoReg. Score Prediction
- TBD: Using review text in pipeline

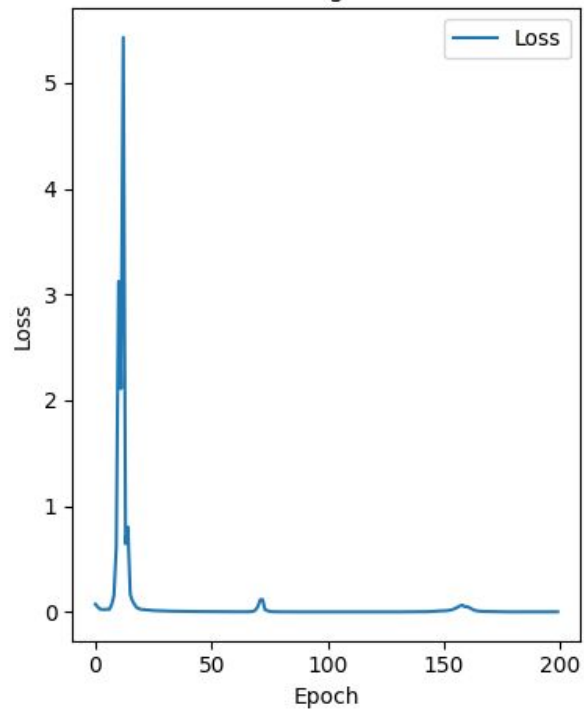


Questions?

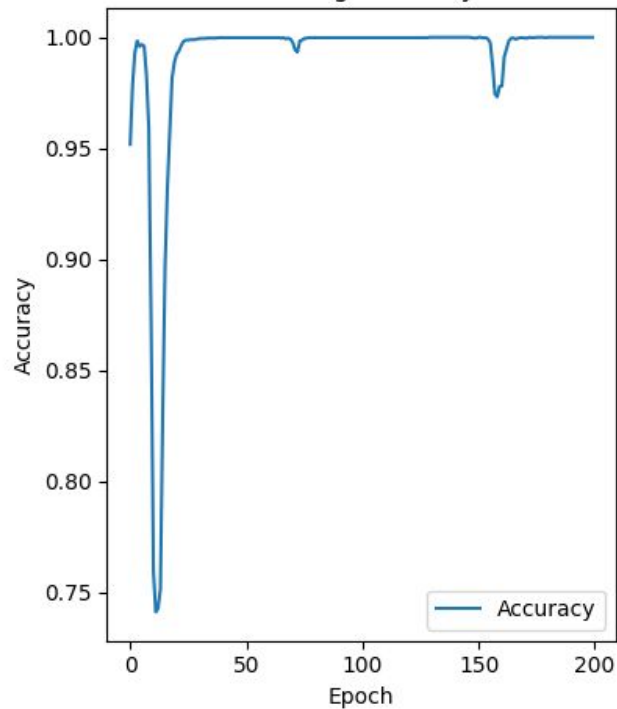
References

1. Guo, Huifeng, et al. "DeepFM: a factorization-machine based neural network for CTR prediction." arXiv preprint arXiv:1703.04247 (2017).

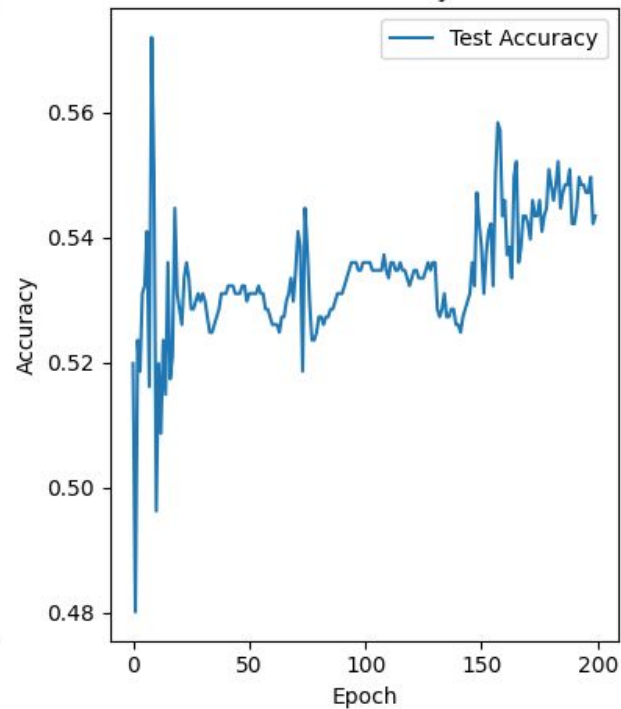
Training Loss



Training Accuracy

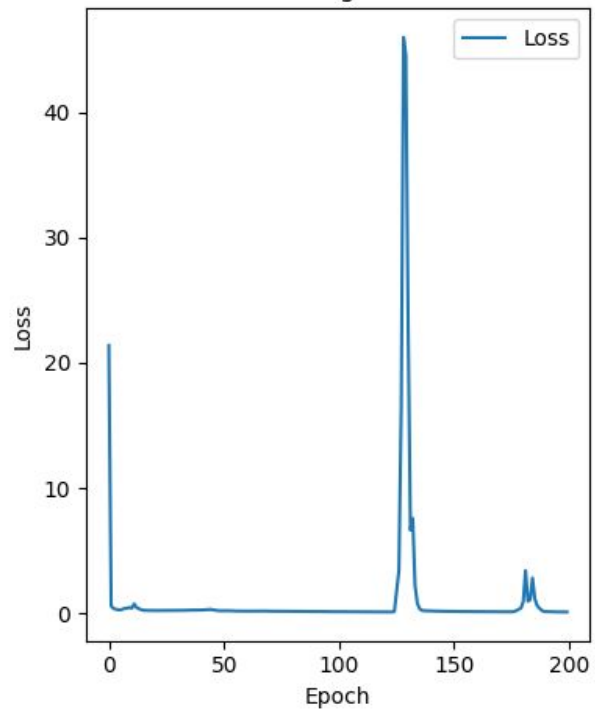


Test Accuracy

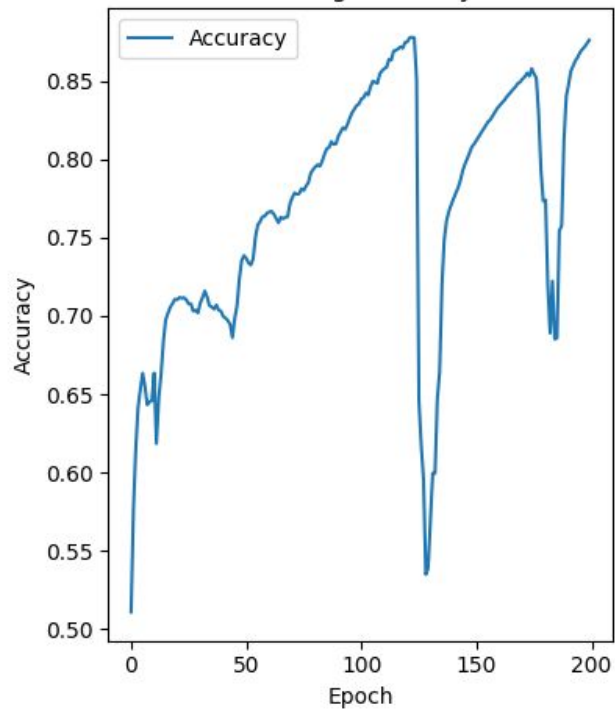


$N = 500$

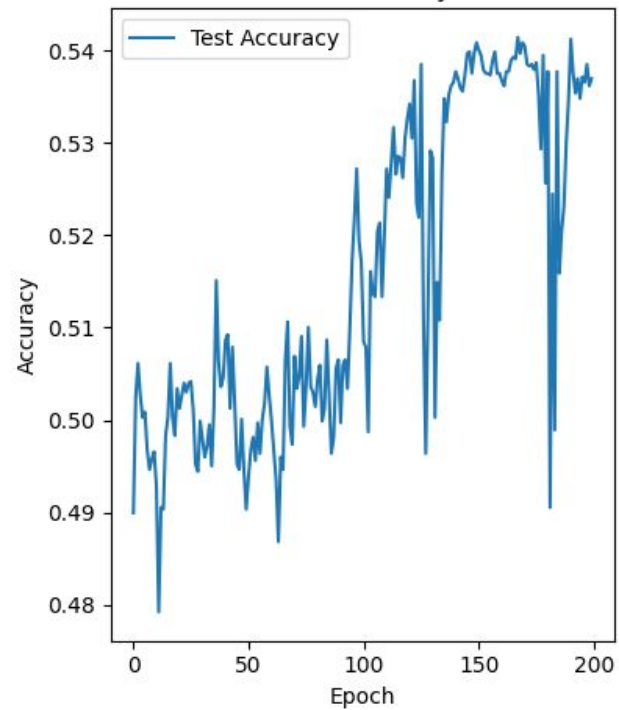
Training Loss



Training Accuracy



Test Accuracy



$N = 1000$