

Computer Science 2035B: Data Analysis and Visualization 2017–18 Course Outline

Course Description

It is becoming increasingly common in a number of disciplines to be faced with an overwhelming quantity of data that must be processed, interpreted, and understood in order for it to be of value and truly useful. As a result, skills and background in data analysis and data visualization are quickly becoming essential to these disciplines. The purpose of this course is to develop and refine these skills and background, using MATLAB as a software platform for understanding and applying the fundamental techniques in statistics, mathematics, and computing necessary for gaining mastery over your data.

Lecture and Instructor Information

Section	Time	Room	Instructor	Office	Office Hour	Email
001	Tu: 4:30–6:30 pm Th: 3:30–4:30 pm	SSC-3022	Dr. Robert Moir	MC 385	F: 12:00–2:00 pm	rmoir3@uwo.ca

If you are contacting your instructor, please use your Western email address.

Is This a MATLAB Course?

YES, this is a MatLab course! However, this course assumes no prior programming knowledge, although some knowledge of programming in general would be very helpful. MATLAB lets you start programming right away, with just some rudimentary knowledge.

Obtaining MATLAB

As a Western student, you are entitled to install a free copy of the MATLAB software on your home computer or laptop. The software is available at <http://software.uwo.ca>. For information on how install MATLAB on your personal computing device see <https://wts.uwo.ca/sitelicense/matlab/activation.html>.

Prerequisite Requirements

0.5 course in Applied Mathematics, Calculus, Mathematics, Statistics (including Introductory Statistics), or the former Linear Algebra at the 1000-level or above, or permission of the Department. Beware of the following Dean's rule:

Unless you have either the requisites for this course or written special permission from your Dean 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.

Lab Time Schedule

There are two lab sections held consecutively (you attend the one you registered for)

- Thursday 4:30-5:30 pm – North Campus Building NCB-105
- Thursday 5:30-6:30 pm– North Campus Building NCB-105

The timetable for the University of Western Ontario Winter Term lectures and labs are posted at: <http://studentservices.uwo.ca/secure/timetables/mastertt/ttindex.cfm>

Important Dates

The following are important days that may affect students taking CS2035b:

1. First day of classes - Tuesday, January 8th
2. Reading week (also known as slack/skiing week) - Monday to Friday, February 19-23 (this week there are no classes, and yes, it includes family day as the 1st day)
3. Good Friday, March 30th
4. Last day of classes, Friday, April 11th
5. Study days (before exam) – Saturday April 12th, Sunday April 13th
6. Exam Period - April 14th-30th (16 days) NB: Typically the final exam date will be released early in the term but students are required to attend the exam. Purchasing a cheap ticket to go home and then finding out the exam is after your travel ternary is not sufficient grounds for as appeal.

Course Website

Students should check OWL (<http://owl.uwo.ca>) on a regular basis for news and updates. There will also be a course webpage set up in early January. The non-OWL webpage is the primary method by which information will be disseminated to all students in the class. Students are also responsible for checking OWL on a regular basis.

Course Materials

1. Recommended text: *Mastering MATLAB*, Duane Hanselmann and Bruce Littlefield, Pearson (Prentice Hall), 2012. However, any MATLAB textbook would mostly like be sufficient.
2. Another good text: *MATLAB Programming for Engineers* (5 th edition), Stephen J. Chapman, Cenage Learning, 2016 [has GUI, Object Oriented, I/O Chapters.]
3. The course notes and some MATLAB functions and data will be on the course webpage. The course webpage will be announced in class.
4. All MATLAB toolboxes are fully documented on www.mathworks.com/help/documentation-center.html.
5. Mathworks offers a number of Webinars on various topics on www.mathworks.com.
6. Mathworks also offers online documentation, discussion forums, and numerous other resources.
7. Google can find just about anything to do with MATLAB!

Anticipated Lecture Topics

Computer Science 2035B is a course about handling data in the modern world. The topics listed below are potential topics and may be adjusted to reflect lecture progress or to introduce new and exciting developments in the field.

- Introduction to MATLAB and the MATLAB Toolboxes
 1. The components of MATLAB (command window, editor, figures, toolboxes)
 2. Simple MATLAB programming
 3. Data types (single, double, integer, character arrays, records, cells)
 4. Variables and arrays
 5. Control flow (loops, while, if-then-else, switch (case) statements)
 6. Simple I/O (reading/writing binary, ASCII and mat files)
 7. Some built-in mathematical MATLAB functions
 8. Scripts and functions (*.m files)
 9. Arrays and simple array operations
 10. Multidimensional arrays

11. Simple 2D/3D plots and the print statement
 12. Matrix algebra
 13. Serialization versus Vectorization, JIT compilation
 14. Serialized versus Vectorized I/O
 15. Graphical User Interfaces (GUIs) using GUIDE
 16. MATLAB Programming Interfaces (such as C, Fortran and Java)
 17. Object Oriented MATLAB
- Basic Data Visualization
 1. Setting the camera and the lighting model
 2. Mesh and surface plots
 3. Colormaps and texture
 4. Representation arbitrary shaped 3D objects using patches
 5. Using transparency to display data
 6. Volume Visualization: scalar values, slice planes, isosurfaces, vector data
 7. Stream lines/ribbons and tubes
 8. Images, movies and sound
 - Basic Data Analysis
 1. Some basic operations: mean, standard deviation, weighted average, median, covariance matrices
 2. Random number generation
 3. Histograms
 4. Data correlation (Pearson's coefficient)
 5. Hypothesis testing (z-test and t-test)
 6. Chi-square goodness-of-fit and other variance tests
 7. Regression analysis (including linear, nonlinear and robust regression)
 8. Scatter/Box/Distribution plotting
 9. Probability Density/Cumulative distributions
 10. Normal, Exponential, Poisson, Rayleigh, Rican distributions
 11. Performance curves (ROC)

Teaching Assistants

TBA

Course Website

I will be setting up a website for the course at a location TBA. Assignment and lab pdf files will be available there. Also course lectures and MatLab programs referred to in the lectures will be available from there. On the other hand, all assignments and labs will be submitted via OWL and all marks will be posted on OWL.

Evaluation

Components

The overall course grade, out of 100, will be calculated as listed below. Listed next to the respective components are their maximum contributions toward the course grade.

Component	Notes	Value
Labs	Worth 1.25 each, must submit 8 throughout the term	10
Assignments	Worth 8 for assignment 1, worth 9 for assignments 2-4	35
Midterm Exam	Tuesday February 13 th (in class)	20/0
Final Exam	Scheduled by the Registrar	35/55

No electronic devices may be in your possession during tests and exams.

Notes:

1. Assignment 1 is worth 8% and is due Sunday, January 22th at 11:55pm (via Owl).
2. Assignment 2 is worth 9% and is due Sunday, February 12th at 11:55pm (via Owl).
3. Assignment 3 is worth 9% and is due Sunday, March 12th at 11:55pm (via Owl).
4. Assignment 4 is worth 9% and is due Sunday, April 2nd at 11:55pm (via Owl).
5. Each lab is due on the Thursday of the following lab.
6. The first lab session is Thursday Jan 11th, so the first lab is due Thursday Jan 18th.
7. You are required to complete 8 labs. Each lab is worth 1.25 marks (for a maximum of 10 marks). Lab attendance is mandatory and attendance is taken. Photo identification is required. There are (potentially) either 11 or 12 labs but you only have to complete 8 to obtain full marks. There are no bonus marks for completing more than 8 labs but note that there may be a final exam question based on the labs.
8. The purpose of the labs is to introduce or expand on the core material of this course, and to provide programming exercises with concepts. Lab instructions are posted on the course website, and include material that must be read before the lab. Attendance at labs is a required part of the course.
9. You must attend the lab session for which you are registered. There are no make-up labs and students who are absent from a lab do NOT have the option of just submitting the lab online via OWL. Attendance is required.
10. Midterm Exam is Tuesday, February 13th in class (90 minute exam, open book but NO laptops or cellphones allowed) and worth 20%. There is no makeup midterm exam, rather if you miss the midterm, your final exam will count for all the exam grade. Note this time was chosen because it is the last Tuesday before the reading week.
11. Final Exam TBA (3 hours, open book, no laptop or cellphones allowed) and worth 35% (or 55% if you do better on the final exam than on the midterm).

It is Faculty of Science policy that a student who chooses to write a test or exam deems themselves fit enough to do so, and the student must accept the mark obtained. Claims of medical, physical, or emotional distress after the fact will not be considered.

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

Lecture Notes

Lecture notes will be available on the course website after the lecture has been given. Pdfs of the lectures and MATLAB code relevant to these lectures are password protected and the password will be given out in class. The username is "class".

Computing Facilities

The labs are in NCB-105, general ITS university computing labs. The latest version of MATLAB is available there on all the machines. Many students will have their own MATLAB software on their laptops: these are acceptable as long as they are version 2009 or better.

Other Labs:

- There are other labs available to you that are open on the weekend, which includes SS1032 and the Genlab located in Taylor Library.

- Hours for the these labs can be found at: <https://wts.uwo.ca/genlabs/hours.html>

The locations of all Western labs can be found at: <https://wts.uwo.ca/genlabs/locations.html>

- All computers in the university computing labs will have MatLab available on them (probably MatLab R2015b or better).

Missed Course Components

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or supporting documentation to the Academic Counselling Office of your home faculty as soon as possible.

If you are a Science student, the Academic Counselling Office of the Faculty of Science is located in WSC 140, and can be contacted at 519-661-3040 or scibmsac@uwo.ca. Their website is: https://www.uwo.ca/sci/Maintenance/academic_counselling/index.html

A student requiring academic accommodation due to illness must use the Student Medical Certificate (http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf) when visiting an off-campus medical facility.

For further information, please consult the university's medical illness policy at www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf

If you miss the Midterm Exam there will be no makeup. Instead, your Final Exam grade will count for 55% of your final grade.

If you miss the Final Exam, please contact your faculty's Academic Counselling Office as soon as you are able to do so. They will assess your eligibility to write the Special Exam (the name given by the university to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

Other Grading Considerations

- If for any reason the assignment schedule cannot be adhered to, the assignment marks will be pro-rated. The assignments are worth 35% of the overall mark for the course. If an assignment has to be cancelled for any reason, the remaining assignment weights will be prorated to add up to 35%.
- If you obtain a higher grade on the final than on the midterm the final grade make will count for the complete exam grade.
- If you miss the midterm exam for any reason, the final exam make will comprise the entire exam mark. There will be no midterm makeup exam.
- You need to pass the assignments (average 50%) to pass the course.
- You need to obtain 40% on the exams to pass the course.
- You need to obtain 50% on the exams to receive a grade of 65% or more in the course.
- Neither cellphones or laptop computers can be brought to exams. We cannot be responsible for the storage of these devices at the front of the class. Possession of either of these devices will be considered to constitute cheating!

Appeal of Assignment Marks

1. Appeals of assignment marks should be addressed to your T.A. first. If you and the T.A. cannot agree, then the T.A. and the student will discuss the situation with the instructor. That decision will be final.
2. Appeals must occur within 1 week from the first day that the marked assignments or midterm exam were made available to students. After that 1 week period has gone by, no further appeals

will be considered and the marks are considered final. Note that this rule applies even if assignments are not picked up when passed back. The week (8 day) count down starts from the date the assignment is passed back.

Late Assignment Policy

Assignment due dates are always at 11:55pm (via Owl). It is not necessary to skip a class to put the final touches on an assignment. Hard copies of your assignments are not necessary and the Owl date of submission will be the “official” date of submission. Assignments mailed to the instructor or TA will not be accepted. Assignments passed in 1 day late will have 5% deducted while assignments passed in 2 days late will have 10% deducted. No assignments will be accepted after 2 days. Saturday and Sunday count as 1 day in determining the lateness of an assignment but since all assignments are due on a Sunday this rule will not apply unless an assignment date is changed. Extensions can only be granted by the course instructor.

If you have serious medical or compassionate grounds for an extension, you should take supporting documentation to the Academic Counseling office of your faculty, who will contact the instructor. Workload, exams, minor illnesses, and home computer problems are not valid reasons for being unable to complete an assignment within the allotted time (unless your academic councilor thinks otherwise).

Mental Health

Students who are in emotional/mental distress should refer to Mental Health website: <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.

Academic Accommodation for Medical Illness

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to your Academic Counseling office as soon as possible and contact your instructor immediately. It is the student’s responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed.

For further information please see: www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf

If you miss the Final Exam, please contact your faculty’s Academic Counselling Office as soon as you are able to do so. They will assess your eligibility to write the Special Exam (the name given by the university to a makeup Final Exam). You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (see http://www.registrar.uwo.ca/examinations/exam_schedule.html).

Tutoring

The role of tutoring is to help students understand course material. Tutors should not write part or all of an assignment. Having employed the same tutor as another student is not a legitimate defense against an accusation of collusion, should two or more students hand in assignments considered similar beyond the possibility of coincidence.

Accessibility

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 Services for Students with Disabilities (SSD) at 661-2111 ext. 82147 if you have questions regarding accommodation.

For more details see the policy on Accommodation for Students with Disabilities
www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_disabilities.pdf

Email Policy

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html>, 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 his/her official university address is attended to in a timely manner.

Ethical Conduct

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

Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offense. All assignments are individual assignments. You may discuss approaches to problems among yourselves; however, the actual details of the work (assignment coding, answers to concept questions, etc.) must be an individual effort. Assignments that are judged to be the result of academic dishonesty will, for the student's first offense, be given a mark of zero with an additional penalty equal to the weight of the assignment also being applied. You are responsible for reading and respecting the Department of Computer Science policy on Scholastic Offenses and Rules of Ethical

Conduct. The University of Western Ontario may use software for plagiarism checking. Students may be required to submit their written work and programs in electronic form for plagiarism checking.

Additionally,

1. All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).
2. Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating

Support Services

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

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

Additional student-run support services are offered by the USC, <http://westernusc.ca/services>.

The website for Registrarial Services is <http://www.registrar.uwo.ca>.