Cluster 5 (Biophysics) Sequence with Python (2023)

Introduction to Python

- Introduction to Jupyter Notebooks

- Introduction to Python language

Basics of python

- Python variable types: strings, integers, floats, booleans [python_types.ipynb]

- Python containers: lists, tuples, dictionaries [python_containers.ipynb]

- Python controls: if-then statements, for loops, while loops [python_controls.ipynb]

- Python functions: regular functions, lambda functions [python_functions.ipynb]

- Python libraries: numpy (arrays), random, matplotlib [python_libraries.ipynb]

- Python programming exercises [python_exercises.ipynb]

- Quadratic program exercise [python_quadratic_program.ipynb]

Advanced strings and string operations (Optional)

- Fun with strings Part 1 [fun_with_strings1.ipynb]

- Fun with strings Part 2 [fun_with_strings2.ipynb]

Zen of Python:

- What is pythonic code? [zen_of_python.ipynb]

- Pythonic way Part 1 [pythonic_way1.ipynb]

- Pythonic way Part 2 [pythonic_way1.ipynb]

Predator-Prey Model

- Introduction to the Predator-Prey Model [intro_to_predator_prey.ipynb]

- Simple model of Predator-Prey interaction [predator_prey_exercise.ipynb]

Bioinformatics: Central Dogma Model- DNA to RNA to protein

- Review of basic biology: DNA, RNA, amino acids, proteins

- Introduction to Central Dogma of Genetics [Central_Dogma_Genetics.ipynb]

- DNA to RNA to Protein modelling [DNA_to_protein_model.ipynb]

Introduction to probability and random numbers

- Discussion of probability concepts

- Introduction to random numbers [intro_to random_numbers.ipynb]

- Exploring random number generators in python [random_numbers_python.ipynb]

Gamblers Ruin problem : random process in practice

- Introduction to the Gamblers Ruin problem [intro_to_gamblers_ruin.ipynb]

- Statistics for playing lots of games [gamblers_ruin_stats.ipynb]

Random walks in one dimension

- Discuss diffusion and cellular transport mechanisms (concepts)

- Introduction to random walks in 1D [intro_random_walks.ipynb]

- Gathering statistics for random walks [randomwalk1d_stats.ipynb]

Random walks in two dimensions

- Discussion of random walks in 2 dimensions

- Create simple 2d random walks and plots [randomwalk2d_simple.ipynb]

- Create 2d random walk with a confining boundary [randomwalk2d_box.ipynb]

- Create 2d random walk with target inside boundary (uses module approach) [randomwalk2d_target.ipynb]

- Capture statistics for random walks with target [randomwalk2d_target_stats.ipynb]

Final Project Selection