BTEC 362: Python3 Programming for Translational and Biomedical Science

Course Designer:
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BTEC 362 (3 credit): Python3 Programming for Translational and Biomedical Science.
This is a Python3 programming course for beginners, however an understanding of computer systems and biostatistics are required (see prerequisites). The class will teach Python3 programming language, and students will learn fundamental coding concepts and practices applicable to other major programming languages such as C++ and Java. The class will also introduce students to utilizing Python for data analysis in biomedical/translational research.

Prerequisites: BTEC330 (Software Applications), BTEC350/STAT350 (Biostatistics).

Course Objectives:
1. Understand programming fundamentals and coding conventions using the Python3 programming language. These include data types and data structures, functions, control structures, file handling, and other key concepts.

2. Apply Python3 programming language to statistical analysis and plotting visualizations for biomedical/translational datasets.

Textbook:
Python Crash Course, 2nd Edition: A Hands-On, Project-Based Introduction to Programming. Eric. Matthes. 2019.

Grading:

> Quizzes: 20%
> Programming exercises and HW: 30%
> Mid-Term Exam (Week 10): 25%
> Final Project (Final Exam): 25%

Course Outline (16 weeks):
Content and exercises are adapted from:
1. Codecademy.com "Learn Python 3". (https://www.codecademy.com/learn/learn-python-3)
2. Datacarpentry.org "Data Analysis and Visualization in Python for Ecologists. (https://datacarpentry.org/python-ecology-lesson/)

A. **Module A: Fundamentals of coding in Python (Weeks 1-10):**
 1. Hello World
 2. Variables, simple data types, lists, strings
 3. Functions
 Quiz 1 (**Week 3, 10%**)
 4. Control Flow, Loops and if statements
 5. Dictionaries

6. Modules
   <u>Quiz 2</u> (**Week 6, 10%**)
7. Files
8. Classes
9. Function Arguments
   <u>Mid-term Exam</u> (**Week 10, 25%**)

B. <u>Module B: Data Visualizations and analysis of a biomedical dataset (Week 11-16)</u>
1. Downloading and accessing data accessing Data from SQL/SQLite Databases
2. Applying API's to generate data visualizations
   <u>Quiz 3</u> (**Week 12, 10%**)
3. Plotting data with Plotnine package, choosing the correct visualizations
4. More visualizations with Matplotlib and Pandas

<u>Final Project:</u> **(Due Finals Week, 25%).** Projects will be graded on the basis of the functionality of their code and application of proper coding practices as delineated in the assignment description.