

Fundamental Research Methods in Health Informatics (Python Programming)

HLTH 453 / 619 - Fall 2025

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Lecture Time: 6:00 PM -7:25 PM (Monday)
[BMH 1016 and on TEAM](#)
Office hours 12:00 PM - 1:00 PM (Thursday)
In person and on TEAM

Course Description

This course focuses on the fundamental analytic skills commonly employed in modern health informatics research to collect, store, organize, process, analyze, and communicate data, information, and knowledge. Emphasis is on Python Programming. Students will gain theoretical understanding and practical experience to apply the learned methods in practice.

By the end of the course, students will be able to:

1. Have practical knowledge and hands-on experience in Python Programming Language
2. Data processing/analytics/visualization routines
3. Perform basic natural language processing
4. Train and evaluate machine learning models

Textbook [Python for Data Analysis \(3rd edition\)](#), McKinney, W. (2022). Sebastopol, CA: O'Reilly Media. ISBN: [978-1098104030](#). Available for free through UWATERLOO library. Or [online](#)

Course Website

All course materials will be made available and submitted through [learn.uwaterloo.ca](#). Meetings and informal discussion/support will happen on [Microsoft Teams](#).

Lecture Times (Labs, Q&A, and Class Discussions)

This course will follow a flipped classroom model, where students are required to watch the prerecorded lectures in advance and come to the lecture time prepared to engage with the rest of the class in discussions, exercises, Q&A, etc.

The course will be in a hybrid format, where you can attend general lectures online or in-person, except some sessions are online only. All sessions will be recorded.

Grade Distribution

HLTH 453 (Undergraduate students)

Assignment 0	2%
Assignment 1	10%
Assignment 2	8%
Assignment 3	10%

Assignment 4	10%
Assignment 5	10%
Final Exam (you must pass final exam in order to pass this course)	50%
Bonus (you can join a project team in HLTH 619)	10%

HLTH 619 (Undergraduate students)

Assignment 0	2%
Assignment 1	10%
Assignment 2	8%
Assignment 3	10%
Assignment 4	10%
Assignment 5	10%
Course Project (you must pass project interview: oral exam in order to pass this course)	50%

Late Assignments

Each of the assignments in this course has a due date, which is posted on LEARN and is presented on the Course Outline on this Syllabus. Assignments are due at 11:59 PM (midnight) on the specified due date. All assignments in this course should be submitted online to the respective web submission on Marmoset by the specified due dates and times. Late assignments will be penalized by 10% of the assignment total marks for each 24 hours, up to a maximum of five (5) days. The late penalty begins immediately after the posted time at which the assignment is due. After the 5-day maximum, assignments will not be accepted, and a grade of "zero" will be recorded for that assignment. Elective arrangements (e.g., travel plans) or heavy workloads are not considered grounds for variance.

Slip Days

We will be using slip days to give students some flexibility in this course. Each student starts the term with three (3) slip days, which can be used to push back assignment deadlines. Here are the rules for slip days:

- Slip days are non-transferable from one student to another.
- Partial slip days are not allowed (e.g., it is not possible to use part of a slip day to push a deadline back by a few hours).
- Assignments that are submitted without a slip day request will be treated as late assignments and penalized as indicated above.
- Student must request a slip day to the course instructor at least 24 hours before the due date and time.
- Slip day can not be used for the final exam or project presentation.

Course Outline

Week	Topic	Reading	Assignment	Due Date
1 Sept 2	Introduction to the course	Textbook Ch. 1	0	
2 Sept 8	Introduction to Python	Google's Python Tutorial	Project	Sept 14 (Ao)
3 Sept 15	Modules, Classes, Objects	Textbook Ch 2,3	1	Sept 21 (A1)
4 Sept 22	NumPy	Textbook Ch 4,5	2	Sept 28 (P1)
5 Sept 29	Pandas, reading and writing data	Textbook Ch 6	2	Oct 5 (A2)
6 Oct 6	matplotlib Data Preparation	Textbook Ch7 Textbook Ch9	3	Oct 12 (A3)
7. Oct 13 Reading Week				
8 Oct 20	pandas and cartopy Time Series	Textbook Ch7 Textbook Ch9	4	Project Proposal
9 Oct 27	Raw Text Processing	Textbook Ch10		Project Consultation
10 Nov 10	Tagging Words Text Classification	NLTK Ch. 3	4	Nov 9 (A4)
11 Nov 17	Introduction to Machine Learning Classification, Regression			Project Consultation
12 Nov 24	Unsupervised Learning - Cluster Analysis	scikit-learn Tutori	5, Project	Nov 23 (A5) Project Consultation
13 Nov 25	Evaluation of ML models		Project	Dec 15 (Project Demo)

University Policies

1. Cross-listed course

Please note that a cross-listed course will count in all respective averages no matter under which rubric it has been taken. For example, a PHIL/PSCI cross-list will count in a Philosophy major average, even if the course was taken under the Political Science rubric.

2. Academic Integrity

In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility. Visit uwaterloo.ca/academicintegrity for more information.

- Discipline**

A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for their actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about rules for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](#). For typical penalties see [Guidelines for the Assessment of Penalties](#).

- Grievance**

A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](#). When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

- Appeals**

A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read [Policy 72 \(Student Appeals\)](#).

3. Accommodations for Students with Disabilities

The [AccessAbility Services](#) office, located in Needles Hall Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AS office at the beginning of each academic term.