Course Goals and Objectives

The course is organized into theoretical and practice sessions

- Theoretical sessions introduce a topic, there are slides
- In practice sessions, we apply the methods of the previous session in a live-coding hands-on fashion
- Practice sessions are there to decompress and to slow down the pace of the course
- Gives you the opportunity to ask questions that came up after that week’s theory session

Topics we are going to discuss:

- What is computational modelling for?
- Relationship between models and the real world
- Simple inferential models
- Modelling of causal implications: what causes the patterns I see in the data?
- Multi-level models: overfitting/underfitting control
- Different data types: categorical (classification), continuous, ordered, etc.
- Latent variables and missing data: modelling what we can’t observe.
- Foundations of ML – Gaussian processes
- Spline models
- State-space models
- Modelling of dynamic processes
Canvas:

I will upload the following files:

- lecture slides
- lecture script & datasets
  - The R script and dataset used to generate the examples on my slides

We will have a linguistic dataset repository online where we store different datasets that are derived from actual research (my research, research of colleagues in the dept., replication datasets provided by researchers online)

Do not share the datasets with people outside of this course!

Recommended Reading:

There is no course book per se but the course is inspired by the books:


Those are available as e-books at the library

If you need help with something:

Questions concerning course organization, deadlines etc. and for help with technical issues, first contact our TA Megan

For other issues, feel free to contact me! If I get many questions about the same topic, I might wait until our next session to answer them for everyone.

Examination:

At the end of the course, you will write a research paper on a topic you can choose yourself. By the midpoint of this semester, I will upload several different datasets which I am going to present to you. You can then write a computational research paper on the topic that interests you most.
The **paper** should and follow the standards of academic writing. We are going to discuss in class how such a computational paper can be written. For this paper, you should consider the appropriate scientific context and use various methods we study in the course (linear, nonlinear models, Gaussian processes etc.). Since it’s a scientific paper, be sure to do a literature search and reference papers and books!

Along with the paper, please submit your programming **script** that you used to do the analysis. This way, I can go and check your code as well.

Please submit the paper and the script on Canvas via Turnitin by Sunday, May 5th 11.59pm.

**Length of term paper:**

- **4-level course:** 1500-2000 words in length
- **5-level course:** 2000-2500 words in length

Reminder: this is NOT a group assignment turning in joint work will be considered plagiarism (see policy below).

**Weekly Plan:**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
</tr>
<tr>
<td>2</td>
<td>Bayesian inference</td>
</tr>
<tr>
<td>3</td>
<td>MCMC and linear models</td>
</tr>
<tr>
<td>4</td>
<td>MCMC and linear models II</td>
</tr>
<tr>
<td>5</td>
<td>Causality</td>
</tr>
<tr>
<td>6</td>
<td>Causality II; Logistic models</td>
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<tr>
<td>7</td>
<td>Linear and nonlinear models</td>
</tr>
<tr>
<td>8</td>
<td>Categorical classification &amp; ordered models</td>
</tr>
<tr>
<td>9</td>
<td><strong>Spring break</strong></td>
</tr>
<tr>
<td>10</td>
<td>Hierarchical models I</td>
</tr>
<tr>
<td>11</td>
<td>Hierarchical models II</td>
</tr>
<tr>
<td>12</td>
<td>Latent variables, missing data</td>
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<tr>
<td>13</td>
<td>Gaussian processes</td>
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<tr>
<td>14</td>
<td>Splines</td>
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<tr>
<td>15</td>
<td>Dynamics: State-space models/ordinary differential equations</td>
</tr>
<tr>
<td>16</td>
<td>Final discussion</td>
</tr>
</tbody>
</table>

**Plagiarism policy:**

There are two forms of plagiarism I distinguish:
Minor plagiarism contains plagiarism that only occurs occasionally in the paper and can be attributed to human error or lack of knowledge. In this case, you will be asked to correct the affected instances; a subsequent lowering of the grade will be considered by the lecturer.

Major plagiarism is plagiarism that can be considered as extensive both in severity and frequency in the paper. The lecturer will call you in to offer a chance for you to explain the case. It is at the lecturer’s discretion to take any or all of the following measures: fail the student, report the student.

Forms of plagiarism contain, but are not limited to:
- Copying parts of the paper from a classmate
- Copying parts from an earlier examination/homework assignment, even if the author is yourself
- Using direct quotes or close paraphrasing from research literature without indicating the source.
- Having someone else write parts (or all) of the term paper

Technical Requirements & Skills

Minimum Technology Requirements
The following are minimum technology requirements for students to attend the course and communicate with the instructor:
- Computer
- Reliable internet access

Computer Skills & Digital Literacy
Course-specific technical skills learners must have to succeed in the course include:
- Using Canvas
- Using email with attachments

Rules of Engagement
Rules of engagement refer to the way students are expected to interact with each other and with their instructors online. Here are some general guidelines:
- Treat your instructor and classmates with respect in email or any other communication.
- Always use your professors’ proper title: Dr. or Prof., or if in doubt use Mr. or Ms.
- Unless specifically invited, do not refer to your instructor by first name.
- Use clear and concise language.
- Remember that all college level communication should have appropriate language (this includes discussion boards).
- Be cautious when using humor or sarcasm as tone is sometimes lost in an email or discussion post and your message might be taken seriously or sound offensive.
- Be careful with personal information (both yours and other’s).
- Do not send confidential information via e-mail
Getting Help

Technical Assistance
Part of working in the online environment involves dealing with the inconveniences and frustration that can arise when technology breaks down or does not perform as expected. Here at UNT we have a Student Help Desk that you can contact for help with Canvas or other technology issues.

UIT Help Desk: [UIT Student Help Desk site](http://www.unt.edu/helpdesk/index.htm)
Email: helpdesk@unt.edu
Phone: 940-565-2324
In Person: Sage Hall, Room 130
Walk-In Availability: 8am-9pm
Telephone Availability:
- Sunday: noon-midnight
- Monday-Thursday: 8am-midnight
- Friday: 8am-8pm
- Saturday: 9am-5pm

Laptop Checkout: 8am-7pm

For additional support, visit [Canvas Technical Help](https://community.canvaslms.com/docs/DOC-10554-4212710328)

Student Support Services
UNT provides mental health resources to students to help ensure there are numerous outlets to turn to that wholeheartedly care for and are there for students in need, regardless of the nature of an issue or its severity. Listed below are several resources on campus that can support your academic success and mental well-being:

- [Student Health and Wellness Center](https://studentaffairs.unt.edu/student-health-and-wellness-center)
- [Counseling and Testing Services](https://studentaffairs.unt.edu/counseling-and-testing-services)
- [UNT Care Team](https://studentaffairs.unt.edu/care)
- [UNT Psychiatric Services](https://studentaffairs.unt.edu/student-health-and-wellness-center/services/psychiatry)
- [Individual Counseling](https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling)

Other student support services offered by UNT include
- [Registrar](https://registrar.unt.edu/registration)
- [Financial Aid](https://financialaid.unt.edu/)
- [Student Legal Services](https://studentaffairs.unt.edu/student-legal-services)
- [Career Center](https://studentaffairs.unt.edu/career-center)
- [Multicultural Center](https://edo.unt.edu/multicultural-center)
- [Counseling and Testing Services](https://studentaffairs.unt.edu/counseling-and-testing-services)
- [Pride Alliance](https://edo.unt.edu/pridealliance)
- [UNT Food Pantry](https://deanofstudents.unt.edu/resources/food-pantry)
Academic Support Services

- Academic Resource Center (https://clear.unt.edu/canvas/student-resources)
- Academic Success Center (https://success.unt.edu/asc)
- UNT Libraries (https://library.unt.edu/)
- Writing Lab (http://writingcenter.unt.edu/)
- MathLab (https://math.unt.edu/mathlab)

UNT Policies

Academic Integrity Policy
Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

ADA Policy
UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one’s specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website (https://disability.unt.edu/).

Emergency Notification & Procedures
UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

Retention of Student Records
Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Canvas online system, including grading information and comments, is also stored in a safe electronic environment for one year. Students have the right to view their individual record; however, information about student’s records will not be divulged to other individuals without proper written consent. Students are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University’s policy. See UNT Policy 10.10, Records Management and Retention for additional information.

Acceptable Student Behavior
Student behavior that interferes with an instructor’s ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the
classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. Visit UNT’s Code of Student Conduct (https://deanofstudents.unt.edu/conduct) to learn more.

Access to Information - Eagle Connect

Students’ access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student’s Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail Eagle Connect (https://it.unt.edu/eagleconnect).

Student Evaluation Administration Dates

Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be made available during weeks 13, 14 and 15 [insert administration dates] of the long semesters to provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations viaIASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the SPOT website (http://spot.unt.edu/) or email spot@unt.edu.

Sexual Assault Prevention

UNT is committed to providing a safe learning environment free of all forms of sexual misconduct, including sexual harassment sexual assault, domestic violence, dating violence, and stalking. Federal laws (Title IX and the Violence Against Women Act) and UNT policies prohibit discrimination on the basis of sex, and therefore prohibit sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking, and/or sexual assault, there are campus resources available to provide support and assistance. UNT’s Survivor Advocates can assist a student who has been impacted by violence by filing protective orders, completing crime victim’s compensation applications, contacting professors for absences related to an assault, working with housing to facilitate a room change where appropriate, and connecting students to other resources available both on and off campus. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-565-2648. Additionally, alleged sexual misconduct can be non-confidentially reported to the Title IX Coordinator at oeo@unt.edu or at (940) 565 2759.

Important Notice for F-1 Students taking Distance Education Courses

Federal Regulation

To read detailed Immigration and Customs Enforcement regulations for F-1 students taking online courses, please go to the Electronic Code of Federal Regulations website (http://www.ecfr.gov/). The specific portion concerning distance education courses is located at Title 8 CFR 214.2 Paragraph (f)(6)(i)(G).

The paragraph reads:

(G) For F-1 students enrolled in classes for credit or classroom hours, no more than the equivalent of one class or three credits per session, term, semester, trimester, or quarter may be counted toward the full course of study requirement if the class is taken on-line or through distance education and does not require the student's physical attendance for classes, examination or other purposes integral to completion of the class. An on-line or distance education course is a
course that is offered principally through the use of television, audio, or computer transmission including open broadcast, closed circuit, cable, microwave, or satellite, audio conferencing, or computer conferencing. If the F-1 student's course of study is in a language study program, no on-line or distance education classes may be considered to count toward a student's full course of study requirement.

**University of North Texas Compliance**

To comply with immigration regulations, an F-1 visa holder within the United States may need to engage in an on-campus experiential component for this course. This component (which must be approved in advance by the instructor) can include activities such as taking an on-campus exam, participating in an on-campus lecture or lab activity, or other on-campus experience integral to the completion of this course.

If such an on-campus activity is required, it is the student’s responsibility to do the following:

1. Submit a written request to the instructor for an on-campus experiential component within one week of the start of the course.
2. Ensure that the activity on campus takes place and the instructor documents it in writing with a notice sent to the International Student and Scholar Services Office. ISSS has a form available that you may use for this purpose.

Because the decision may have serious immigration consequences, if an F-1 student is unsure about his or her need to participate in an on-campus experiential component for this course, s/he should contact the UNT International Student and Scholar Services Office (telephone 940-565-2195 or email internationaladvising@unt.edu) to get clarification before the one-week deadline.

**Student Verification**

UNT takes measures to protect the integrity of educational credentials awarded to students enrolled in distance education courses by verifying student identity, protecting student privacy, and notifying students of any special meeting times/locations or additional charges associated with student identity verification in distance education courses.

See [UNT Policy 07-002 Student Identity Verification, Privacy, and Notification and Distance Education Courses](https://policy.unt.edu/policy/07-002).

**Use of Student Work**

A student owns the copyright for all work (e.g. software, photographs, reports, presentations, and email postings) he or she creates within a class and the University is not entitled to use any student work without the student’s permission unless all of the following criteria are met:

- The work is used only once.
- The work is not used in its entirety.
- Use of the work does not affect any potential profits from the work.
- The student is not identified.
- The work is identified as student work.

If the use of the work does not meet all of the above criteria, then the University office or department using the work must obtain the student’s written permission.

**Download the UNT System Permission, Waiver and Release Form**

**Transmission and Recording of Student Images in Electronically-Delivered Courses**

1. No permission is needed from a student for his or her image or voice to be transmitted live via videoconference or streaming media, but all students should be informed when courses are to be conducted using either method of delivery.
2. In the event an instructor records student presentations, he or she must obtain permission from the student using a signed release in order to use the recording for future classes in accordance with the Use of Student-Created Work guidelines above.

3. Instructors who video-record their class lectures with the intention of re-using some or all of recordings for future class offerings must notify students on the course syllabus if students' images may appear on video. Instructors are also advised to provide accommodation for students who do not wish to appear in class recordings. Example: This course employs lecture capture technology to record class sessions. Students may occasionally appear on video. The lecture recordings will be available to you for study purposes and may also be reused in future course offerings. No notification is needed if only audio and slide capture is used or if the video only records the instructor's image. However, the instructor is encouraged to let students know the recordings will be available to them for study purposes.