Teaching Statement

Teaching Philosophy and Experience

My teaching philosophy stems from my experience as a teaching assistant and instructor at Duke University, and my observations of what other good college teachers do. From my perspective, three components of teaching are important to foster effective learning: understand how students perceive and learn new ideas, set the right expectations of the students, and create a natural critical learning environment in conducting class.

Before teaching a class, I think it is essential to understand how students perceive and learn new ideas, then design the course accordingly. From the research of Ibrahim Abou Halloun and David Hestenes, we know that “students held firm to mistaken beliefs even when confronted with phenomena that contradicted those beliefs.” For example, students intend to memorize formula and plug the right numbers into them when solving problems, instead of changing their basic conceptions when they learn new concepts and ideas. One reason that causes this phenomenon is that instructors often rely on “plug and chug” exercises to teach a course instead of connecting a problem to the real world. In contrast, I think a better way of teaching is to contrast a new concept with an older idea. Consider how Duke Professors Christopher Timmins and Allan Collard-Wexler conduct their classes: as I have observed, they will challenge students intellectually and create “expectation failure” to help students realize the problems they face in learning new concepts. Then they will introduce the new concepts or answers by pulling together patterns from many examples. In order to teach a course in this way, an instructor first needs to have a good sense of the history of the discipline, such as the controversies that have been raised within the discipline. Second, besides asking students intriguing questions, caring is also crucial. Research has found that performance and motivation will decrease when subjects believe that other people are trying to control them. Therefore, it is important to give students control over their own education and display faith in their learning abilities.

Then in preparing course materials, it is important to set the right expectations of the students. As explained by Claude Steele, a social psychologist from Stanford, “the long night of racism, sexism, segregation, and discrimination has left its mark.” Certain students are likely to suffer from “stereotype vulnerability”, which means that their awareness of the negative stereotype adds a level of anxiety that others do not face, and it harms their performance. There are several things a teacher can do to help those students. First, the course should not be designed like a “beauty contest”, which aims to separate students into winners and losers, good students and bad students.
Instead, the instructor should look for the abilities that any person can bring to the table. For example, as an instructor, I designed my programming course by giving exercises of different difficulty levels. For each exercise, students can challenge themselves step-by-step given their different background and programming skills. Moreover, I helped each student design their own final project based on their research needs. Based on what I learned from their special needs, in the last few classes, I designed and covered special topics such as time-series analysis and spatial analysis.

In conducting class, I think it is important to create a natural critical learning environment. First, the teacher should challenge students with intriguing questions. Some good examples are “Who killed Socrates?” and “Does anyone know anything for sure?”, asked by Professor Robert Solomon in his introductory philosophy class. An intriguing question motivates students to start thinking, asking their own questions, and looking for possible answers. Second, in a natural critical learning environment, the teacher should encourage students to compare, apply, and analyze instead of just listening and remembering. Professor Donald Saari explains that “he wants the students to feel like they have invented calculus and that only some accident of birth kept them from beating Newton to the punch”. Last, a natural critical learning environment should leave students with more questions that they are willing to explore. During my experience as a teaching assistant for a microeconomics theory class, I roughly followed these steps in creating a natural critical learning environment for the students when leading the discussion sessions. Before each discussion session, I design opening questions based on course materials of that week. After reviewing the basic concepts, I also design challenging in-class exercises for students to explore the advanced topics. I allow students to try and fail and provide them with prompt feedback.

Teaching Interest

I am qualified to teach undergraduate and graduate level microeconomics and econometrics, as well as topic courses in industrial organization (IO), environmental economics, and courses about statistical programming like R, Python, and Matlab. I would also like to design a topic course on introduction to empirical IO and structural models. Drawing from my experience in conducting empirical research, this course will emphasize the difference between reduced-form analysis and structural models, when each method is preferable, and under what scenarios such methods can be applied. This course will help students understand why empirical analysis can be useful in solving real-life problems such as litigation cases and provide students with the empirical tools to conduct their own research.
Evidence of Effective Teaching

Teaching Interests
I am especially interested in teaching courses in microeconomics, industrial organization, environmental economics, and applied econometrics. But I am also happy to teach courses outside these areas. I would like to design a case-based course on the introduction to empirical industrial organization and structural models. In my research and study experience, I was initially puzzled by the distinction of when to apply a structural model and when a reduced-form analysis is preferred. I plan to start the course with a litigation case, forming some basic ideas about how economic tools are used in an antitrust case and diving into details about how a reduced-form analysis provides evidence for such cases. I will then explain why a structural model is preferred under certain scenarios and how to build complicated structural models. I will end this course with another case that students can try to solve by implementing the methods they have learned.

Teaching Experience
- **Intro to R Programming, Summer 2019**
  - Instructor
  - I designed and taught the course covering statistical programming tool R, with an application to the estimation of structural models in different economics topics.
  - Teaching materials are available on my website: (https://sites.duke.edu/yanyouchen/teaching)

- **Microeconomics Theory, 2013**
  - Head teaching assistant for Prof. R. Vijay Krishna
  - Led discussion sessions for students every week; held office hours; graded students’ work
  - Won the excellence in teaching assistant award
  - Handouts I prepared for each discussion session are available on my website: (https://sites.duke.edu/yanyouchen/teaching)

Teaching Evaluation
I received a rating of 4.6/5 for the statistical programming course I instructed. Students wrote: “The notes were very well prepared, and I really enjoyed the special topics.” “I liked the general introduction that YC gave to R and his explanation of how he uses it. The coding examples were very useful.” “Excellent all around! Thank you!”

I won the excellence in teaching assistant award for being a TA for Microeconomics Theory. Students in this course even jointly wrote me a recommendation letter to prove my effective teaching.
Instructor: Yanyou Chen
Email: yanyou.chen@duke.edu
Day/Time: MTuTh 9:30AM - 12:00PM
Location: Social Sciences 124
Office: Social Sciences 308B
Office Hours: Monday/Tuesday 1:00-2:00pm or by appointment

Course Overview

R is an open source software environment for statistical computing and graphics and R is becoming increasingly popular both in industry and academia. This course elaborates on the basic operation of R and introduces how to conduct advanced empirical analysis using R, such as textual analysis and various machine learning algorithms.

I understand that students have many chances to learn programming or R programming specifically, such as from CS department, Duke workshops, or various online resources. Then why should you take this course? What's special about this course is that we will focus on the most useful tools for economic research: I will explain when, and why you should use R instead of other programming languages such as Matlab, Stata and Python in certain scenarios; and I will elaborate with detailed examples on how R could be used to analyze various economic problems. This will help you understand which R packages to choose from in solving economic problems among the ocean of R packages that are available.

This course is specifically designed for economics master’s and Ph.D. students. There is no pre-requisite of this course, but you will benefit more from this course if you already know at least one programing language: include but not limited to C++, Matlab, Python or Java. As a caveat, the schedule of summer course is very intensive. You are expected to attend all lectures by taking this course. Each class takes 2.5 hours and runs on every Monday, Tuesday and Thursday.

Below is a short list of what will be covered in this course:

- **Basic Topics**
  - Logic in R (data structure, boolean, Loop etc.), function in R
  - R markdown
  - Data management, dplyr, tidyr
  - Data visualization, ggplot
  - Basic analysis, regression and optimization

- **Advanced Topics**
  - Text analysis and some machine learning algorithms
  - Network analysis
  - Spatial data and spatial analysis
  - How to use API, for example how to use Google Map API in R

- **Other Topics**
  - Advanced coding practice
  - Parallel computation using R
  - Version control, Git

Course Objectives

By the end of this course you will be able to:

- Understand and apply basic operation of R: file management, objects in R, loop, classes, functions, R-markup, tests and conversion.
- Conduct basic empirical analysis using R: which includes but not limited to data cleaning, running regressions, perform various hypothesis testing. Illustrate results using R packages: ggplot2, leaflet.
• Evaluate good coding practice: creating, merging, importing and exporting datasets; working with large datasets; usage of pipeline.
• Understand the logic of advanced topics and how to use them: what is version control (Git), how to perform parallel computing with R, how to use various sampling methods in R, machine learning algorithms in R.
• Conduct advanced empirical analysis using R: textual and network analysis.

Assessment

The grades will be determined by attendance (20%), two problem sets (30%) and a project (50%). I understand that you are busy doing your own research in the summer, therefore there will be only two short problem sets. Instead, we will have multiple in-class assignments. The main purpose of in-class assignments is for you to familiarize with what is taught in each class. Therefore, attending classes is very important (actually I hope this saves your time and you won’t need to spend too much time reviewing the materials out of class). You do not need to submit in-class assignments and we will go through the solutions in class together. Regarding the final project, you can choose one of the following: You could replicate a paper of your choosing; Or you could use your own research project as the final project. See more details below.

Attendance

I understand that summer is a busy time, therefore, you can skip two classes. You need to attend 6 out of 8 classes to get full credit for attendance.

Problem sets

There will be two problem sets. The problem set is designed to help you understand and try the techniques we learn in the class. The first problem set is due at 07/08 11:59pm and the second problem set is due at 07/15 11:59pm. Each problem set will be graded at a pass or fail level, which basically means if you tried all problems in each problem set, you will get full credit. The whole point of having these problem sets is for you to familiarize with the code and concept we introduce in the class.

Projects

Choose one of the following three as your final project. You could replicate a paper of your choosing or you could use your own research project as the final project.

• If you choose to replicate a paper of your choosing: you should submit a project proposal before 07/11 11:59pm, where you should explain what the main results of the paper are, what data would be used in replicating the results (if the data is not obtainable, you could simulate your own data), which set of results you plan to replicate, why R is useful and how you are going to replicate the results.

• If you choose to use your own research project as the final project: you should submit a project proposal before 07/11 11:59pm, where you should explain what the project is about, what kind of results you want to generate, how R could be useful in generating those results.

The final project is due on 07/21 11:59pm.

Suggested Readings

There is no required text for this course, but you may find following resources helpful:

A Beginner's Guide to R by Alain Zuur, Elena N. Ieno, Erik Meesters
Introduction to statistical data analysis with R by Matthias Kohl
R for Data Science
Text Mining with R
Advanced R

Disability Statement

Students with disabilities who believe that they may need accommodations in the class are encouraged to contact the Student Disabilities Access Office at 919.668.1267 or disabilities@aas.duke.edu as soon as possible to better ensure that such accommodations are implemented in a timely fashion.

Academic Integrity

Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and non-academic endeavors, and to protect and promote a culture of integrity. To uphold the Duke Community Standard:

- I will not lie, cheat, or steal in my academic endeavors;
- I will conduct myself honorably in all my endeavors; and
- I will act if the Standard is compromised.

Preferred Contact

Please do not hesitate to contact the instructor via email (yanyou.chen@duke.edu) with any questions or comments. Expect a response within one business day of email delivery.

Proposed Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>HW</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/01</td>
<td>Basics in R: R packages, basic operations, file management, objects in R, classes, tests and conversion.</td>
<td>In-class Assignment</td>
</tr>
<tr>
<td>07/02</td>
<td>Introduction to R Markdown. Functions, conditional statements and loops.</td>
<td>In-class Assignment</td>
</tr>
<tr>
<td>07/04</td>
<td>No class, happy 4th of July</td>
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</tr>
<tr>
<td>07/08</td>
<td>Data work: creating, merging, exporting and importing datasets; strings; dates. Visualization in R: graphs, ggplot</td>
<td>Problem Set 1</td>
</tr>
<tr>
<td>07/09</td>
<td>Advanced coding practices: pipes, tidyr, tibble and dplyr. Parallel computation Git version control</td>
<td>In-class Assignment</td>
</tr>
<tr>
<td>07/11</td>
<td>Regressions: linear regression, times-series and panel data, quantile regression. Numerical optimization.</td>
<td>In-class Assignment Project Proposal Due</td>
</tr>
<tr>
<td>07/15</td>
<td>Text analysis and machine learning algorithms.</td>
<td>Problem Set 2</td>
</tr>
<tr>
<td>07/16</td>
<td>Network analysis in R.</td>
<td>In-class Assignment</td>
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<tr>
<td>07/17</td>
<td>Spatial analysis in R. How to Use API in R.</td>
<td>In-class Assignment</td>
</tr>
<tr>
<td>07/21</td>
<td>No class, final project due date</td>
<td>Final Project Due</td>
</tr>
</tbody>
</table>