

Bootcamp Info Sheet

Instructor

Name: *Ryan Ellison*

Bio: *Dr. Ryan Ellison is a research scientist and educator at Ohio University, specializing in neuro[electro]physiology, computational neuroscience, and machine learning/artificial intelligence (AI/ML). His current research focuses on understanding the dynamics of slow biophysical processes in neurons within biological neural networks responsible for rhythmic motor-movement production. Dr. Ellison's multidisciplinary background led to tenure at NASA and subsequently the University Space Research Association. During this time, he developed a novel algorithm capable of identifying relevant subnetworks from whole brain connectomes. These subnetworks were then used to engineer simulatable artificial brains that were deployed to investigate emulated space effects on brain activity. The overarching goal of this work was to identify potential neural countermeasure targets, ultimately contributing to astronaut safety and mission success during long-term spaceflight. Beyond academia, he is the founder and president of data.ai, an AI/ML company dedicated to educating practitioners, bringing AI/ML technologies to businesses in the Appalachian region, and, at present, advancing artificial neural networks through neurobiological inspiration.*



Bootcamp Details

Bootcamp Title: *Classification in Python*

Number of Days: *4 days*

Hours per Day: *3 hours per day (11-2 eastern)*

Type of Instruction: *lecture with knowledge checks and hands on exercises*

Description: *Classification algorithms are powerful and intuitive data science tools that can predict behaviors and trends. This course teaches students how to implement algorithms like k-Nearest Neighbors, logistic regression and decision trees, as well as evaluate and interpret their results. By the end of the course, students will be able to build classification models to anticipate events and assess the accuracy of predictive algorithms.*

Target Audience: *Students who are comfortable using Python to manipulate data using numpy and pandas and must know how to create basic visualizations using matplotlib.*

Technologies: *Python & Anaconda. Packages that need to be installed:*

python==3.11.4

matplotlib==3.7.1

numpy==1.24.3

pandas==2.0.2

scikit-learn==1.2.2

Prerequisites: *Students must be comfortable using Python to manipulate data using numpy and pandas and must know how to create basic visualizations using matplotlib.*

Student References: *Class slides, class code, exercise files*

Bootcamp Syllabus

Day 1

- Introduction to Classification
- Building kNN models and performance metrics
 - Definition of kNN technique and application

- o Applying cross-validation to the kNN algorithm

Day 2

- Building kNN models and performance metrics
 - o Applying cross-validation to the kNN algorithm
 - o Identifying and evaluating performance metrics
- Logistic regression
 - o Introduction to logistic regression and its relation to neural networks

Day 3

- Logistic regression
 - o Assessing classifier performance (ROC curve, AUC, cutoff value selection)
 - o Tuning & regularization of logistic regression
- Decision trees
 - o Decision trees: Gini coefficient and information gain

Day 4

- Decision trees
 - o Confusion matrices and misclassification rates
 - o Evaluating the model for overfitting and underfitting