

ACSC/STAT 3740, Predictive Analytics
WINTER 2025
Toby Kenney

Instructor:	Toby Kenney Department of Mathematics and Statistics Chase Building, Room 102 email: tkenney@mathstat.dal.ca
Course Website:	www.mathstat.dal.ca/~tkenney/3740/2025/ or Brightspace
Office Hours:	TBA
Lectures:	TT: 16:05-17:25 LSC C220
Topics:	Data exploration; Data visualisation; Modelling data; Model validation; Communication
Textbook:	Regression Modeling with Actuarial and Financial Applications by Edward W. Frees published by Cambridge University Press Chapters 1–3, 5–9, 11–13
Additional References:	Data Visualization: A Practical Introduction Healy Princeton University Press, 2018 Currently available online at https://socviz.co/ Chapters 1–4 An Introduction to Statistical Learning, with Applications in R, James, Witten, Hastie & Tibshirani Springer, 2013 Available online at https://statlearning.com/ Chapters 2–6, 8, 10

Course Work and method of assessment

There will be a project and a final exam. The project will be completed during the term and submitted within one week of the end of classes (so by 23:59 on Monday 14th April). The final exam will be arranged **online** during the examination period 9th–26th April.

There will also be 5 homework assignments, which must usually be submitted on Thursdays. After the deadline, I will put the model solutions on the course website. **No credit can be given for late homework.** The overall homework mark will be made up of an average of the homework marks, with the exception of the worst mark for each student.

Homeworks will be submitted on Brightspace. Brightspace only allows annotation of pdf and image (e.g. jpeg) files, so **please submit any computer output in pdf format.** For handwritten work, you may submit photographs or scans in jpeg format. The homeworks will involve using R to analyse datasets. Unless the question is specifically asking for R code to create a particular plot, or some other effect, the credit is based on the output submitted, not the R code. You may submit the R code as a reference, but **I will not attempt to run any submitted R code, so ensure all output is submitted.**

If you prefer, you may submit paper copies of homework in the lecture on Thursday. In the event of technical difficulties submitting to Brightspace, you may email the files to me.

Grades will be determined by performance in the exam, project and the weekly homeworks. The project counts for 40%, the final counts for 40%, while the homework counts for the remaining 20%.

Discussion Lectures

Because of the practical nature of this course, an important part of the instruction will involve discussion of your ideas and approaches to problems. To facilitate this, some problems for discussion will be given in lectures, on the course website and on brightspace. You will then be expected to spend a short time (20–30 minutes) approaching these problems (you can work in groups if you prefer), and in the following lecture, we will discuss your approaches. In cases involving coding, the easiest approach is to send the code to me before the lecture, then we can present the code and discuss it during the lecture with minimal technical disruptions.

These discussion lectures will mostly be on Fridays. The other lectures, mostly on Wednesdays will introduce the relevant topics and approaches.

This is the current schedule of planned lectures and discussion sessions.

Week	Wednesday	Friday
6th January	Introduction and Preliminaries, Problem Formation, Data Selection, R setup.	Programming and R
13th January	Data Wrangling	Programming and Data Wrangling
20th January	Data Visualisation and <code>ggplot</code>	Data Exploration
27th January	PCA and Clustering	Data Visualisation & Exploration
3rd February	Model Fitting	Generalised Additive Models
10th February	Time Series Models	Project Planning
17th February	STUDY BREAK	
24th February	Time Series Models	Model Fitting
3rd March	Tree-based Methods	Variable Selection
10th March	Model Validation	Model Selection & Validation
17th March	Communication	Communication
24th March	Case study	Case study
30th March	Revision	Revision

Material covered

Rather than covering particular material, the purpose of this course is to practice applying material in realistic scenarios. We will introduce particular topics as needed for the data analysis problems.

Students with disabilities

Students with disabilities are encouraged to register as quickly as possible at the Student Accessibility Services if they want to receive academic accommodations. To do so, please phone 494-2836, email access@dal.ca, drop in at the Killam, G28, or visit our website at www.studentaccessibility.dal.ca.

Plagiarism

Plagiarism is a serious academic offense which may lead to loss of credit, suspension or expulsion from the university. Please read the Policy on Intellectual Honesty contained in the Calendar or on the Dalhousie web site at: <http://www.registrar.dal.ca/calendar/ug/UREG.htm#12>.

Dalhousie Writing Centre

Writing expectations at university are higher than you will have experienced at high school (or if you are entering a master's or PhD program, the expectations are higher than at lower levels). The Writing Centre is a Student Service academic unit that supports your writing development. Make an appointment to discuss your writing. Learning more about the writing process and discipline-specific practices and conventions will allow you to adapt more easily to your field of study.

Internet Resource Policy

As the course is designed to reflect real world problems, I will take a more relaxed approach to use of internet resources in answering homework questions. Using an internet search to find approaches to a problem is possible.