BMEG 3105 Fall 2024

Data analytics for personalized genomics and precision medicine

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Lecture 1: Course Introduction

Agenda

- Review of pre-course survey results
- Course Logistics
- Overview of data in personalized genomics and precision medicine

Review of pre-course survey results

Responses: 47/52

Most students taking BMEG3105 are BME UG students

Most of the students taking this course for the three credits and degree requirement

The top three topics that students are interested in:

- Protein-protein/RNA interaction
- Neural networks
- Dynamic Programming

Course Logistics

Grading

Homework (20%): Three grading homework (each 5%)

Scribing (10%): Lecture summarize(at least do 1 lecture, 1 additional scribing: 1%)

In-class quiz (10%): Two in-class quizzes

Midterm (20%): One bonus question in midterm (2%)

Project (20%): Midterm report (5%), Final report (7%), presentation (3%) together with the implementation (5%).

Final (20%)

Remarks: Exams and quizzes will be open-book

Attendance

No attendance checking except for two quizzes, the midterm exam and the final exam.

Programming

Language: Python

Assignment

Assignment 1: About the basic concept of data analytics-1

Posted: Sep 13

Due: Sep 27

Assignment 2: About the basic concept of data analytics-2

Posted: Oct 4

Due: Oct 18

Programming assignment: About the application of DA to the biology

Posted: Oct 30

Due: Nov 15

Assignment 3: DA in Personalized Genomics and Precision Medicine

Posted: Nov 13

Due: Nov 22

Midterm

Date: Oct 23 (Wed)

In class, open-book

Project

- Milestone report (Due: Nov 8)

  1-page report

  1. Title, author
  2. What problem do you want to do? Why is the problem interesting? (1%)
  3. What data are you going to process? The source, the size, the sample of the data(1%)
  4. What's the output of your method? (1%)
  5. How are you going to do it? Describe the method step by step, frominput to output(1%)
  6. What are the expected results? How are you going to evaluate the results? (1%)
  7. What have you done?

- Project report (Due: Dec2)

  No length requirement

  1. Title, author
  2. What problem do you want to do? Why is the problem interesting and important?(0.5%)
  3. What data have you processed? The source, the size, the sample of the data (0.5%)
  4. What have you done to resolve the problem? Describe the method step by step, from input to output (2%)
  5. What are the results? (1.5%)
  6. Result evaluation (1.5%)
  7. Any idea for further improvement? (1%)
- Project presentation (Date: Nov 22, Nov 29)

  Will be graded in the following way:

  Logic (1%)
  - What is the problem?
  - Why is it important?
  - How do you resolve it?
  - Overview of your idea
  - Overview of the results

  Clarity (1%)
  - Whether the audience can understand and follow the presentation

  Slides Preparation (1%)
  - Clear illustration No typos, no grammar errors

Late days

Can be used on Assignment 1,2,3 and programming assignment, project mid-term report

Cannot be used on final project report and scribing report

6 late days total, 2 max for assignments

Grade will be deducted by 25% for each additional late day

Let TA know when it is necessary to use the late dates

About AI tools

AI tools are allowed.

About Data analytic

Data analytics are useful for aggregating data, generating hypotheses and support conclusions.

Data needed to measure a person (examples)

- Gene and mutations
- Gene expression (Transcriptome)
- Protenome
- Metabolome
- Molecular network and Cellular network
- Microbiome
- Organ (biomedical imaging)
- Hospital test
- ECG
- Demographic information (Age, gender…)
- Drug history and disease history
- Personal statement and doctor's diagnosis
- Living habit (exercise)
- Diet
- Family history
- Communications and social media data
- Environment (Pollution)
- Travel history (Global pandemic)
- …