STA475 / STA2475: Survival Analysis

Course Instructor: Nathalie Moon

How do you pronounce that?

- Nathalie: the "h" is silent; Moon: like the English word!

Preferred pronouns: she/her

Virtual class meetings: Tuesday 11:10 – 12 pm
Thursday 3:10 – 5pm

Virtual drop-in hours: Will be held virtually on Zoom, day/time TBA (check Quercus)

Email: sta475@course. utoronto.ca (note that this email will only be monitored during the semester)

Course Information

An overview of theory and methods in the analysis of survival data. Topics include survival distributions and their applications, parametric and non-parametric methods, proportional hazards regression, and extensions to competing risks and multistate modelling. More specifically, we this course will cover:

1. Introduction to Survival Analysis
2. Non-parametric Survival Models
3. Comparing Survival Distributions
4. Parametric Regression
5. Semi-parametric Regression
6. Other advanced topics

Recommended Reference books (not required, but available electronically through the library): *Survival Analysis: Techniques for Censored and Truncated Data* by John P Klein and Melvin L Moeschberger

Course materials and delivery

Course webpage: All materials will be posted on Quercus (https://q.utoronto.ca). Course materials provided on Quercus are for the use of students currently enrolled in the course only. All course materials are copyrighted; the copyright for textbook materials belongs to the textbook publisher, while the copyright for materials provided by the instructor belongs to the instructor. Distributing course materials (including course notes, assignments, etc.) to anyone outside the course is considered unauthorized use and may constitute an academic offense.

Course delivery: All class meetings will be held online via Zoom. I intend to post the recordings on Quercus after class, but recordings are not guaranteed in the event of technical errors. There will be two mandatory in-person assessments, to be held during the Thursday class time on the dates indicated in the syllabus. Class meetings will include a combination of 1) the instructor presenting new course material, 2) students working on worksheets in small groups to explore new topics, and 3) full class discussions.

Emergency circumstances: Some weeks, there may be circumstances outside my control which lead to changes to the standard course delivery format (e.g., asynchronous materials may be provided if a synchronous class meeting cannot be held as planned). If this arises, I will post an announcement on Quercus as early as possible to notify you.

Fostering a safe classroom environment

If you are feeling unwell, do *NOT* attend in-person assessments (refer to the Missed/late Submission Policy section of this syllabus for details on what to do if this occurs). As a class community, we are all accountable to each other to maintain a safe classroom environment for everyone. Even if you live alone and / or feel you are not at high risk of severe illness, remember that some of your peers may themselves be at high risk or living with individuals who are. Let's all do our part to keep each other safe.

Learning objectives

By the end of the course, you should be able to:

1. Classify data problems in survival analysis (e.g. types of censoring mechanisms, censoring assumptions, time-varying covariates, etc.)
2. Calculate and interpret non-parametric estimates of survival probabilities and related confidence intervals.
3. Analyze time-to-event data using R using parametric, non-parametric, and semi-parametric approaches (variable selection, inference, interpretation, and assessment of model fit) articulating the rationale for modeling decisions.
4. Critically evaluate the strengths and limitations of different modeling approaches to make well-informed decisions in model selection.
5. Critically evaluate and interpret survival analyses reported in research papers, focusing on methodology, generalizability, and limitations.
6. Conduct simulation studies to explore properties of methods, including robustness to violation of assumptions
7. Clearly communicate complex statistical concepts to diverse audiences, adjusting explanations to different technical levels, while addressing statistical challenges and ethical implications.
8. Reflect on learning and professional development

How Your Success Will be Measured

	STA475 (Undergrads); Maximum of the two grading schemes below*		**STA2475 (Grads)**	
	Option 1	Option 2		Date (dates are tentative but unlikely to change)
Active Engagement & Reflection	9%	9%	9%	
Weekly ticket out the door (1pt)				Fridays, starting on January 9
Class worksheets (1pt)				Fridays, starting on January 9
Assignments (three, equally weighted)	15%	15%	10%	January 30 / February 13 / March 13
Term Test (in person)	25%	30%	20%	Thursday February 26, during class time
Pick Your Path Project (Optional)	10%	0%	-	Friday March 27
Deep Dive Project (Required)	-	-	20%	Friday March 13
Survey	1%	1%	1%	Friday April 3
Final exam (in person)	40%	45%	40%	TBD – date will be chosen by the faculty of Arts & Science

*Undergrads: Your final grade will automatically be calculated as the maximum of the two options.

To pass this course, you must achieve a grade of at least 50% on the final exam, regardless of your performance on other course components. Students who score below 50% on the final exam will receive a maximum final grade of 47%, even if their weighted average from all course components would otherwise result in a passing grade. This policy ensures that all students demonstrate sufficient mastery of the core course concepts by the end of the course.

Expectations for students / Norms for online course

My intention is to make our class meetings a welcoming virtual space for everyone to learn, exchange ideas, and engage with each other. I strongly encourage you to participate in the class meetings by asking questions through chat or by raising your hand, responding to questions, and turning on your camera if you are comfortable doing so. This will make it easier for me to get to know you (which is key for potential reference requests down the road!) and make the experience more engaging for everyone. I realize that some of you may be tuning in to class from public spaces on or off campus which may make engaging via video/microphone more challenging – if this is the case, consider attending weekly office hours to introduce yourself, meet fellow classmates, and discuss course material in a more casual setting.

Coursework

Active Engagement and Reflection

The Active Engagement & Reflection score will be calculated as min(m/0.80M, 100), where M is the total value of points for work assigned, and m is the student's grade. In other words, you will get full marks if you meaningfully complete at least 80% of tasks in this category.

Weekly Ticket Out the Door: Each week, you will complete a short "ticket out the door" questionnaire on Quercus; due on Fridays starting on Friday January 9. You can submit responses as many times as you like before the deadline, but only the last submission will be considered. To get full credit on your ticket out the door survey, you must provide meaningful answers to the open-ended questions, but there is no right or wrong answer. This should not take you long to do, just 5-10 minutes to reflect back on the material covered that week. However, saying "Nothing" or "Everything" is not enough to get credit!

Weekly Class Worksheets: Most weeks, part of the class time will be reserved for you to work in groups on problems related to the course material, after which we will discuss the solutions as a class. You will submit the work you did on these worksheets to demonstrate your active engagement with the course material. These will be due on Fridays, at the same time as the weekly ticket out the door.

Reflections (Occasional): A few times during the semester, there may be additional opportunities for you to demonstrate your reflections on the course material, which can also count towards your Engagement and Reflection score.

Assignments

There will be three homework assignments throughout the term. You will receive each assignment 10 days before the due date and are encouraged to start working on it early. While you may discuss course content with your classmates, you must complete assignments on your own. In addition, you may not submit work generated by AI tools (such as ChatGPT, Claude, Gemini, or other large language models) as your own. It is an academic offence to submit another person's work as your own, and infractions will be reported and investigated.

Survey

During the final week of classes, you will receive a link to a brief survey about your usage of class recordings. You will receive 1% course credit for completing this survey, regardless of how you respond to any individual question.

As part of this survey, you will be asked whether you consent to having your anonymized responses included in a research project investigating how students use class recordings. **Your decision about research participation does not affect your course credit**, you will receive the 1% simply for completing the survey.

To protect your privacy, the course instructor will only receive a list of students who completed the survey (for grading purposes) and will not see any individual responses until after final course grades have been submitted. This research has been approved by the University of Toronto Research Ethics Board.

Projects

Pick Your Path Project (Undergraduate students): The project is optional for undergraduate students - for students who don't complete it, the course grade will be based on grading scheme 2. Students will have the choice to work in a group of 2-3 or alone to explore a survival analysis topic of their choice in a format of their choice (options will be provided). More details will be provided on Quercus later in the term.

Deep Dive Project (Graduate students): Required project. Students will work in small groups to master and teach an advanced extension of the Cox model through simulation studies, real data analysis, and an in-class presentation. Topics will include time-varying covariates, frailty models, and penalized Cox regression. Groups will submit a reproducible report (qmd) and deliver a mini lecture to the class to share what they've learned. More details will be provided on Quercus later in the term.

Term test and Final Exam

While class meetings will be held virtually on Zoom, there will be one in-person term test and one in-person final exam. The term test will be held on campus during class time on Thursday February 26 (the location will be made available on Quercus as soon as it is available). The final exam's date and location will be set by the faculty of Arts and Science – it is your responsibility NOT to make travel plans during the exam period until the schedule has been released.

Missed/late Submission Policies

Engagement and Reflection [automatic 2.5-day grace period]

There is an automatic 3-day grace period for Engagement and Reflection tasks (e.g. Weekly Ticket out the Door and Class Worksheets). While the deadline for these is Friday at 11:59pm, you can submit until Mondays at 1pm with no penalty. No submissions will be accepted after this point.

Assignments [automatic 2.5-day grace period AND MS Form if missed]

If personal circumstances prevent you from submitting an assignment by the Friday deadline (see due dates in the "How will your success be measured" section of the syllabus), you have until the following Monday at 1pm ET to submit it, with no penalty. As solutions will be released on Mondays after 1pm, no submissions will be accepted after this point.

If your personal circumstances are such that you cannot submit your assignment by the Monday, you must submit this form by that day (that is, by the Monday immediately following the Friday deadline) with an attestation of illness or personal emergency. I will *NOT* be asking you for a doctor's note. By completing this form by the deadline, you may shift the weight of at most ONE of the three assignments to the other two assignments. If you are unable to submit two or more assignments, you will only be able to shift the weight of one of them to the other assignments.

Term Test [if missed, submit MS Form within 72 hours]

If personal circumstances prevent you from writing the term test on the scheduled date, submit this form within 72 hours of the missed test with an attestation of illness or personal emergency. I will *NOT* be asking you for a doctor's note. After this form closes, you will receive information about an alternative assessment (which may be an in-person test or an oral exam, at the discretion of the instructor).

Pick Your Path Project (Undergrad Students) [automatic 1 week grace period]

If personal circumstances prevent you from making your submission by the posted deadline (see due date in the "How will your success be measured" section of the syllabus), you have one additional week to submit your work, with no penalty. There is no need to request this extension, it will be automatically applied to everyone. No extensions will be allowed beyond this one-week grace period.

Deep Dive Project (Grad Students) [extensions on a case-by-case basis]

There is no automatic grace period for this project. However, please email sta475@course.utoronto.ca as early as possible if you have concerns about the deadline and I will work with you to find a reasonable solution.

Marking concerns

Assignments and term test

If you believe there has been an error in the grading of your assignment, you must complete the re-grade request form for each relevant question within one week of the grades being posted; your request will be reviewed by the course instructor in consultation with the TA (Teaching Assistant) who graded your work, as appropriate). To complete your request, you must include:

- your name and student number,
- a **detailed written justification** for your request (it is **not enough** to simply say that you believe your work deserves higher credit)

Please note that we reserve the right to review the grading of your entire submission when you re-submit an assessment for reconsideration (i.e., your grade could go down).

Help me catch typos in course materials

If you think you find an error in any course materials (e.g., course notes, Quercus page, assignment, etc.), please check the course's Errata page on Quercus to see if it is already listed – if it isn't listed, please submit a description of the typo or error at the form linked on the Quercus page.

Computing

We will use R, the RStudio IDE, and R notebooks. You will need to install R first, and then RStudio. R can be downloaded for free from http://cran.r-project.org. RStudio can be downloaded for free from http://www.rstudio.com/products/rstudio/download/. If you already have these installed, make sure to update to current versions (R version >= 4.0.0, RStudio 2022.07.1+554 or more recent).

You can also use the University of Toronto's JupyterHub (https://jupyter.utoronto.ca) to access RStudio through your Internet browser (this requires an internet connection).

Course Communication Policy

- Piazza forum: Questions about course content and course logistics should be posted on our Piazza forum, which you can access from the menu on the left of the Quercus page.
- Email: Questions relating to your personal circumstances should be sent to **sta475@course.utoronto.ca** by email. General questions about course content or course logistics will not be answered by email and will be referred to Piazza instead. Please send emails when it is convenient for you to do so, but expect responses within 1-2 business days (Monday to Friday), from 9am to 5pm ET.
- MS Forms:
    - Typo submissions must be submitted via the appropriate form, to be considered for bonus credit.
    - Regrade requests will only be considered if submitted via the appropriate form, within one week of the grades being posted. Email requests will *not* be considered.
    - Notification of illness (for missed assignments or tests) will only be considered if submitted via the appropriate form, by the required deadline (see Missed Work section of the syllabus for more details).

Minimal technical requirements

All students should consult the minimum technical requirements for participation in online learning. If you are facing financial barriers to obtaining the required technology, please contact your College Registrar's Office to obtain information regarding your potential eligibility for a need-based bursary.

Accessibility

The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom, or course materials, please contact Accessibility Services as soon as possible: email accessibility.services@utoronto.ca or visit the website at http://accessibility.utoronto.ca

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If you have an accommodation letter from your accessibility advisor that is relevant to this course, please do the following:

- Email your letter to sta475@course.utoronto.ca with "Accommodation letter" as part of the email subject, cc (carbon copy) your advisor and let us know anything else you wish us to know/any questions you have. Please do this as soon as possible after you enrol in the course/receive this syllabus.
- Confirm any accommodations for **each** specific assessment at least **1 week** before the assessment / due date.

Academic Integrity

Academic integrity is fundamental to learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the University of Toronto degree that you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

Plagiarism

In this course you may be at risk of plagiarising if you do not understand the rules and your responsibilities. You must not present the work of others as your own. This includes, but is certainly not limited to, copying text and including it in your writing without a citation and quotation marks.

There are many resources to help you learn more:

- https://guides.library.utoronto.ca/plagiarism
- https://www.academicintegrity.utoronto.ca/smart-strategies/

Intellectual Property Statement

Course material that has been created by your instructor (i.e. lecture slides, term test questions/solutions and any other course material and resources made available to you on Quercus) is the intellectual property of your instructors and is made available to you for your personal use in this course. Sharing, posting, selling or using this material outside of your personal use in this course is not permitted under any circumstances and is considered an infringement of intellectual property rights.

This course, including your participation, may be recorded on video and will be available to students in the course for viewing remotely and after each session. These are intended only for students registered in the course. Course videos and materials belong to your instructor, the University, and/or other source depending on the specific facts of each situation and are protected by copyright. In this course, you are permitted to download session videos and materials for your own academic use, but you should not copy, share, or use them for any other purpose without the explicit permission of the instructor.

Use of Generative Artificial Intelligence Tools

Students may use artificial intelligence tools, including generative AI, in this course as learning aids. However, students are ultimately accountable for the work they submit. **If students use an artificial intelligence tool (e.g. ChatGPT) in an assignment, they must include, as an appendix, any content produced by an artificial intelligence tool and the prompt(s) used to generate the content. Any content produced by an artificial intelligence tool must be cited appropriately.** Many organizations that publish standard citation formats are now providing information on citing generative AI (e.g. MLA: https://style.mla.org/citing-generative-ai/.)

Students may not use generative artificial intelligence tools (e.g. ChatGPT and other AI writing and coding assistants) for the completion of, or to support the completion of invigilated, closed book assessment, including the midterm and final exam.

If you are unsure if a particular usage of a generative AI tool is appropriate, please ask your instructor for guidance. Note that policies for the use of these tools may be different across courses, and even for different assignments within a course.

Beware of Tutoring Companies

Tutoring companies do not have any right to suggest they are associated with this course. There is extensive support available within the course, department, and university for all students. Some so-called “tutoring” may in fact be a predatory scam and a potential risk to students’ academic integrity**.**