STA314H: Statistical Methods for Machine Learning I

Syllabus

Summer 2025

Prerequisites

- **Statistics & Probability:** STA302H1/ STA302H5/ STAC67H3
- **Multivariate calculus:** MAT235Y1 / MAT237Y1 / MAT257Y1 / (MATB41H3, MATB42H3) / (MAT232H5, MAT236H5) / (MAT233H5, MAT236H5)
- **Linear algebra:** MAT223H1 / MAT240H1 / MATA22H3 / MATA23H3 / MAT223H5 / MAT240H5
- **Programming basics:** CSC108H1 / CSC110Y1 / CSC120H1 / CSC148H1 / CSCA08H3 / CSCA48H3 / CSCA20H3 / CSC108H5 / CSC148H5

Teaching Team

- Instructor: Junhao Zhu (https://j0eyjoey.github.io/junhaozhu98/), PhD student in Statistical Sciences. Email: jh.zhu@mail.utoronto.ca (mailto:jh.zhu@mail.utoronto.ca)
- Teaching Assistants: Arturo Esquivel Fuente, Arian Hashemzadeh Amirkhizi, Maksim Helmann

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Course Communication

- **? Quercus & Piazza** Quercus will only be used to make annoucements. We will use Piazza for the course forum to which you need to sign up via TBD. If your question is about the course material, logistics and clarification on homework & tutorial problems, please post to Piazza so that the entire class can benefit from the answer. All questions that give hint on solving homeworks should be exclusively asked during office hours. TAs will respond within 48 hours. Ask early!

- **Course email** Please, do not email the instructor or TAs on their personal or professional emails, unless for absolute emergency. Instead, use the course email, sta314@course.utoronto.ca (mailto:sta314@course.utoronto.ca), for special requests, such as: homework extension, regrading request, absence due to illness, etc. Questions about course material will not be addressed over email and these questions should be instead directed to the course Piazza site.

Office Hours

- Instructor: TBD
- Teaching Assistant : TBD

Class Times and Location

Unless otherwise specified, lectures and tutorials will be held in-person. There will be no synchronous online video stream or recordings of the lectures. Students should be enrolled in a lecture section and a tutorial section. The tutorial sessions are complementary to the lectures, and provide reviews and extension of the important concepts / methods in the lectures as well as helpful demonstrations on how to use computational software to conduct statistical analysis. Students are highly encouraged and expected to attend both lectures and tutorials.

Lectures

- Time: Monday 10:00 am - 1:00 pm, Friday 2:00 pm - 5:00 pm
- Location: NL 6 (https://map.utoronto.ca/?id=1809#!m/494486?s/)

Tutorials

Section	Time	Location
TUT 0101	Friday 1:00 pm-2:00 pm	MS 4171 (https://map.utoronto.ca/?id=1809#!m/494491?s/)
TUT 0102	Friday 1:00 pm-2:00 pm	HS 106 (https://map.utoronto.ca/?id=1809#!m/494459?s/)

Evaluation

Students will be evaluated according to University Assessment and Grading Practices Policy (https://governingcouncil.utoronto.ca/secretariat/policies/grading-practices-policy-university-assessment-and-january-26-2012). The table below shows the weight of each assessment.

Assessment	Weight
Quiz (during tutorial)	5%
Assignment 1	7%
Assignment 2	7%

Assessment	Weight
Assignment 3	6%
Midterm	30%
Final	45%
Bonus	1%

Tests

The course will have **two mandatory tests**, each with a duration of 2 hours. The midterm test is held during the normal class time while the final test is held in the final assessment period (see the dates and locations below). For the midterm test, students must take the test with their assigned section. All tests will be closed-book. Students are responsible for the material covered in lectures, tutorials, and practical sets. More details on the tests will be provided during the term.

Missed Tests

If you missed the midterm test, its grading weight will be equally added up to the final exam that have not been taken, meaning that if you missed the midterm, the final will be worth 75%.

Textbooks

Suggested readings:

- **ESL:** Elements of Statistical Learning (https://link.springer.com/book/10.1007/978-0-387-84858-7), by Hastie, Tibshirani, and Friedman.
- **PRML:** Pattern Recognition and Machine Learning (https://www.microsoft.com/en-us/research/people/cmbishop/prml-book/), by by Chris Bishop.
- **MLAPP:** Machine Learning: a Probabilistic Perspective (https://probml.github.io/pml-book/book0.html), by Kevin Murphy.
- **ISL:** An Introduction to Statistical Learning (https://www.statlearning.com), by James, Witten, Hastie, Tibshirani, and Taylor.

Computing

Python Programming Language

The course will use Python 3 for computing, and libraries such as Numpy (https://numpy.org), Scipy (https://scipy.org), scikit-klearn (https://scikit-learn.org/stable/) and Torch (https://pytorch.org) (mainly for DNNs, LLMs, etc.). We will not be expecting you to know advanced Python programming, however we will expect that you are able to do the following:

- navigate the file structure of a basic Python project,
- execute and read through Python scripts while understanding the distinction between code that executes and comments,
- basic Python programming, including calling and defining functions; assigning variables, evaluating expressions, the basics of loops, etc.
- read Numpy (https://numpy.org), Scipy (https://scipy.org), sklearn (https://scikit-learn.org/stable/) documentation to understand their API.

Python Tutorials

- In Python Tutorial (https://docs.python.org/3/tutorial/) you can find a variety of great tutorials to get you started. In particular, this Numpy Tutorial (https://realpython.com/numpy-tutorial/).

Using Python

There are a few options for running Python yourself.

- The easiest option is probably to install everything yourself on your own machine.
  - If you don't already have python, install it. We recommend using Anaconda (https://www.anaconda.com).
  - Optionally, create a virtual environment for this class and step into it. If you have a conda distribution run the following commands:

    ```
    conda create --name sta314
    source activate sta314
    ```

  - Use pip to install the required packages:

    ```
    pip install scipy numpy autograd matplotlib jupyter sklearn
    ```

- You may also consider using UofT Jupyter Hub (https://datatools.utoronto.ca) or Google Colab (https://colab.research.google.com/drive/).

ℹ Course Policies

📌 Missed Work Policy

Valid reasons for missing an assessment include: illness, injury, or other relevant personal issues. Any of the following types of documentation will be accepted to verify a student's reason for missing an assessment:

- University of Toronto Verification of Student Illness or Injury form (http://www.illnessverification.utoronto.ca/index.php). The form must indicate that the degree of incapacitation on academic functioning is moderate, serious, or severe in order to be considered a valid medical reason for missing.
- Student Health or Disability Related Certificate.
- A College Registrar's Letter.
- Accessibility Services Letter.

If an assignment due date is missed for a valid reason then your assignment will not be subject to a late penalty.

Other reasons for missing an assignment due date, without documentation, will require prior approval by your instructor. If prior approval is not received and an assessment is not submitted on time then your assessment will be subject to a late penalty (see Late Penalty).

📌 Late Penalty

The late penalty for a missed due date is 20% per day (i.e., 24 hours). For example, if the work is submitted after 5 days (including weekend days and holidays) then you will receive a grade of zero for the missed work.

📌 Collaboration Policy

Collaboration on the tests is strictly not allowed, and you must not discuss the test with anyone other than the instructor or TAs. Each student is responsible for his/her own work. Violation of this policy is an academic offence and will be investigated and reported as such.

📌 Ragrading Policy

Regrading requests should be submitted to the course email sta314@course.utoronto.ca (mailto:sta314@course.utoronto.ca). Regrading requests must include student name, student number, and a justification for the request, which refers specifically to the problem and the student's answers. Requests without this justification will not be considered. Requests will be considered by the same TA who marked the problem. The deadline for requesting a regrading is one week after the marks are returned. Regrading requests may result in a decrease in the grade.

📌 Academic Integrity

The University supports acting in honesty, trust, fairness, respect, responsibility, and courage in all aca- demic matters. Students are responsible for knowing the content of the Universitys Code of Behaviour on Academic Matters (https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019). All suspected cases of academic dishonesty will be investigated following proce- dures outlined in the Code of Behaviour above. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (http://academicintegrity.utoronto.ca/ (http://academicintegrity.utoronto.ca/)).

📌 Accessibility Needs

Students with diverse learning styles and needs are welcome in this course. If you have an acute or ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) at the beginning of the academic year by visiting http://www.studentlife.utoronto.ca/as/new-registration (http://www.studentlife.utoronto.ca/as/new-registration). Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will assess your situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your needs or condition with any instructor, and your instructors will not reveal that you are registered with AS

📌 Religious Accomodations

As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of cultural and religious traditions. For my part, I will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. Further to University Policy, if you anticipate being absent from class or missing a major course activity (such as a test or in-class assignment) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

📌 Specific Medical Circumstances

If you become ill and it affects your ability to do your academic work, consult me right away. Normally, I will ask you for medical documentation in support of your specific medical circumstances. The University's Verification of Student Illness or Injury (VOI) form is recommended because it indicates the impact and severity of the illness, while protecting your privacy about the details of the nature of the illness. You can submit a different form (like a letter from a doctor), as long as it is an original document, and it contains the same information as the VOI. For more information, please see http://www.illnessverification.utoronto.ca (http://www.illnessverification.utoronto.ca) If you get a concussion, break your hand, or suffer some other acute injury, you should register with Accessibility Services as soon as possible.

Accommodation for Personal Reasons

There may be times when you are unable to complete course work on time due to non-medical reasons. If you have concerns, speak to me or to an advisor in the Registrar's office; they can help you to decide if you want to request an extension or accommodation. They may be able to provide you with a Registrar's letter of support to give to your instructors, and importantly, connect you with other resources on campus for help with your situation.

Acknowledgements

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