# Your Name

# Your Andrew ID

# Homework 6

**0. Statement of Assurance**

You must certify that all of the material that you submit is original work that was done only by you. If your report does not have this statement, it will not be graded.

# 1. Training Set Construction (5 pts)

Construct the training set for LETOR as instructed and report the following statistics.

|  |  |
| --- | --- |
| Statistics |  |
| the total number of observed ratings in R |  |
| the total number of training examples in T |  |
| the ratio of positive examples to negative examples in T |  |
| the number of training examples in T for user ID **1234** |  |
| the number of training examples in T for user ID **4321** |  |

# 2. NDCG of Memory-based methods (10 pts)

## 2.1 User-user similarity (Do the same imputation first as in HW4)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Rating Method** | **Similarity Metric** | **K** | **NDCG@20** | **Runtime(sec)\*** |
| Mean | Dot product | 10 |  |  |
| Mean | Dot product | 100 |  |  |
| Mean | Dot product | 500 |  |  |
| Mean | Cosine | 10 |  |  |
| Mean | Cosine | 100 |  |  |
| Mean | Cosine | 500 |  |  |

\*runtime should be reported in seconds.

## 2.2 Movie-movie similarity (Do the same imputation first as in HW4)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Rating Method** | **Similarity Metric** | **K** | **NDCG@20** | **Runtime(sec)** |
| Mean | Dot product | 10 |  |  |
| Mean | Dot product | 100 |  |  |
| Mean | Dot product | 500 |  |  |
| Mean | Cosine | 10 |  |  |
| Mean | Cosine | 100 |  |  |
| Mean | Cosine | 500 |  |  |

# 3. NDCG of PMF (6 pts)

Report the best results you can get on dev set from training PMF with different dimensions of latent factors.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Num of Latent Factors** | **NDCG@10** | **NDCG@20** | **NDCG@30** | **Runtime(sec)\*** |
| 10 |  |  |  |  |
| 20 |  |  |  |  |
| 50 | 0.9478 | 0.9516 | 0.9520 |  |
| 100 | 0.9480 | 0.9519 | 0.9523 |  |

# 4. RankSVM (12 pts)

1. After the optimum w is learned by SVM on the training set T, given a testing user, how to generate the ranked list of unrated items and why? (Please be concise and clear; use formulas to express your idea when possible) (2 pts)
2. Report the best results you can get on dev set from training RankSVM with features from PMF (10 pts)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Num of Latent Factors from PMF** | **NDCG@10** | **NDCG@20** | **NDCG@30** | **Runtime(sec)\*** |
| 10 |  |  |  |  |
| 20 |  |  |  |  |
| 50 |  |  |  |  |
| 100 | 0.9467s | 0.9507 | 0.9511 |  |

\*report the time of training SVM after PMF outputs the features. For each case, you might want to tune the regularization parameters of both PMF and SVM.

# 5. LR-LETOR (12 pts)

1. After the optimum w is learned by LR-LETOR on the training set T, given a testing user, how to generate the ranked list of unrated items and why? (Please be concise and clear; use formulas to express your idea when possible) (2 pts)
2. Report the best results you can get on dev set from training LR-LETOR with features from PMF (10 pts)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Num of Latent Factors from PMF** | **NDCG@10** | **NDCG@20** | **NDCG@30** | **Runtime(sec)\*** |
| 10 |  |  |  |  |
| 20 |  |  |  |  |
| 50 |  |  |  |  |
| 100 | 0.9468 | 0.9507 | 0.9511 |  |

\*report the time of training LR-LETOR after PMF outputs the features. For each case, you might want to tune the regularization parameters of both PMF and LR.

# 6. Analysis of results (20 pts)

Discuss the complete set of experimental results, comparing the algorithms to each other. Discuss your observations about the various algorithms, i.e., differences in how they performed, different parameters, what worked well and didn't, patterns/trends you observed across the set of experiments, etc. Try to explain why certain algorithms or approaches behaved the way they did.

# 7. The software implementation (15 pts)

# Add detailed descriptions about software implementation & data preprocessing, including:

1. A description of what you did to preprocess the dataset to make your implementations easier or more efficient.

2. A description of major data structures (if any); any programming tools or libraries that you used;

3. Strengths and weaknesses of your design, and any problems that your system encountered;