

Recommendation Systems Approaches on the Netflix Prize Data Set

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Abstract—Recommendation systems play an increasingly vital role in the ability to make informed decisions in modern societies, given the ever growing deluge of data which might inform those decisions. Without the ability to quickly choose from among a few well selected options ordinary activities from applying to jobs to searching the internet, buying household goods, or reading the latest news might become difficult, deceptive, or even dangerous. Given the relatively many recent major advances in machine learning techniques, especially in relation to deep learning, it is important to understand how recommendation systems have changed and improved. In this paper we investigate approaches to recommendation systems using deep learning.

1. Introduction

Data characterizes the modern world. Corresponding to exponential growth in computing power over time, and the related proliferation of sensors and interactions with computing systems, the volume of recorded data has exploded. It is estimated that in 2010 there was more than 1 Zettabyte of recorded unstructured data, and that as of 2018 there exists more than 2 Zettabytes structured data and 20 Zettabytes structured data [cite this]. While much of this deluge is comprised of highly specific and narrowly specialized data, not useful for making decisions at a personal level, there still is a wealth of data - far more than is human interpretable - which could be used to inform such decisions. Recommendation systems are predictive tools designed specifically for this use case, helping pare from a glut of options a select few choices based on available data.

The Netflix Prize competition [cite this], started in 2006 and finalized in 2009, is, along with the publishing of the ImageNet dataset in 2009 [cite this], credited as one of the events that encouraged the perception of a revolution in the field of machine learning both among professional audiences and the public at large [cite this]. In the near decade since team BellKor's Pragmatic Chaos won the Netflix Prize competition [cite this], rapid advances, especially in Deep Learning, have continued to push boundaries in machine learning and recommendation systems. The Netflix dataset remains an important benchmark dataset for recommendation systems.

In this paper we will discuss recent improvements in the field of recommendation systems and attempt to benchmark some of those improvements on the Netflix dataset. Section

2 will cover some important background material on the field of recommendation systems. Section 3 will discuss some recent and related results. Section 4 will talk about our experimental setup, while Section 5 will include the specific experiments carried out. Section 6 discusses our results, conclusions, and will cover our expectations for future work.

2. Background

3. Related

4. Approach

Our approach to investigating the architecture for deep learning recommendation systems, was to first decide on a baseline with which we could compare the effectiveness of our techniques. After finding a benchmark we reviewed the literature we had assembled to decide which design was most applicable to our dataset, and our ability to implement.

We knew from the Netflix competition that the winners had an RMSE of 0.8567. We also wanted a way to compare our engineered solution, to one that simply took all the data Netflix provided and used it as inputs on a naive feed-forward neural net.

The theme of all the papers we read covering the various methodologies for applying deep learning to recommendation systems, was creating more meaningful representations of the users, the items they interacted with, and context around the item. Many of the models we read about involved many complex hierarchical layers. While many of these exotic arrangements made sense, we were not sure we had the technical expertise to implement them in the allotted time. We settled on a technique called Neural Collaborative Filtering [1]. Neural Collaborative Filtering or NCF is a process that involves creating a hybrid of traditional recommendation system and deep learning.

5. Setup

6. Experiments

7. Conclusions

References

- [1] X. He, L. Liao, H. Zhang, L. Nie, X. Hu, and T.-S. Chua, "Neural Collaborative Filtering," 2017. [Online]. Available: <http://arxiv.org/abs/1708.05031>

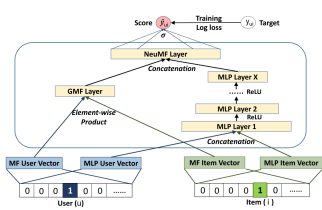


Figure 1. a nice plot