BME1510: Introduction to Data Science for Biomedical Engineers

CONTACT INFORMATION

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TA: TBD

COURSE OBJECTIVE

This course will provide BME students with an introduction to fundamentals of data science with a specific focus on application of the methods to biological data. The topics covered will include:

1. Structures for data representation
2. Data visualisation
3. Methods for diagnosing data quality
4. Preprocessing methods including variable transformations and feature selection
5. Introduction to supervised learning
6. Introduction to unsupervised learning
7. Reliability, interpretability, and generalizability
8. Introduction to cloud computing

COURSE REQUIREMENTS

It is recommended that students have access to a laptop during the class. If this is not possible, please contact the instructor.

Students enrolled in the class are expected to have experience with programming, preferably in Python or R, as well as an understanding of basic statistical concepts (e.g., descriptive statistics, t-tests, analysis of variance, regression).

EVALUATION

The final mark is composed as follows:

Participation – 20%
In-class assignments (6) - 60%
Final project - 20%

SUGGESTED READING LIST

1. Python for data analysis data wrangling with pandas, NumPy & Jupyter / Wes McKinney. McKinney, Wes, author. Sebastopol : O'Reilly Media, Inc. 2022 (available online through the U of T library).

Rubric for Participation - 20% of final mark.

	20	15	10	5	0
Attendance	Prompt and regular attendance	Attends more than 80% of lectures	Attends more than 75% of lectures	Misses or is late to more than 40% of lectures without explanation	Misses or is late to more than 50% of lectures without explanation
Engagement	Consistently contributes to class by initiating discussions, offering ideas, and asking relevant questions in more than 80% of classes	Consistently Contributes to class by participating in discussions, and asking relevant questions in more than 70% of classes	On most occasions contributes to class by asking relevant questions in more than 50% of classes	Contributes to less than 50% of classes	Does not contribute to discussion
Effort	Consistently goes above expectations in time spend on in class projects and quality of output	Consistently meets expectations in time spend on in class projects and quality of output	For most lectures, meets expectations in time spend on in class projects and quality of output	Meets expectations in time spend on in class projects and quality of output less than 50% of the time	Does not meet expectations in time spend on in class projects and quality of output
Team work	Consistently cooperates effectively with team to complete task; takes leadership; shows self-initiation; brings positive attitude	For most lectures, cooperates effectively with team to complete task; shows self-initiation; brings positive attitude	For most lectures, cooperates effectively with team to complete task; brings positive attitude	Cooperates effectively with team to complete task less than 50% of the time	Does not contribute to team
Preparation	Consistently arrives prepared with	For most lectures, arrives prepared with	For most lectures, arrives prepared with	On at least 50% of lectures, arrives	Does not arrive with appropriate software

	appropriate software and hardware; has read the relevant material	appropriate software and hardware; has read the relevant material	appropriate software and hardware	prepared with appropriate software and hardware; has read the relevant material	and hardware; has not read the relevant material

Rubric for Assignments - each 10% of final mark.

	10	7	5	3	0
Technical approach	Technical approach is appropriate for the problem; clearly demonstrates understanding of concepts	Technical approach is reasonable for the problem, but a more appropriate solution exists.	Technical approach demonstrates some understanding of concepts but is not fully adequate to solve the problem.	Technical approach is not adequate to solve the problem.	Approach does not demonstrate any understanding of concepts.
Presentation	Approach and results are clearly described; visualisations are clear, communicate the message, and are visually appealing; concepts effectively communicated in 5 minutes.	Approach and results are clearly described; concepts effectively communicated in 5 minutes.	Approach and results are somewhat described. Presentation is longer than 5 minutes.	Difficult to understand approach and results.	Approach and results not presented.
Effort	Fully engaged during assignment time; Cooperates effectively with team;	Mostly engaged during assignment time; Cooperates effectively with team.	Mostly engaged during assignment time;	Somewhat engaged during assignment time;	Not engaged with team.

	Demonstrates leadership.				