CS 6220: Data Mining Techniques
Course Project Description

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General Goal

In this project, you will have an opportunity to apply the data mining algorithms and techniques you learned in the class to some real-world problems.

- You can choose any problem that you are interested in, and formalize it into a data mining task.
- Get some data related to the task.
- Apply some data mining algorithms to your data.
- Evaluate and compare your algorithms.
- Submit a report, together with your data and code.
- Finally, present your project to the whole class.
Detailed Stages and Deadlines: 1. Form Groups

- 3-4 students
- Deadline: Jan. 27 (11:59pm)
- Where to submit: Blackboard
- What to submit: Group name; Group members; Group leader
- Points: 1 point.
Detailed Stages and Deadlines: 2. Project Proposal

- Deadline: Feb. 23 (11:59pm)
- Where to submit: Blackboard
- What to submit: A 2-Page proposal including
  
  2.1 Problem and goal
  - What do you want to solve?
  - Why do you think it is important?
  - What results do you expect?

  2.2 Formalization into data mining task
  - Which data type?
  - Which function? E.g., Frequent pattern mining, classification, and clustering.

  2.3 Data plan
  - What kind of data?
  - Where and how do you get the data?
  - Make sure get data in time

  2.4 Schedule: detailed plan of your project
  
  - Points: 5 points
  - Note: We will discuss with every group about your proposals later that week.
Detailed Stages and Deadlines: 3. Midterm Check

- **Deadline:** Mar. 22 (11:59pm)
- **Where to submit:** Blackboard
- **What to submit:** A Temporary report
  - A draft of report
  - Discuss about progress
  - Issues and difficulties you have met
- **points:** 2 points
- **Note:** We will discuss with every group about your progress later that week.
Detailed Stages and Deadlines: 4. Final Report

- Deadline: Apr. 27 (11:59pm)
- Where to submit: Blackboard / Course System
- What to submit: A final report, data, and code
  - Problem introduction, formalization, algorithms, experiment results, etc..
- points: 12 + 2 points
Detailed Stages and Deadlines: 5. Final Presentation

- When: Apr. 27 (in class)
- Who to present: whole class
- How long to present: 15 mins (include Q and A)
- In what form: slides (include demo if you like)
  - Motivating your audience, problem introduction, formalization, algorithms, experiment results, demo, etc..
- points: 5 points (peer evaluation)
Grading

Total: 30 points of regular credit and 2 points of extra credit

1 Group formation (1 point)
2 Proposal (5 points)
3 Midterm check (2 points)
4 Data and code (5 points)
   ▶ Any programming language that can run in CCIS environment (Java and Python recommended)
   ▶ Documentation
5 Final report (12 points)
   ▶ At least two algorithms and two evaluation methods
6 Additional features (2 extra points)
   ▶ Novelty of the problem
   ▶ Your own data
   ▶ More than two algorithms/evaluation methods
   ▶ Other innovative features (e.g., new algorithm)
7 Presentation (5 points)
Grading

Collaboration Rules

- Every member in a team gets the same score (encourage teamwork)
  - Exception: the team has the right to claim someone as a free rider, and we will lower his/her score
- A table describing your division

An example:

<table>
<thead>
<tr>
<th>Task</th>
<th>People</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Collecting and preprocessing data</td>
<td>Student A</td>
</tr>
<tr>
<td>2. Implementing Algorithm 1</td>
<td>Student B</td>
</tr>
<tr>
<td>3. Implementing Algorithm 2</td>
<td>Student C and D</td>
</tr>
<tr>
<td>4. Evaluating and comparing algorithms</td>
<td>Student A</td>
</tr>
<tr>
<td>5. Writing report</td>
<td>Student B and C</td>
</tr>
<tr>
<td>6. Slides, demo, and Presentation</td>
<td>student A, B</td>
</tr>
</tbody>
</table>

- Peer evaluation
Resources and References

Datasets
- UCI Machine Learning Repository
  http://archive.ics.uci.edu/ml/
- DBLP “four-area dataset”:
  http://www.ccs.neu.edu/home/yzsun/data/DBLP_four_area.zip

Sample Projects from Previous Semesters
- Face Recognition
- Outlier Detection from Clinical Lab Data
- CCIS COURSE PLANNER
- Stylometry Classification for Authors
- MBTA Arriving Time Prediction
- Price Range Prediction for Boston Real Estate Data
- Student Application Recommendation System.
A Simple Example: Email Classification

Problem
▶ Determine whether a given email is spam or not

Data Mining Task
▶ Binary classification

Data
▶ UCI spam data set
  (http://archive.ics.uci.edu/ml/datasets/Spambase)
▶ Number of instances: 4601
▶ Number of attributes: 57
▶ The last column denotes whether the e-mail was spam (1) or not (0)
A Simple Example: Email Classification

Algorithms
- Naive Bayesian classifier
- Artificial neural network
- AdaBoost

Evaluation and Comparison
- Error rate
- ROC and AUC
- Speed
Have fun with your project!

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