Course Syllabus

DBDA.X427 – Python for Machine Learning and Artificial Intelligence, Essentials – 3 Units

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Course Description

This course introduces students to the Python programming language essential for data manipulation, statistical analysis, and modeling techniques required for machine learning and artificial intelligence.

We will explore the wonderfully concise and expressive use of Python’s advanced module features and apply it in probability, statistical testing, signal processing, and various other applications.

Students will explore mathematical operations with array data structures, optimization, probability density function, interpolation, fast Fourier transform, basic signal processing, and other high-performance benefits of core scientific packages such as NumPy, SciPy, sklearn and scikit-learn, and Matplotlib.

Once you gain a deep understanding of the practical aspects of Python for data wrangling involved in ML and AI applications, you will be a more effective problem solver when dealing with engineering and scientific challenges in your own career.

Prerequisite Skills

None

Notes

None

Learning Outcomes

At the conclusion of the course, you should be able to:

* Solve complex engineering, financial, mathematical, and scientific problems.
* Develop complex functions and scripts to perform complicated calculations and to visualize the results of these calculations.
* Attain deeper understanding of the mathematical toolkit provided by powerful core packages.
* Acquire in-depth, hands-on experience.
* Install and configure Python and essential Python development tools.
* Write Python programs, and run them to generate tabular and graphical results.
* Manage and manipulate data, perform data type conversions, merge datasets, deal with missing values, and extract, delete, or transform subsets of data based on logical criteria.
* Use Python to perform basic data analysis using data exploration, statistical analysis, and machine learning and AI techniques.

Course Outline

Here’s an outline of what I plan to cover in class. But, it may be changed to meet your class’s needs.

|  |  |  |
| --- | --- | --- |
| **Week** | **Topics** | **Assignments** |
| **1** | Introduction   * Install Anaconda * Python environment and core packages |  |
| **2** | Data Analysis and Data Analytics |  |
| **3** | Numpy   * Basic Data Types * Arrays |  |
| **4** | Numpy   * Advanced Data Types * Type Casting * Polynomials, text and media files | Assignment 1 |
| **5** | Scipy   * Random Numbers * Optimization * Histogram * Probability Density Function * Interpolation |  |
| **6** | Pandas   * Statistical Analysis * Data Exploration | Assignment 2 |
| **7** | Pandas continued   * Data Cleaning * Data Transformations |  |
| **8** | Visualization Tools   * Plots * Histogram * Charts | Assignment 3 |
| **9** | * Building Machine Learning Models using Scikit-learn * Building Data Pipelines |  |
| **10** |  | Final Project Presentation |

Required Tools and Materials

* Required Software: Anaconda (Python) from https://www.anaconda.com/products/individual

Recommended Tools and Materials

* Python for Data Analysis, Wes McKinney, O'Reilly Media, 2012, ISBN-10: 1449319793 and ISBN-13: 978-1449319793.
* Essential Python, Pudipeddi and Chityala, Essential Education, 2018

Performance Evaluation

|  |  |  |
| --- | --- | --- |
| **Activity** | **Percentage** | **Description** |
| **Assignments** | 30% | Three homework assignments each 10 points |
| **Final Project** | 30% | One final project for 30 points |
| **Quiz** | 35% | One mid-term quiz for 15 points and one final quiz for 20 points |
| **Class participation** | 5% |  |
| **Total:** | **100%** |  |

Grading

Letter grades (A through F) are the default options.  However, students have until the day before the course end date to change their grading preference to a Credit/No Credit Option.

Grading scale

|  |  |
| --- | --- |
| **Grade options** | **%** |
| **A** | ≥ 93 |
| **A-** | 90-92 |
| **B+** | 88-89 |
| **B** | 83-87 |
| **B-** | 80-82 |
| **C+** | 78-79 |
| **C** | 73-77 |
| **C-** | 70-72 |
| **D+** | 68-69 |
| **D** | 63-67 |
| **D-** | 60-62 |
| **F** | 59 and below |
| **Credit** | 60 and above |
| **No Credit** | 59 and below |

**\*For alternative grading options, students MUST** **contact**[**extensiongrades@ucsc.edu**](mailto:extensiongrades@ucsc.edu)**with the Alternative Grade Form.**

**Click Here to Review the**[**Grading and Credits WebsiteLinks to an external site.**](https://www.ucsc-extension.edu/info/policies/grading-and-credits-policy/)

UCSC Extension Policies:

Click here to view and print the [UCSC Extension Policies (PDF)Links to an external site.](https://file.ucsc-extension.edu/unexfiles/UNEX_Policies_Syllabus.pdf)

Schedule:

I wanted to give you an update on homework and quiz that will be coming up during this quarter. There will be three homework and two in-class quizzes. The homework will test your programming skills and the in-class quizzes are meant to ensure that you remember key syntax.

Homework schedule:  
  
Homework 1 - will be assigned in 3rd class - will be due at the start of 4th class  
  
Homework 2 - will be assigned in 5th class - will be due at the start of 6th class  
  
Homework 3 - will be assigned in 7th class - will be due at the start of 8th class  
  
  
Quiz will have both multiple choice and code related questions. For the quiz, you will only be writing programs that are less than 10 lines.  
  
Quiz schedule:  
  
Quiz 1 - will be given in 5th class. It will be a closed book and no internet quiz. You will be quizzed on the following topics -  numpy, pandas.  
  
Quiz 2 - will be given in 10th class. It will be a closed book and no internet quiz. You will be quizzed on the following topics - scipy, matplotlib