MIS 6110 Data Analytics with Python

COURSE DESCRIPTION

This course introduces the fundamentals of data analytics with python. It first reviews several most popular python libraries in data science, Numpy, Pandas, and Matplotlib. Then it focuses on basics of statistics concepts, time series analysis, and natural language processing. The course follows a streamline of data analytics projects with python as the tool. The course uses the hand-on approach, integrating the concepts of data analytics with python code examples. All python code examples are in Jupyter Notebooks.

COURSE OBJECTIVES

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

1. Gaining factual knowledge (terminology, classifications, methods, trends)
   1. You will be able to understand the basics of data analytics.
   2. You will be able to understand the basics of statistical analysis.
   3. You will be able to understand the basics of time series analysis.
   4. You will be able to understand the basics of natural language processing.
2. Learning to apply course materials (to improve rational thinking, problem solving and decisions)
   1. You will be able to write python programs to perform statistical analysis.
   2. You will be able to write python programs to analyze time series.
   3. You will be able to write python programs to process natural language.
3. Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course
   1. You will be able to write python programs to handle different types of data files and perform data management.
   2. You will be able to write python programs to explore the data, preprocess the data, and visualize the data.

REQUIRED/OPTIONAL MATERIALS

There is no required textbook for students to purchase in this course. However, the followings are highly recommended.

1. *Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython*

   Author: Wes McKinney. Publisher: O'Reilly Media.

2. **Practical Statistics for Data Scientists: 50 Essential Concepts**

Author: Peter Bruce, Andrew Bruce

Amazon link: [https://www.amazon.com/Practical-Statistics-Data-Scientists-Essential/dp/1491952962/ref=mt_paperback?_encoding=UTF8&me](https://www.amazon.com/Practical-Statistics-Data-Scientists-Essential/dp/1491952962/ref=mt_paperback?_encoding=UTF8&me)

3. **Think Stats: Exploratory Data Analysis 2nd Edition**

Author: Allen B. Downey

Amazon link: [https://www.amazon.com/Think-Stats-Exploratory-Data-Analysis/dp/1491907339/ref=mt_paperback?_encoding=UTF8&me](https://www.amazon.com/Think-Stats-Exploratory-Data-Analysis/dp/1491907339/ref=mt_paperback?_encoding=UTF8&me)

4. **Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit**

Author: Steven Bird, Ewan Klein, Edward Loper

Amazon link: [https://www.amazon.com/Natural-Language-Processing-Python-Analyzing/dp/0596516495/ref=mt_paperback?_encoding=UTF8&me](https://www.amazon.com/Natural-Language-Processing-Python-Analyzing/dp/0596516495/ref=mt_paperback?_encoding=UTF8&me)

5. **Numpy documentation:**

[https://docs.scipy.org/doc/](https://docs.scipy.org/doc/)

6. **Matplotlib documentation:**

[https://matplotlib.org/contents.html](https://matplotlib.org/contents.html)

7. **Pandas documentation:**

[http://pandas.pydata.org/pandas-docs/version/0.15.2/tutorials.html](http://pandas.pydata.org/pandas-docs/version/0.15.2/tutorials.html)
COURSE OUTLINES

Reading (10%)
There will be assigned reading for each week.

Quizzes (10%)
There are 10 quizzes throughout the semester to test students' understanding of the concepts and techniques. 2 attempts are allowed and you will see correct answer and responses (if any) after the last attempt.

Assignments (40%)
Python notebook assignments are scheduled for students to apply the concepts to solve real machine learning problems.

Exams (30%)
Two exams will be scheduled. One is in the middle of the semester and the other at the end of the semester.

Weekly Discussion (10%)
Every student needs to create one new post and reply one post by others in the weekly discussion each week.

In the post created by youself, you need to share a python code you just learned in this week, including the code itself, explanation of the code, and an example of the code. (5%)  

In the reply to the post by others, you need to point out the mistakes or error of others if any, or if there isn't any mistakes, create a new example using others code examples. (5%)

SPECIAL NOTE FOR ONLINE COURSE STUDENTS

Study groups are encouraged for this online course. Students can discuss together the assignments and reading. However, for Jupyter notebook assignments, one should complete the notebook file himself or herself and should not use others' file. In addition, quizzes and exams should be completed individually.

GRADE SCHEME
The following grading standards will be used in this class:
<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>100 % to 93.0%</td>
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<tr>
<td>A-</td>
<td>&lt; 93.0 % to 90.0%</td>
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<tr>
<td>B+</td>
<td>&lt; 90.0 % to 87.0%</td>
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<tr>
<td>B</td>
<td>&lt; 87.0 % to 83.0%</td>
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<tr>
<td>B-</td>
<td>&lt; 83.0 % to 80.0%</td>
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<tr>
<td>C+</td>
<td>&lt; 80.0 % to 77.0%</td>
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<tr>
<td>C</td>
<td>&lt; 77.0 % to 73.0%</td>
</tr>
<tr>
<td>C-</td>
<td>&lt; 73.0 % to 70.0%</td>
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<tr>
<td>D+</td>
<td>&lt; 70.0 % to 67.0%</td>
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<tr>
<td>D</td>
<td>&lt; 67.0 % to 60.0%</td>
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<tr>
<td>F</td>
<td>&lt; 60.0 % to 0.0%</td>
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</tbody>
</table>

**CANVAS INFORMATION**

Canvas is the where course content, grades, and communication will reside for this course.

- [http://canvas.usu.edu](http://canvas.usu.edu) Links to an external site.
  - Your **username** is your A#, and your **password** is your global password (the same one you use for Banner or Aggiemail).
- For Canvas Links to an external site,, Passwords Links to an external site,, or any other computer-related technical support contact the [IT Service Desk](http://it.usu.edu).
  - 435 797-4357 (797-HELP)
  - 877 878-8325
  - [http://it.usu.edu](http://it.usu.edu)
  - servicedesk@usu.edu

**DETAILED SCHEDULE**

The schedule below is just **tentative**, as stated earlier, the instructor will adjust the pace as needed according to students’ understanding of the concepts.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to syllabus</td>
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<tr>
<td></td>
<td>Why python for data science?</td>
</tr>
<tr>
<td></td>
<td>Software setup</td>
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<tr>
<td></td>
<td>Ipython (Jupyter Notebook) basics</td>
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<tr>
<td>2</td>
<td>Review Python basics</td>
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<tr>
<td></td>
<td>Review Pandas and Numpy</td>
</tr>
<tr>
<td>3</td>
<td>Basic Statistical Concepts: Part 1</td>
</tr>
<tr>
<td>4</td>
<td>Basic Statistical Concepts: Part 2</td>
</tr>
<tr>
<td>5</td>
<td>Basic Statistical Concepts: Part 3</td>
</tr>
<tr>
<td>6</td>
<td>Basic Statistical Concepts: Part 4</td>
</tr>
<tr>
<td>7</td>
<td>Time Series Analysis: Part 1</td>
</tr>
<tr>
<td>8</td>
<td>Time Series Analysis: Part 2</td>
</tr>
<tr>
<td>9</td>
<td>Midterm Exam</td>
</tr>
<tr>
<td>10</td>
<td>Advanced String Operation in Python</td>
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<tr>
<td></td>
<td>Regular Expression</td>
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<tr>
<td>11</td>
<td>Natural Language Processing: Part 1</td>
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<td>Week</td>
<td>Topics</td>
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<tr>
<td>12</td>
<td>Natural Language Processing: Part 2</td>
</tr>
<tr>
<td>13</td>
<td>Natural Language Processing: Part 3</td>
</tr>
<tr>
<td>14</td>
<td>Natural Language Processing: Part 4</td>
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<tr>
<td>15</td>
<td>Optional topics (TBA)</td>
</tr>
<tr>
<td>16</td>
<td>Final</td>
</tr>
</tbody>
</table>

**UNIVERSITY POLICIES & PROCEDURES**

**Academic Freedom and Professional Responsibilities**

Academic freedom is the right to teach, study, discuss, investigate, discover, create, and publish freely. Academic freedom protects the rights of faculty members in teaching and of students in learning. Freedom in research is fundamental to the advancement of truth. Faculty members are entitled to full freedom in teaching, research, and creative activities, subject to the limitations imposed by professional responsibility. [Faculty Code Policy #403 (Links to an external site.)](#) further defines academic freedom and professional responsibilities.

**Academic Integrity – "The Honor System"**

Each student has the right and duty to pursue his or her academic experience free of dishonesty. To enhance the learning environment at Utah State University and to develop student academic integrity, each student agrees to the following Honor Pledge: "I pledge, on my honor, to conduct myself with the foremost level of academic integrity." A student who lives by the Honor Pledge is a student who does more than not cheat, falsify, or plagiarize. A student who lives by the Honor Pledge:

- Espouses academic integrity as an underlying and essential principle of the Utah State University community;
- Understands that each act of academic dishonesty devalues every degree that is awarded by this institution; and
- Is a welcomed and valued member of Utah State University.

**Academic Dishonesty**
The instructor of this course will take appropriate actions in response to Academic Dishonesty, as defined the University's Student Code. Acts of academic dishonesty include but are not limited to:

- **Cheating**: using, attempting to use, or providing others with any unauthorized assistance in taking quizzes, tests, examinations, or in any other academic exercise or activity. Unauthorized assistance includes:
  - Working in a group when the instructor has designated that the quiz, test, examination, or any other academic exercise or activity be done “individually;”
  - Depending on the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments;
  - Substituting for another student, or permitting another student to substitute for oneself, in taking an examination or preparing academic work;
  - Acquiring tests or other academic material belonging to a faculty member, staff member, or another student without express permission;
  - Continuing to write after time has been called on a quiz, test, examination, or any other academic exercise or activity;
  - Submitting substantially the same work for credit in more than one class, except with prior approval of the instructor; or engaging in any form of research fraud.

- **Falsification**: altering or fabricating any information or citation in an academic exercise or activity.

- **Plagiarism**: representing, by paraphrase or direct quotation, the published or unpublished work of another person as one's own in any academic exercise or activity without full and clear acknowledgment. It also includes using materials prepared by another person or by an agency engaged in the sale of term papers or other academic materials.

For additional information go to: ARTICLE VI. University Regulations Regarding Academic Integrity (Links to an external site.)

**Sexual Harassment**

Sexual harassment is defined by the Affirmative Action/Equal Employment Opportunity Commission as any "unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature." If you feel you are a victim of sexual harassment, you may talk to or file a complaint with the Affirmative Action/Equal Employment Opportunity Office located in Old Main, Room 161, or call the AA/EEO Office at (435) 797-1266.

**Withdrawal Policy and "I" Grade Policy**

Students are required to complete all courses for which they are registered by the end of the semester. In some cases, a student may be unable to complete all of the coursework because of extenuating circumstances, but not due to poor performance or to retain financial aid. The term 'extenuating' circumstances includes: (1) incapacitating illness which prevents a student from attending classes for a minimum period of two weeks, (2) a death in the immediate family, (3) financial responsibilities requiring a
student to alter a work schedule to secure employment, (4) change in work schedule as required by an employer, or (5) other emergencies deemed appropriate by the instructor.

**Students with Disabilities**

USU welcomes students with disabilities. If you have, or suspect you may have, a physical, mental health, or learning disability that may require accommodations in this course, please contact the Disability Resource Center (DRC) (Links to an external site. Links to an external site.) as early in the semester as possible (University Inn # 101, (435) 797-2444, drc@usu.edu). All disability related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with faculty to provide accommodations.

**Diversity Statement**

Regardless of intent, careless or ill-informed remarks can be offensive and hurtful to others and detract from the learning climate. If you feel uncomfortable in a classroom due to offensive language or actions by an instructor or student(s) regarding ethnicity, gender, or sexual orientation, contact:

- Division of Student Affairs: https://studentaffairs.usu.edu (Links to an external site.), (435) 797-1712, studentservices@usu.edu, TSC 220
- Student Legal Services: https://ususa.usu.edu/resources/student-advocacy/legal-services (Links to an external site.), (435) 797-2912, TSC 326
- Access and Diversity: http://accesscenter.usu.edu (Links to an external site.), (435) 797-1728, access@usu.edu; TSC 315
- Multicultural Programs: http://accesscenter.usu.edu/multiculture (Links to an external site.), (435) 797-1728, TSC 315
- LGBTQA Programs: http://accesscenter.usu.edu/lgbtqa (Links to an external site.), (435) 797-1728, TSC 3145
- Provost’s Office Diversity Resources: https://www.usu.edu/provost/diversity (Links to an external site.), (435) 797-8176

You can learn about your student rights by visiting:
The Code of Policies and Procedures for Students at Utah State University: https://studentconduct.usu.edu/studentcode (Links to an external site. Links to an external site.).

**Grievance Process**

Students who feel they have been unfairly treated may file a grievance through the channels and procedures described in the Student Code: Article VII (Links to an external site. Links to an external site.).

**Full details for USU Academic Policies and Procedures can be found at:**

- Student Conduct (Links to an external site. Links to an external site.)
- Student Code (Links to an external site. Links to an external site.)
Emergency Procedures

In the case of a drill or real emergency, classes will be notified to evacuate the building by the sound of the fire/emergency alarm system or by a building representative. In the event of a disaster that may interfere with either notification, evacuate as the situation dictates (i.e., in an earthquake when shaking ceases or immediately when a fire is discovered). Turn off computers and take any personal items with you. Elevators should not be used; instead, use the closest stairs.