CEE 298: Transportation Data Analysis II
Prof. Dean

CEE 298 Transportation Data Analysis II
Winter 2024

Instructor Information

Instructor: Dr. Matthew Dean (he/him)
Email: matthew.dean@uci.edu
Office Hours: Thursdays 1-2 PM (AIRB 4072) & as-needed upon request
Modality: In-person

Course Information

Course Location: AIRB 4080
Class Times: M/W 12:30-1:50 pm
Prerequisites: Statistical & data analysis skills/R

Course Description

The purpose of this course is to provide civil engineering students with a background in statistical methods tailored for the analysis of civil engineering data (including transportation, power systems, land use, and pollution). Students will learn about spatial econometrics, structural equation models, and discrete choice modeling (focusing on hybrid choice models).

Student Learning Outcomes

Students will be able to identify an appropriate statistical model to represent a civil engineering problem of their choice. Students will be able to use R to analyze data. Students will interpret model results and discuss the implications to technical and non-technical audiences.

Course Materials

Part of the lecture time will often be reserved for you to practice data analysis, coding, and statistical testing. For this reason, you should have a computer available during the lectures. The class will primarily use R for data analysis and statistical work. RStudio is a user-friendly environment for coding in R. Alternatively, students may use Jupyter Notebooks (with R as the language).

Text Resources

There is no required textbook for this class. Readings will be provided via Canvas and will consist of both scholarly articles from academic literature, popular press articles, and other resources.

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**Grading**

Your final grade will be calculated using the following weights:

Homework Assignments (3 total) – 45%
Term Project Paper – 25%
Term Project Presentation – 15%
Class Participation – 15%

I may choose to raise your final grade by curving or some other method. However, these adjustments will never lower your grade.

**Attendance and Participation**

I will not take attendance or formally penalize you for missing a lecture. However, participation will count as 15% of your final grade in the course. Good discussions, assisting classmates with coding, recommending datasets and/or papers contribute to everyone’s experience in this class. The purpose of this participation credit is to encourage you to ask questions and exchange ideas with your fellow students.

Each student will also select an article in the literature to lead a brief <10 min. discussion on at the start of a class period (about a topic of their choosing that aligns with the course schedule). Depending on the final class size, groups may be formed to lead this brief discussion. You should read the chosen article, present a summary of the problem, data, method to analyze it, its replicability or application to other problems/disciplines, and engage the class with policy solutions and key findings.

I will record videos of all lectures and make these recordings available on Canvas. However, participation in class discussions and asking questions is an important part of the class and the grade scale reflects this.
Assignment Leniency

Life happens. You may turn in one homework assignment late and no more than a week after the actual deadline. Other than that, no late homework will be accepted. The late exception does not apply to the term project. Homework assignments need to be uploaded to Canvas by 11:59 PM on the due date.

Homework Assignments

A total of three homework assignments will be given over the quarter. You are allowed to talk with classmates about the assignment, but you must complete the analysis, coding, and submit your own write-ups. Give credit to others where it is due by name dropping them as “advisers” at the top of your write-up. Each assignment will provide a brief overview of the real-world problem, and ask you to develop a model to analyze the problem and arrive at hopefully insightful explanations and policy suggestions.

Your write-up should include the following elements and be approximately five pages in length:

1. **Summary of the Problem**: Give a brief description of the problem, explain why it is important, and what data you have to analyze.
2. **Model**: Provide a clear, formal description of the analysis conducted.
3. **Results**: Show the results of statistical tests and models.
4. **Discussion**: Describe the limitations of the model and results. Summarize the significance of your findings and what you have learned about it. Explain how this information helps address the problem.

You should also provide a PDF of the R code used in this data analysis and modeling. Make sure to scrub any unnecessary code, add comments for readability, and generate the PDF using RStudio IDE knit button to render the R Markdown as a PDF. Alternatively, students using Jupyter Notebooks can download their notebook as a PDF.

Term Project

A major part of this course is a 10-page (approximately, single-spaced) research paper and in-class presentation, motivated by a specific problem in civil engineering to be decided mid-quarter. It should present an analysis of data you selected using (preferably) one of the techniques covered in class. Be creative, and have fun with it! Options include developing a new study, or expanding on a current piece of published (and peer-reviewed) work. You will present your project to the class in the final exam period (March 18th, 1:30 – 3:30 pm). You will submit the term paper after the presentation. The class paper will be structured similarly to the homework assignment write-ups, but should be more extensive and include additional sections such as a literature review (with peer-reviewed articles) and practical significance.

Academic Integrity

In this class, students are NOT allowed to use AI-assisted writing technologies, like ChatGPT, in their assignments (e.g., homework, term project, and in-class article presentation). This policy does not cover tools like Grammarly or bibliography managers like Zotero or EndNote. These tools can be used by students without disclosure.

Accessibility Statement
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This course is challenging, but personal circumstance or disability (visible or non-visible) should not affect one’s equal access and full participation in the class. Please do not hesitate to reach out to me with ideas, comments, and/or suggestions about the course so we can reach an agreement on how to best meet your needs. I will be handing out a voluntary questionnaire on the first day to understand the needs of my students (e.g., accommodations, pronouns, planned travel).

**Feedback**

I want all of you to have a top-notch learning experience and want to be the most effective instructor I can be. At the end of each class, students will be asked to anonymously submit questions they would like answered at the start of next class. This “muddy topics” form allows you to spend time processing that day’s material, assist me in clarifying misconceptions or confusing materials, and helps me plan this course for the next offering. Please also use this form to let me know what topics or methods were most helpful or interesting.

At the end of the quarter, you will be asked to fill out an evaluation form through EEE+. If at least 5 students respond to this form, the School of Engineering will provide me with a list of names of who participated (which will be used to award students in class participation).

**Tentative Course Outline**

The course schedule is subject to change and will be updated as frequently as possible. Homework will be due one week after it is assigned.

<table>
<thead>
<tr>
<th>Class Days</th>
<th>Topics</th>
<th>Reading Material</th>
<th>Homework</th>
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<tbody>
<tr>
<td>1/8</td>
<td>Cancelled: Professor at Conference in DC (Asynchronous R lessons)</td>
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<td></td>
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<tr>
<td>1/10</td>
<td>Cancelled: Professor at Conference in DC (Asynchronous R lessons)</td>
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<td>1/15</td>
<td>Holiday: Martin Luther King, Jr. Day</td>
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<td>1/17      &amp; 1/22</td>
<td>Introduction to Spatial Econometrics: Motivation, Statistical Tests</td>
<td>LeSage &amp; Pace (2009) Ch1</td>
<td>HW1 Assigned 1/17</td>
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<tr>
<td>1/24 &amp; 1/29</td>
<td>Spatial Econometrics: Models</td>
<td>Liu et al. (2017) Spatial Effects on HEV Adoption</td>
<td>HW1 Due 1/24</td>
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<tr>
<td>2/14  &amp; 2/21</td>
<td>Confirmatory Factory Analysis (CFA)</td>
<td>Jöreskog et al. Ch 7 Murphy et al. (2021) Transportation Insecurity Index</td>
<td>HW2 Due 2/14</td>
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<td>Date</td>
<td>Topic</td>
<td>Reading/References</td>
<td>Assignment Due Date</td>
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<tr>
<td>3/18</td>
<td>Final Project Presentations (During Final Exam Slot 1:30 – 3:30 pm)</td>
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**Student Resources**

- UCI Policies and Procedures from the Office of Equal Opportunity & Diversity (OEOD)
- UCI Library
- UCI Center for Excellence in Writing & Communication
- The Learning & Academic Resource Center (LARC)
- UCI Student Portal
- UCI Disability Service Center (DSC)
- Office Information Technology (OIT)
- UCI Student Affairs
- UCI Office of Academic Integrity & Student Conduct
- UCI Counseling Center