# Course Syllabus

# **Jump to Today**

Course Name: Data Analytics II

Course Number: ST 518
Term Offered: Spring 2025

Credits: 4

Instructor name: Kollin Rott

Instructor email: kollin.rott@oregonstate.edu (mailto:kollin.rott@oregonstate.edu)

**Instructor Office Hours:** By Appointment

Teaching Assistant: Patrick Jin (jinp@oregonstate.edu (mailto:jinp@oregonstate.edu)

# **Course Description**

Methods for modeling categorical and count data—contingency tables; proportions, risk and odds; logistic regression; log-linear regression mixed effects models; data imputation; prediction and cross-validation; scaling up to large datasets. Simulations and data analysis using R. Offered via Ecampus only.

PREREQS: ST 517 [C+]

#### Communication

Please post all course-related questions in the appropriate **Discussion Forum** 

(https://canvas.oregonstate.edu/courses/2003952/discussion\_topics) so that the whole class may benefit from our conversation. Email the instructor regarding private issues. You can expect a response within 24-48 hours on weekdays. I will be as responsive as possible on weekends, since I know many of you are occupied at your jobs during the week. However, please plan ahead so you don't have last-minute questions Sunday afternoon and evening. Questions in submission comments on quizzes and labs are emailed to us. If these questions would be of general interest, please post in the appropriate <a href="Discussion\_topics">Discussion\_topics</a>) instead.

**Course Credits** This course combines approximately 120 hours of instruction, online activities, and assignments for 4 credits.

#### **Technical Assistance**

If you experience any errors or problems while in your online course, contact 24-7 Canvas Support through the Help link within Canvas. If you experience computer difficulties, need help downloading a browser or plug-in, or need assistance logging into a course, contact the IS Service Desk for assistance. You can call (541) 737-8787 or visit the Service Desk online.

#### **Course Content**

This course adds methods for modeling categorical and count variables and making predictions using

those methods to your data analytics tool-kit. Specific topics include:

- Data analysis
- Contingency tables
- Proportions, risk and odds
- Logistic regression
- Log-linear regression
- · Mixed models in this setting
- Imputation for missing data
- Prediction and cross-validation
- Scaling up to large datasets

Other key elements of the course are:

- Gaining experience using R to perform exploratory, inferential and predictive data analytics
- Using simulations to understand the properties of estimators and the performance of predictions

## **Measurable Student Learning Outcomes**

After completing this class, you will be able to:

- Interpret and analyze data from a contingency table using an appropriate method.
- Identify the underlying assumptions of the logistic and log-linear regression models and perform diagnostics to evaluate the validity of these assumptions.
- Recognize the situations in which to use different data analytic tools, and be able to appropriately
  implement those tools in R.
- Recognize the situations in which adding random effects to a statistical model is an appropriate approach; implement, evaluate and interpret mixed effects models in R.
- Address missing data using data imputation methods.
- Make and evaluate predictions using regression models.
- Identify issues with scaling logistic and log-linear regression analysis to large datasets; implement methods for large data sets.
- Perform a complete data analysis—describing a dataset and research questions; selecting between candidate models; evaluating model assumptions and taking appropriate remedial action; interpreting and reporting results.

## **Learning Resources**

The course is composed of 10 week-long modules. The learning materials for a module consist of:

- Readings (see Assigned Reading section below).
- Lectures 4-6 Narrated lectures (slides with a voiceover) that cover the topics for the week and important concepts from the readings. Some lectures will include demos in R Studio.
- Computer lab Self-paced exercises in R intended to teach you how to perform computer simulations
  to understand the properties of procedures as well as perform data exploration and statistical
  analyses.

Within each module, the following learning assessments are due (exact due dates are found in the Course Summary section below):

- · two discussion board posts,
- two quizzes,
- · submission of your lab work, and
- a homework assignment

The last two modules are a little different. There is no homework, lab, discussion or quiz. Instead you are beginning and completing your final project.

#### Late Submissions

No late homework, discussion posts, quizzes, labs, or projects will be accepted without **permission from the instructor**. Please contact me if something comes up preventing you from submitting an assignment on time.

## **Recommended Approach**

Within a module the learning resources aren't in any particular order. The readings and lectures come first, but that doesn't mean you need to complete them all before moving on to the other pages. You will however always want to complete the computer lab before attempting the first question on the homework, and generally after the readings and lectures. You will probably find iterating between lectures, reading and glancing over relevant homework problems the best way to work through the material.

### **Topic Schedule**

Week	Topic
1	Introductions and Types of Categorical & Count Data
2	Proportions, Risk and Odds
3	Logistic Regression I
4	Logistic Regression II
5	Log-linear Regression
6	Over Dispersion, Zero-inflation
7	Fixed and Random Effects in this Setting
8	Evaluating Models and Scaling Up
9	Case Studies (Imputation, Prediction, Cross-validation)
10	Putting it all Together: Final Project

# **Assigned Readings**

The following textbooks are used over multiple weeks, but are not the only sources of readings. Additional readings may be assigned and will be provided as needed.

- OpenIntro Statistics. Diez, D.; Barr, C.; Çetinkaya-Rundel, M. 3rd Ed. (2015)
   <a href="https://www.openintro.org/stat/textbook.php">https://www.openintro.org/stat/textbook.php</a>
   (https://www.openintro.org/stat/textbook.php)
- 3. Categorical Data Analysis, 3<sup>rd</sup> edition. Agresti, A. (2014).

  <a href="https://ebookcentral.proquest.com/lib/osu/detail.action?docID=1168529">https://ebookcentral.proquest.com/lib/osu/detail.action?docID=1168529</a> 

  (https://ebookcentral.proquest.com/lib/osu/detail.action?docID=1168529)

<u>This page (https://canvas.oregonstate.edu/courses/2003952/pages/course-reading-list)</u> lists the readings for the entire term.

# **Computing Resources**

For the computing component of the course you will use  $R \Rightarrow (https://www.r-project.org/)$  (a programming language and environment for data analysis) and  $RStudio \Rightarrow (https://posit.co/download/rstudio-desktop/)$  (a program we will use to interact with R). You must have access to R and RStudio to complete the labs, homework, and some quizzes. R and RStudio are both free.

#### **Evaluation of Student Performance**

- Discussions 16 points
- Labs 40 points
- Quizzes 64 points
- Homework 80 points
- Final Project 40 points
- Total 240 points

# **Grading Scale**

Final percentages will be rounded to the nearest 10th of a percent and converted to letter grades according to the following scheme.

Percent	Grade
95-100	А
88-94.9	A-
80-87.9	B+
75-79.9	В

70-74.9	B-
65-69.9	C+
60-64.9	С
55-59.9	C-
45-54.9	D
0-44.9	F

#### **Course Policies**

## **Discussion Participation**

Students are expected to participate in all graded discussions. While there is great flexibility in online courses, this is not a self-paced course. You will need to participate in our discussions on at least two different days each week, with your first post due no later than Wednesday evening, and your post due by the end of each week.

#### **Proctored Exams**

There are no proctored exams for this course.

## Incompletes

Incomplete (I) grades will be granted only in emergency cases (usually only for a death in the family, major illness or injury, or birth of your child), and if the student has turned in 80% of the points possible (in other words, usually everything but the final paper). If you are having any difficulty that might prevent you completing the coursework, please don't wait until the end of the term; let me know right away.

#### Guidelines for a Productive and Effective Online Classroom

(Adapted from Dr. Susan Shaw, Oregon State University)

Students are expected to conduct themselves in the course (e.g., on discussion boards, email) in compliance with the university's regulations regarding civility.

Civility is an essential ingredient for academic discourse. All communications for this course should be conducted constructively, civilly, and respectfully. Differences in beliefs, opinions, and approaches are to be expected. In all you say and do for this course, be professional. Please bring any communications you believe to be in violation of this class policy to the attention of your instructor.

Active interaction with peers and your instructor is essential to success in this online course, paying particular attention to the following:

- Unless indicated otherwise, please complete the readings and view other instructional materials for each week before participating in the discussion board.
- Read your posts carefully before submitting them.

- Be respectful of others and their opinions, valuing diversity in backgrounds, abilities, and experiences.
- Challenging the ideas held by others is an integral aspect of critical thinking and the academic process. Please word your responses carefully, and recognize that others are expected to challenge your ideas. A positive atmosphere of healthy debate is encouraged.

## **Statement Regarding Students with Disabilities**

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at <a href="http://ds.oregonstate.edu">http://ds.oregonstate.edu</a>
(<a href="http://ds.oregonstate.edu/">http://ds.oregonstate.edu</a>
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## **Accessibility of Course Materials**

All materials used in this course are accessible. If you require accommodations please contact <a href="Disability Access Services">Disability Access Services (DAS) (http://ds.oregonstate.edu/home/)</a>.

Additionally, Canvas, the learning management system through which this course is offered, provides a **vendor statement** (http://www.instructure.com/accessibility) certifying how the platform is accessible to students with disabilities.

### **Expectations for Student Conduct**

Student conduct is governed by the university's policies, as explained in the Student Conduct Code (<a href="https://beav.es/codeofconduct">https://beav.es/codeofconduct</a>). Students are expected to conduct themselves in the course (e.g., on discussion boards, email postings) in compliance with the university's regulations regarding civility.

### **Academic Integrity**

Integrity is a character-driven commitment to honesty, doing what is right, and guiding others to do what is right. Oregon State University Ecampus students and faculty have a responsibility to act with integrity in all of our educational work, and that integrity enables this community of learners to interact in the spirit of trust, honesty, and fairness across the globe.

Academic misconduct, or violations of academic integrity, can fall into seven broad areas, including but not limited to: cheating; plagiarism; falsification; assisting; tampering; multiple submissions of work; and unauthorized recording and use.

It is important that you understand what student actions are defined as academic misconduct at Oregon State University. The OSU Libraries offer a <u>tutorial on academic misconduct</u> (https://guides.library.oregonstate.edu/c.php?g=286121&p=3896378), and you can also refer to the OSU

Student Code of Conduct and the Office of Student Conduct and Community Standards' website

(https://beav.es/codeofconduct) for more information. More importantly, if you are unsure if something will violate our academic integrity policy, ask your professors, GTAs, academic advisors, or academic integrity officers.

#### **Conduct in this Online Classroom**

Students are expected to conduct themselves in the course (e.g., on discussion boards, email postings) in compliance with the <u>university's regulations regarding civility</u>

(<a href="http://oregonstate.edu/studentconduct/">http://oregonstate.edu/studentconduct/</a>).

#### Academic Calendar

All students are subject to the registration and refund deadlines as stated in the Academic Calendar: <a href="https://registrar.oregonstate.edu/osu-academic-calendar">https://registrar.oregonstate.edu/osu-academic-calendar</a> (<a href="https://registrar.oregonstate.edu/osu-academic-calendar">https://registrar.oregonstate.edu/osu-academic-calendar</a>).

# Student Bill of Rights

OSU has twelve established student rights. They include due process in all university disciplinary processes, an equal opportunity to learn, and grading in accordance with the course syllabus: <a href="https://asosu.oregonstate.edu/advocacy/rights">https://asosu.oregonstate.edu/advocacy/rights</a>.

(<a href="https://asosu.oregonstate.edu/advocacy/rights">https://asosu.oregonstate.edu/advocacy/rights</a>).

The Oregon State <u>Online Writing Support (http://writingcenter.oregonstate.edu/online-writing-lab)</u> is also available for students enrolled in Ecampus courses.

## **Ecampus Reach Out for Success**

University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it's important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about <u>resources that assist with wellness and academic success</u> (<a href="https://counseling.oregonstate.edu/reach-out-success">https://counseling.oregonstate.edu/reach-out-success</a>).

Ecampus students are always encouraged to discuss issues that impact your academic success with the <a href="mailto:ecampus.success@oregonstate.edu">Ecampus Success@oregonstate.edu</a> (https://ecampus.oregonstate.edu/services/student-services/). Email <a href="mailto:ecampus.success@oregonstate.edu">ecampus.success@oregonstate.edu</a> (mailto:ecampus.success@oregonstate.edu) to identify strategies and resources that can support you in your educational goals.

For mental health:

Learn about <u>counseling and psychological resources for Ecampus students</u>
(<a href="https://counseling.oregonstate.edu/main/ecampus-students">https://counseling.oregonstate.edu/main/ecampus-students</a>). If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).

For financial hardship:

Any student whose academic performance is impacted due to financial stress or the inability to afford groceries, housing, and other necessities for any reason is urged to contact the Director of Care for support (541-737-8748).

# Student Learning Experience Survey

During Fall, Winter, and Spring term, the online Student Learning Experience surveys open to students the Wednesday of week 9 and close the Sunday before Finals Week. Students will receive notification, instructions, and the link through their ONID email. They may also log into the survey via MyOregonState. Survey results are extremely important and are used to help improve courses and the learning experience of future students. Responses are anonymous (unless a student chooses to "sign" their comments, agreeing to relinquish anonymity of written comments) and are not available to instructors until after grades have been posted. The results of scaled questions and signed comments go to both the instructor and their unit head/supervisor. Anonymous (unsigned) comments go to the instructor only.

# **Course Summary:**

Date	Details	Due
Wed Apr 2, 2025	Initial Post due - Module 1  Discussion  (https://canvas.oregonstate.edu/calendar?  event_id=2998201&include_contexts=course_2003952)	11:59pm
	Module 1 Content Quiz  (https://canvas.oregonstate.edu/courses/2003952/assignments/10034	oy 11:59pm 362)
	Module 1 Discussion due k (https://canvas.oregonstate.edu/courses/2003952/assignments/10034	oy 11:59pm 379)
	Module 1 Homework (https://canvas.oregonstate.edu/courses/2003952/assignments/10034	oy 11:59pm 384)
Sun Apr 6, 2025	Module 1 Lab due k (https://canvas.oregonstate.edu/courses/2003952/assignments/10034	oy 11:59pm 385)
	Module 1 Lab 0 (no submission required, but lots of valuable information) (https://canvas.oregonstate.edu/courses/2003952/assignments/10034	oy 11:59pm . <u>386)</u>
	Module 1 R Quiz (https://canvas.oregonstate.edu/courses/2003952/assignments/10034	oy 11:59pm 359)

Date	Details	Due
Wed Apr 9, 2025	Initial Post due - Module 2  Discussion  (https://canvas.oregonstate.edu/calendar?  event_id=2998202&include_contexts=course_2003952)	11:59pm
	Module 2 Content Quiz (https://canvas.oregonstate.edu/courses/2003952/assignments	due by 11:59pm s/10034360)
	<b>Module 2 Discussion</b> (https://canvas.oregonstate.edu/courses/2003952/assignments	due by 11:59pm s/10034378)
Sun Apr 13, 2025	Module 2 Homework  (https://canvas.oregonstate.edu/courses/2003952/assignments	due by 11:59pm s/10034387)
	Module 2 Lab (https://canvas.oregonstate.edu/courses/2003952/assignments	due by 11:59pm s/10034388)
	Module 2 R Quiz (https://canvas.oregonstate.edu/courses/2003952/assignments	due by 11:59pm s/10034370)
Wed Apr 16, 2025	Initial Post due - Module 3  Discussion (https://canvas.oregonstate.edu/calendar? event_id=2998203&include_contexts=course_2003952)	11:59pm
	Module 3 Content Quiz (https://canvas.oregonstate.edu/courses/2003952/assignments	due by 11:59pm s/10034369)
Sun Apr 20, 2025	Module 3 Discussion (https://canvas.oregonstate.edu/courses/2003952/assignments	due by 11:59pm s/10034377)
	Module 3 Homework  (https://canvas.oregonstate.edu/courses/2003952/assignments	due by 11:59pm s/10034389)
	Module 3 Lab (https://canvas.oregonstate.edu/courses/2003952/assignments	due by 11:59pm s/10034390)
	Module 3 R Quiz (https://canvas.oregonstate.edu/courses/2003952/assignments	due by 11:59pm s/10034357)
Wed Apr 23, 2025	Initial Post due-Module 4	11:59pm

**Discussions** 

Details	Due
(https://canvas.oregonstate.edu/calendar?	
event_id=2998204&include_contexts=course_2003952)	
Module 4 Content Quiz	11·50nm
(https://canvas.oregonstate.edu/courses/2003952/assignments/1003436	<u>64)</u>
Module 4 Discussion	11.50pm
(https://canvas.oregonstate.edu/courses/2003952/assignments/1003437	76)
Module 4 Homework	11·50nm
(https://canvas.oregonstate.edu/courses/2003952/assignments/1003439	11.39pm <u>91)</u>
<b>Module 4 Lab</b>	11:50nm
(https://canvas.oregonstate.edu/courses/2003952/assignments/1003439	93)
Module 4 R Quiz	11.50nm
(https://canvas.oregonstate.edu/courses/2003952/assignments/1003435	11.59pm 58)
initial Post due - Module 5	
<u>Discussion</u>	11:59pm
event_id=2998205&include_contexts=course_2003952)	
	44.50
(https://canvas.oregonstate.edu/courses/2003952/assignments/1003435	11:59pm <u>56)</u>
ਜ਼ੀ Module 5 Discussion	
(https://canvas.oregonstate.edu/courses/2003952/assignments/1003437	11:59pm <u>75)</u>
Module 5 Homework	11.F0pm
(https://canvas.oregonstate.edu/courses/2003952/assignments/1003439	11:59pm <u>94)</u>
Module 5 Lab	11.50pm
(https://canvas.oregonstate.edu/courses/2003952/assignments/1003439	95)
Module 5 R Quiz	11·50nm
(https://canvas.oregonstate.edu/courses/2003952/assignments/1003437	<u>71)</u>
Initial Post due - Module 6	
<u>Discussion</u>	11:59pm
(https://canvas.oregonstate.edu/calendar? event_id=2998206&include_contexts=course_2003952)	•
	(https://canvas.oregonstate.edu/courses/2003952/assignments/100343/s/module 4 Content Quiz (https://canvas.oregonstate.edu/courses/2003952/assignments/100343/s/module 4 Discussion (https://canvas.oregonstate.edu/courses/2003952/assignments/100343/s/module 4 Homework (https://canvas.oregonstate.edu/courses/2003952/assignments/100343/s/module 4 Lab (https://canvas.oregonstate.edu/courses/2003952/assignments/100343/s/module 4 R Quiz (https://canvas.oregonstate.edu/courses/2003952/assignments/100343/s/module 5 Discussion (https://canvas.oregonstate.edu/courses/2003952/assignments/100343/s/module 5 Content Quiz (https://canvas.oregonstate.edu/courses/2003952/assignments/100343/s/module 5 Discussion (https://canvas.oregonstate.edu/courses/2003952/assignments/100343/s/module 5 Homework (https://canvas.oregonstate.edu/courses/2003952/assignments/100343/s/module 5 Lab (https://canvas.oregonstate.edu/courses/2003952/assignments/100343/s/module 5 R Quiz

Date	Details	Due
	Module 6 Content Quiz (https://canvas.oregonstate.edu/courses/2003952/assignments/1003	by 11:59pm <u>4365)</u>
	fil Module 6 Discussion due (https://canvas.oregonstate.edu/courses/2003952/assignments/1003	by 11:59pm 4374)
Sun May 11, 2025	Module 6 Homework due (https://canvas.oregonstate.edu/courses/2003952/assignments/1003	by 11:59pm 4396)
	Module 6 Lab due (https://canvas.oregonstate.edu/courses/2003952/assignments/1003	by 11:59pm 4397)
	Module 6 R Quiz (https://canvas.oregonstate.edu/courses/2003952/assignments/1003	by 11:59pm 4366)
Wed May 14, 2025	Initial Post due - Module 7  Discussion  (https://canvas.oregonstate.edu/calendar?  event_id=2998207&include_contexts=course_2003952)	11:59pm
	Module 7 Content Quiz (https://canvas.oregonstate.edu/courses/2003952/assignments/1003	by 11:59pm 4367)
	Module 7 Discussion (https://canvas.oregonstate.edu/courses/2003952/assignments/1003	by 11:59pm 4373)
Sun May 18, 2025	Module 7 Homework (https://canvas.oregonstate.edu/courses/2003952/assignments/1003	by 11:59pm 4398)
	Module 7 Lab  (https://canvas.oregonstate.edu/courses/2003952/assignments/1003	by 11:59pm 4399)
	Module 7 R Quiz  (https://canvas.oregonstate.edu/courses/2003952/assignments/1003	by 11:59pm 4368)
Wed May 21, 2025	Initial Post due - Module 8  Discussion  (https://canvas.oregonstate.edu/calendar? event_id=2998208&include_contexts=course_2003952)	11:59pm

Date	Details	Due
	Module 8 Content Quiz  (https://canvas.oregonstate.edu/courses/2003952/assignments/10034361	1:59pm ).
	FM Module 8 Discussion due by 1 (https://canvas.oregonstate.edu/courses/2003952/assignments/10034372	1:59pm ).
Sun May 25, 2025	Module 8 Homework  (https://canvas.oregonstate.edu/courses/2003952/assignments/10034400	1:59pm ).
	Module 8 Lab due by 1 (https://canvas.oregonstate.edu/courses/2003952/assignments/10034401	1:59pm )
	Module 8 R Quiz due by 1 (https://canvas.oregonstate.edu/courses/2003952/assignments/10034363	1:59pm )
Sun Jun 1, 2025	Final Project - Progress Report  (https://canvas.oregonstate.edu/courses/2003952/assignments/10034383	1:59pm ).
Mon Jun 9, 2025	Final Project - Final Report  (https://canvas.oregonstate.edu/courses/2003952/assignments/10034382	1:59pm )
	DS@OSU JupyterHub (https://canvas.oregonstate.edu/courses/2003952/assignments/10034380	).