Introduction to Python and SQL  
SURV 673  
1 credit/2 ECTS  
Summer 2019

Instructor(s)  
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Video lecture by Brian Kim

Short Course Description  
This course introduces students to the basics of Python and SQL for data analysis. Students will explore real publicly-available datasets, using the data analysis tools in Python to create summaries and generate visualizations. Students will learn the basics of database management and organization, as well as learn how to code in SQL and work with PostgreSQL databases. By the end of the class, students should understand how to read in data from CSV files or from the internet and be comfortable using either SQL or Python to aggregate, summarize, describe, and visualize these datasets.

Course and Learning Objectives  
By the end of the course, students will
- Understand the basic structure of how Python and object-oriented programming works
- Be able to write basic Python code, including functions and loops
- Know how to use Pandas and matplotlib packages in Python to analyze data and create visualizations
- Be comfortable reading error messages and Python documentation to diagnose and debug code
- Understand how relational databases work
- Be able to construct a query to answer questions about the data
- Understand how joins work and how to use them

Prerequisites  
No prerequisite
Class Structure and Course Concept
This is an online course using a flipped classroom design. It covers the same material and content as an on-site course but runs differently. In this course, you are responsible for watching video recorded lectures and going through workbooks and then “attending” mandatory weekly one-hour online meetings where students have the chance to discuss the materials from a unit with the instructor. Just like in an on-site course, homework will be assigned and graded and there will be weekly graded quizzes.

Although this is an online course where students have more freedom in when they engage with the course materials, students are expected to spend the same amount of time overall on all activities in the course – including preparatory activities (readings, studying), in-class-activities (watching prerecorded videos, attending the live online meetings), and follow-up activities (working on assignments and exams) – as in an on-site course. As a rule of thumb you can expect to spend approximately 3h/week on in-class-activities and 9 hours per week on out-of-class-activities (preparing for class, readings, assignments, projects, studying for quizzes and exams). Therefore, the workload in all courses will be approximately 12h/week. This is a 1-credit course that runs for 4 weeks. Please note that the actual workload depends on your personal knowledge.

Mandatory Weekly Online Meetings
Tuesday, 12:00 PM EDT/6:00 PM CEST, starting June 4

Meetings will be held online through Zoom. Follow the link to the meeting sessions on the course website on https://www.elms.umd.edu/. If video participation via Internet is not possible, arrangements can be made for students to dial in and join the meetings via telephone.

In preparation for the weekly online meetings, students are expected to watch the lecture videos and go over the workbooks before the start of the meeting. In addition, students must post questions or comments about the materials covered in the videos and workbooks of the week to the instructor in the forum before the meetings. If you do not have questions, you may respond to another student, or comment about possible topics of interest to you, such as different applications of the tools learned in class. The deadline for posting questions is three hours before the online meeting (each Tuesday, 9:00 AM EDT/3:00 PM CEST).

Students have the opportunity to use the Zoom meeting room set up for this course to connect with peers outside the scheduled weekly online meetings (e.g., for study groups). Students are encouraged to post the times that they will be using the room to the course website forum to avoid scheduling conflicts. Students are not required
to use Zoom and can of course use other online meeting platforms such as Google Hangout or Skype.

**Grading**
Grading will be based on:

- 4 online quizzes (5% each)
- Participation in discussion during the weekly online meetings and posting questions in the forum (deadline: Tuesday 9:00 AM EDT/3:00 PM CEST before class) demonstrating understanding of required readings and video lectures (20% of grade)
- 4 homework assignments (15% each)

Dates of when assignment will be due are indicated in the syllabus. Extensions will be granted sparingly and are at the instructor's discretion.

**Technical Equipment Needs**
The learning experience in this course will mainly rely on the online interaction between students and the instructor during the weekly online meetings. Therefore we encourage all students in this course to use a web camera and a headset. Decent quality headsets and web cams are available for less than $20 each. We ask students to refrain from using built-in web cams and speakers on their desktops or laptops. We know from our experience in previous online courses that this will reduce the quality of video and audio transmission and therefore will decrease the overall learning experience for all students in the course. In addition, we suggest that students use a wire connection (LAN), if available, when connecting to the online meetings. Wireless connections (WLAN) are usually less stable and might be dropped.

**Long Course Description**
Python has recently seen a huge surge not only as a programming language, but also as a tool for data analysis. In this course, we will introduce the basics of programming in Python for the purposes for data analysis. We will explore the Longitudinal Employer-Household Dynamics (LEHD) datasets, specifically the LEHD Origin-Destination Employment Statistics (LODES) datasets, using Python to read in datasets, explore the datasets, find statistical summaries, and create visualizations. By the end of the course, students should be comfortable with using Python for data analysis, as well as be capable of using their general knowledge of the Python language for other applications.
In addition, as more and more data becomes available, relational database management systems (RDBMS) have become increasingly popular because it allows people to relatively easily organize large amounts of data. In many cases, knowledge of SQL is crucial to being able to access this data. In this course, we will introduce the basics of programming in SQL using PostgreSQL. We will explore the Longitudinal Employer-Household Dynamics (LEHD) datasets, specifically the LEHD Origin-Destination Employment Statistics (LODES) datasets, using SQL to explore the datasets and find statistical summaries. By the end of the course, students should be comfortable with constructing basic queries of the database and linking multiple tables together using SQL.

Readings
There is no textbook for this course.

Additional required and recommended readings will be made available on the course website:
https://www.elms.umd.edu/

Academic Conduct
Clear definitions of the forms of academic misconduct, including cheating and plagiarism, as well as information about disciplinary sanctions for academic misconduct may be found at

https://www.president.umd.edu/sites/president.umd.edu/files/documents/policies/III-100A.pdf (University of Maryland) and


Knowledge of these rules is the responsibility of the student and ignorance of them does not excuse misconduct. The student is expected to be familiar with these guidelines before submitting any written work or taking any exams in this course. Lack of familiarity with these rules in no way constitutes an excuse for acts of misconduct. Charges of plagiarism and other forms of academic misconduct will be dealt with very seriously and may result in oral or written reprimands, a lower or failing grade on the assignment, a lower or failing grade for the course, suspension, and/or, in some cases, expulsion from the university.

Accommodations for Students with Disabilities
In order to receive services, students at the University of Maryland must contact the Disability Support Services (DSS) office to register in person for services. Please call
the office to set up an appointment to register with a DSS counselor. Contact the DSS office at 301.314.7682; http://www.counseling.umd.edu/DSS/.

Students at the University of Mannheim should contact the Commissioner and Counsellor for Disabled Students and Students with Chronic Illnesses at http://www.uni-mannheim.de/studienbueros/english/counselling/disabled_persons_and_persons_with_chronic_illnesses/.

Course Evaluation
In an effort to improve the learning experience for students in our online courses, students will be invited to participate in an online course evaluation at the end of the course. Participation is entirely voluntary and highly appreciated.

Class Schedule
*Please note that assignments and dates are subject to change. Information (e.g., articles and assignments) posted to the course website supersedes the information noted here.*

**Unit 1: Introduction to Python and Pandas**
Video lecture and workbook: available Tuesday, May 28, 2019

- Online meeting: Tuesday, June 4, 2019, 12:00 PM EDT/6:00 PM CEST
- Online quiz 1: due Friday, June 7, 2019, 12:00 PM EDT/6:00 PM CEST
- Homework 1: due Friday, June 7, 2019, 12:00 PM EDT/6:00 PM CEST

Readings:

**Unit 2: Functions, Loops, and Visualizations**
Video lecture and workbook: available Tuesday, June 4, 2019

- Online meeting: Tuesday, June 11, 2019, 12:00 PM EDT/6:00 PM CEST
- Online quiz 2: due Friday, June 14, 2019, 12:00 PM EDT/6:00 PM CEST
- Homework 2: due Friday, June 14, 2019, 12:00 PM EDT/6:00 PM CEST
No readings for this week

**Unit 3: Introduction to SQL**
Video lecture and workbook: available Tuesday, June 11, 2019

Online meeting: Tuesday, June 18, 2019, 12:00 PM EDT/6:00 PM CEST
Online quiz 3: due Friday, June 21, 2019, 12:00 PM EDT/6:00 PM CEST
Homework 3: due Friday, June 21, 2019, 12:00 PM EDT/6:00 PM CEST

No readings for this week

**Unit 4: Joins**
Video lecture and workbook: available Tuesday, June 18, 2019

Online meeting: Tuesday, June 25, 2019, 12:00 PM EDT/6:00 PM CEST
Online quiz 4: due Friday, June 28, 2019, 12:00 PM EDT/6:00 PM CEST
Homework 4: due Friday, June 28, 2019, 12:00 PM EDT/6:00 PM CEST

No readings for this week

**Note:** Student access to the course website will be revoked four weeks after the last online meeting.