Department of Computer Science, University of Western Ontario

CS9877A - Research Topics in Genomics and Proteomics / CS4463A - Computational Biology -- Fall 2025

Class time

- Wednesdays, 4:30 - 6:30pm[redacted]

Prerequisites

- CS9877
  - None.
- CS4463
  - Computer Science 3331A/B and Computer Science 3340A/B, or Software Engineering 2205A/B and Software Engineering 3310A/B; Biochemistry 2280A is recommended
  - OR permission from instructor

  Unless you have either the requisites for this course or written special permission from your Dean's Designate (Department/Program Counsellors and Science Academic Advisors) to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Instructor information

- Prof. Lucian Ilie
  - Office hours: Thursdays, 3:30pm - 5:30pm[redacted]

Course Syllabus, Schedule, Delivery Mode

Course description

Genomics and proteomics are two rapidly growing areas of molecular biology that are already causing a revolution in medicine. While genomics is concerned with the sequencing and analysis of an organism's genome, proteomics studies the organism's proteome (the entire set of proteins), including protein abundances, variations, modifications, and their interactions with other proteins or DNA. The two fields aim to understand cellular processes and their relation with diseases. The course will provide first an introduction to basic concepts of computational molecular biology, including sequence alignment, dynamic programming, BLAST, spaced seeds, suffix trees, suffix arrays, Markov chains, hidden Markov models, profile HMMs for sequence families, multiple sequence alignment methods, etc. Then, current and emerging research topics will be discussed, with a focus on machine learning techniques for solving protein prediction problems. Topics include: deep learning, Natural Language Processing, attention, text embeddings such as: word2vec, ELMo, BERT, etc., protein embeddings such as: ProtVec, PRoBERTa, MSA-transformer, ESM2, ProtBert, ProtAlbert, ProtT5, etc., protein interaction site prediction, protein-protein interaction prediction, protein structure prediction, protein contact map prediction, etc.

Course Materials

Useful books (not required)

- W.J. Ewens, G.R. Grant, *Statistical Methods in Bioinformatics,* 2nd edition, Springer, New York, 2005.
- R. Durbin, S. Eddy, A. Krogh, G. Mitchison, *Biological Sequence Analysis,* Cambridge Univ. Press, 1998 (11th printing, 2006).

Lecture Notes

- Click "Lecture notes" button at the top of the page
- Username and password are given in the Announcements

OWL

- Students are responsible for checking the course OWL site (https://westernu.brightspace.com/) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.
- If students need assistance with the course OWL site, they can seek support on the OWL Brightspace Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Methods of Evaluation

Evaluation -- CS9877/CS4463:

- Participation: **20%**
  - Students can miss up to 2 classes without losing participation marks. If they need to miss more classes, permission from the instructor or from their home Faculty Academic Advisors is needed.
- Presentations (given by each student in class): **80%**
  - Schedule
  - Presentation evaluation guidelines
- There will be no assignments or exams

General information about missed coursework

Students must familiarize themselves with the University Policy on Academic Consideration - Undergraduate Students in First Entry Programs posted on the Academic Calendar: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf

This policy does not apply to requests for Academic Consideration submitted for attempted or completed work, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult Accessible Education.

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage: https://registrar.uwo.ca/academics/academic_considerations/ All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation.

When a student mistakenly submits their one allowed Academic Consideration request without supporting documentation for the assessments listed above or those in the Coursework with Assessment Flexibility section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under Special Examinations), especially for those who miss multiple final exams within one examination period.

Additional Statements

Religious Accommodation

When conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing or the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays: https://www.edi.uwo.ca.

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf.

Academic Policies

The website for Registrar Services is https://www.registrar.uwo.ca/.

In accordance with policy, https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

Scholastic offences

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Use of Electronic Devices During Assessments. In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.
Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a **scholastic offence**, even if the device is not in use.
Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

Use of Generative AI Tools. Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is not permitted in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.
Using such tools for content generation, code writing, problem solving, translation, or summarization -- when not explicitly allowed -- will be treated as a **scholastic offence**.
If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic-related matters: https://www.uwo.ca/sci/counselling/.

Students who are in emotional/mental distress should refer to Mental Health@Western (https://uwo.ca/health/) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at
https://www.uwo.ca/health/student_support/survivor_support/get-help html. To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at
http://academicsupport.uwo.ca/accessible_education/index html if you have any questions regarding accommodations.
