Department of Mathematics and Applied Computer Science

CAC 350

Fall 2022

# Course Instructor:

Dr. Anthony Winchester

Office: Olin 209

Email: [agwinche@bsc.edu](mailto:agwinche@bsc.edu) (best way to reach me)

Office Hours:

Monday/Wednesday – 8:00 am-11:00am

(or email for an appointment)

# Course Description:

This course introduces students to the world of data science and will empower students to use various computing tools to collect, explore, and analyze data through the investigation of data driven puzzles in a wide array of ﬁelds - pollical, economic, historical, social, biological, and others. While there

will be an introduction to data science, it will be brief as we will advance very quickly. If you have not had CAC 180 AND MA 209, I don’t recommend this course.

# Major Course Activities:

* Reading quizzes
* Class Participation
* Assignments
* Final Project

# Course Delivery Description:

Lectures will primarily consist of hands-on activities reviewing the material covered in the readings. ***You will be expected to read prior to coming to class as well as completing the reading quizzes.*** There will be class discussions about the data results as well as the best strategies to apply when reviewing data. Keeping up with the readings and activities on Moodle will be very important so that no one falls behind in the content, which would weaken class activities.

# Course Prerequisites:

CAC 180

MA 209

# Required Course Materials:

1. Python Data Science Handbook: Essential Tools for Working with Data
2. Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow: Concepts, Tools, and

Techniques to Build Intelligent Systems, 2nd Edition

# Technology Requirements:

All course materials and assignments will be posted on Moodle. You will need a Python interpreter, preferably Anaconda/Jupyter Notebook.

It is expected ***all written assignments be saved and submitted on Moodle as a PDF and a .py file.***

IT Helpdesk offers telephone, email, and in-person support to all Birmingham-Southern students and employees. Please view the Student Quick Guide for information on how to access BSC technology tools. Hours of operation are listed below.

***Hours of Operation***

*Email:* [*helpdesk@bsc.edu,*](mailto:helpdesk@bsc.edu) *Monday-Friday, 7:30 a.m.- 4 p.m.*

*Phone: 205-226-3033*

*24/7 Hotline via Apogee: 1-877-478-8861*

*Web address:* [*www.bsc.edu/campus/it/helpdesk.html*](http://www.bsc.edu/campus/it/helpdesk.html)

# Student Learning Outcomes (SLOs):

At the conclusion of this project, students will be able to:

SLO-1 Use Python to carry out basic statistical modeling and analysis

SLO-2 Explain the significance of exploratory data analysis

SLO-3 Apply basic machine learning algorithms for predictive modeling

SLO-4 Create effective visualization of given data

SLO-5 Reflect on ethical, social, and legal issues in data collection and security

# Instructional Method and Learning Strategies:

The course will consist of hands-on coding lectures, multiple problem sets, and larger analytical projects. There will be group work, independent research, problem-solving activities, and analytical writings throughout the course.

# Course Outline/Schedule:

Below is the tentative schedule for the course. Outline is subject to change.

The readings will consist of articles or other online material.

DS = Python Data Science Handbook

ML = Hands-on Machine Learning with Scikit-Learn, Keras & TensorFlow

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| --- | --- | --- |
| Date/Week | Topics | Important Dates/Ac0vi0es |
| 8/24 - 8/26  Week 1 | Introduction/What is Data Science  Installing Anaconda/Python in Shell (DS Ch. 1) | 8/26 – Participation: Intro Activity due; Reading quiz due before class |
| 8/29 - 9/2  Week 2 | NumPy (DS Ch. 2) | 8/29 – Reading quiz due before class  8/31 – Project #1 Assigned |
| 9/5 - 9/9  Week 3 | Data Manipulation with Pandas (DS Ch. 3) | **9/5 - Labor Day (no class)**  9/7 – Reading quiz due before class  **9/7 – Last day to add a class** |
| 9/12 - 9/16  Week 4 | Visualization with Matplotlib (DS Ch. 4) | 9/12 – Project #1 Due  9/14 – Reading quiz due before class; Project *#2*  Assigned |
| 9/19 - 9/23  Week 5 | Machine Learning (ML Ch. 1)  End-to-End Machine Learning Project (ML Ch. 2) | 9/21 – Reading quiz due before class |
| 9/26 - 9/30  Week 6 | Classiﬁcation (ML Ch. 3) | 9/26 – Project #2 Due  9/27 – Last day to drop without a grade  9/28 – Reading quiz due before class  9/28 – Project #3 Assigned |

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| --- | --- | --- |
| Date/Week | Topics | Important Dates/Ac0vi0es |
| 10/3 – 10/7  Week 7 | Training Models (ML Ch.4) | 10/5 – Reading quiz due before class; Final Project posted on Moodle  **10/6 – 10/9 – Fall Break** |
| 10/10 - 10/14  Week 8 | Support Vector Machines (ML Ch. 5) | 10/10 – Project #3 Due  10/10 – Reading quiz due before class 10/12 – Last day to drop with a “W” 10/12 – Project #4 Assigned |
| 10/17 - 10/21  Week 9 | Decision Trees (ML Ch. 6) | 10/17 – Project #4 Due  10/19 – Project #5 Assigned |
| 10/24 - 10/28  Week 10 | Ensemble Learning & Random Forests  (ML Ch. 7) | 10/26 – Reading quiz due before class |
| 10/31 - 11/4  Week 11 | Dimensionality Reduc1on (ML Ch. 8) | 10/31 – Project #5 Due  10/31 – Reading quiz due before class  11/2 – Project #6 Assigned |
| 11/7 - 11/11  Week 12 | Unsupervised Learning Techniques (ML Ch. 9) | 11/7 – Project #6 Due  11/7 – Reading quiz due before class  11/9 – Project #7 Assigned |
| 11/14 - 11/18  Week 13 | Catch up/Final Project Time | 11/16 – Project #7 Due |
| 11/21 – 11/25 | Catch up / Final Project Time | **11/23 – 11/27 – Thanksgiving Break** |
| 11/28 - 11/30  Week 14 | Catch up/Final Project Time | 11/30 – Last Day of Class |
| 12/7 | Final |  |

# Course Activities, Assessments, & Interactions:

This course consists of a sequence of activities, assessments, and interactions to support you in achieving the Student Learning Outcomes (SLO) for this course. You will engage in reading assignments with weekly quizzes, projects, research, and analysis. The primary course artifacts required to achieve the Student Learning Outcomes (SLO) are described below:

## Readings

Readings are assigned in the syllabus. The reading and its corresponding quiz is due ***before*** the

class in which it is to be discussed.

## Problem Sets/Projects

There will be seven projects assigned throughout the term. Some of these will be more like a problem set while others will be one or two larger problems requiring a full analysis. The techniques being discussed during the time the project is assigned will be the focus of the assignment; however, previously discussed techniques may be required to solve the problem.

## Final Project

A final project will be given in lieu of an exam. Details regarding the final project will be posted on Moodle before the mid-point of the term. Please read through the requirements to begin building your project as early as possible.

# Grading:

|  |  |
| --- | --- |
| ACTIVITY | Weight |
| **Reading Quizzes** | **10%** |
| **Class Participation** | **5%** |
| **Assignments/Projects** | **50%** |
| **Final Project** | **35%** |

**Grading Scale**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A | 93-100% | B- | 80-82% | D+ | 68-69% |
| A- | 90-92% | C+ | 78-*79%* | D | 60-*67%* |
| B+ | 88-89% | C | 73-*77%* | F | 0-59% |
| B | 83-87% | C- | 70-72% |  |  |

# Getting Started with this Course:

## Moodle Learning Management System

Students are responsible for checking Moodle for course readings, assignments, and announcements. ***No late assignments will be accepted.*** Any assignments not submitted because of not checking Moodle is the responsibility of the student. Students are also required to check grades on Moodle to verify that the correct grades are recorded for completed work.

## Logging into Moodle

Birmingham-Southern College uses the Moodle Learning Management System (LMS). To get

started with the course, do the following:

1. Log onto the BSC access point by going to: moodle.bsc.edu.
2. Enter your BSC username and password.
3. The Moodle dashboard will open, and your courses will be displayed in the middle of the

screen.

1. Select your course to begin.
2. The course welcome page will open. Read the welcome section and follow the

instructions for getting started.

You will need your BSC User Name and Password to log in to the course. If you do not have or

don’t know your User Name, contact the IT Help Desk at 205-226-3039 or [helpdesk@bsc.edu.](mailto:helpdesk@bsc.edu)

# Course & College Policies:

## Attendance

Please attend meetings as scheduled and complete work as assigned.

## Assignments

Assignments will be due as posted on Moodle. All instructions regarding submission format will

be on Moodle. Assignments not following the protocol stated on Moodle **will not be graded**. As stated earlier, ***no late assignments will be accepted.*** All assignments are to be submitted to Moodle, please do not email your assignment.

**While use of an online textbook or searching for syntax is permitted, searching for explicit answers to problems is prohibited.**

## Academic Integrity

Always adhere to the honor code: As a member of the student body of Birmingham- Southern College, I recognize my responsibility to the traditions of the institution, to my fellow students and to myself. I recognize the significance of the honor system. I pledge that I have read and understand the Constitution of the Honor Council, including the Honor Code, and agree to be bound by its provisions.

Some of the work in this class will be collaborative in nature so it is expected that you will discuss assignments with your classmates. However, when you turn in work as your own, please be certain that what you have submitted is your understanding of the concept and not simply copied from another source. You must properly cite and reference all sources. If you are unsure how to do this properly, please reach out to me. If you are found in violation of the Honor Code by the Honor Council, you will receive no credit for the assignment, test, or quiz in question.

Additional information on the honor code and violations can be found in the Birmingham-

[Southern Student Handbook](https://bsc.edu/campus/studev/images/Student-Handbook-2019-2020.pdf) and on the BSC website.

## Netiquette

1. Check your email often--this is the method the instructor will use most often to

communicate with you.

1. Adhere to the same standards in your digital communications as you would for

traditional written language.

1. Use clear and concise language.
2. Remember that all college level communication should have correct spelling and

grammar.

1. Be cautious when using humor or sarcasm as tone can be lost in an email or discussion

post.

1. Using all capitals is the equivalent of SHOUTING and considered RUDE.

## Student Grievance Policy

Students should follow the complaint process as outlined in the current Birmingham-Southern

College Student Handbook.

## Accessibility/ Americans with Disabilities Act

Students with a disability that qualify under the Americans with Disabilities Act (ADA) and/or Section 504 of the Rehabilitation Act and require accommodations should be registered with BSC’s Accessibility Office. If you are registered for academic accommodation, please make an appointment with me as soon as possible to discuss any accommodation that may be necessary. During this discussion you are not expected to disclose any details concerning your disability though you may do so at your discretion. If you have a disability but have not yet registered, please contact Dr. Sandra Foster, Assistant Director of Accessibility Services and Resources, at 205-226-7909 (x1909) or [smfoster@bsc.edu](mailto:smfoster@bsc.edu), or visit Norton 228. Keep in mind that no accommodation will be made unless and until the instructor receives official notification from the College.

## Statement of Inclusion & Equity

CAC 350 supports an inclusive learning environment where diverse perspectives are recognized and respected. As outlined in the Birmingham-Southern mission, the College challenges students to engage in their community and the greater world, to examine diverse perspectives, and to live with integrity.

## Title IX

Birmingham-Southern College is committed to the creation and maintenance of a safe and healthy learning environment for students and the campus community. The College forbids any type of sexual or gender-based misconduct among its students, faculty, and staff. The College encourages all members of the academic community to report suspected sexual and gender-based misconduct to the appropriate authorities so that it can be investigated, remedied, and eliminated. BSC forbids retaliation against any person who has opposed, reported, or participated in an investigation concerning sexual or gender-based misconduct. See the BSC Title IX website ([www.bsc.edu/titleix](http://www.bsc.edu/titleix)) for more information, including a link to file an online report form and information about how and to whom to report in person. If you or a peer have experienced such misconduct, the Title IX webpage also includes information about the numerous resources available on campus and in the local community with whom the College encourages you to seek support. Confidential resources include counseling and health care providers, our Chaplain, and numerous faculty and staff members who are trained in assisting students by answering questions and helping them navigate their choices in seeking further support and the reporting process.

## Inclement Weather

Inclement weather or other events beyond the control of the College that might cause risk or danger to students, faculty, and staff may occasionally result in changes to normal College operations, including cancellation of classes or events; the calendar schedule may be adjusted.

**BSC Resources for Writers and Readers**

Located in Humanities 102, the Writing Center offers in-person and virtual peer-to-peer tutoring and a quiet, supportive lab space to work on writing assignments. The Writing Center’s tutors are students from a wide variety of majors on campus and have the range to address student writing needs with discipline specificity. Supervised and assisted by Writing Center directors, our tutors provide one-on-one consultations for any student at any point in the writing process. During these consultations, tutors do not “edit” papers; instead, they assist students in addressing any potential writing issues, including content development, grammar usage, and citation formatting. Each tutorial is about 30 minutes long, free of charge, and available on a drop-in basis. There is no limit to how many tutorials a student may attend. Once logged in, a director will take your information and pair you with a tutor for your 30-minute tutorial.

The Writing Center is open Sunday-Thursday, 2pm-8pm. To ensure a full 30-minute tutorial time slot, students are encouraged to be mindful of assignment-heavy weeks, keep track of due dates, and visit the Writing Center at their earliest availability during open hours. Please contact Dr. Anna Williams or Laura Tolbert ([writingcenter@bsc.edu](mailto:writingcenter@bsc.edu)) with any questions or requests for virtual appointments.