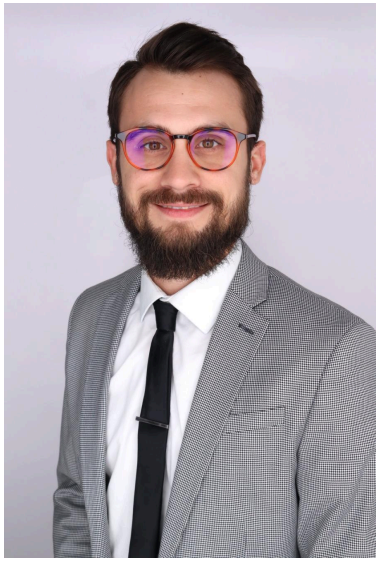
Bootcamp Info Sheet

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

ID: *< Assigned by Skillsoft >*

Bootcamp Title: Introduction to Neural Networks

Dates: February 20-23

Number of Days: 4

Hours per Day: 3 (2.5 h of instruction + .5 h of Q and A)

Type of Instruction: Lecture with interactive knowledge checks and coding exercises

Description: This course offers students a comprehensive introduction to the world of Neural Networks, providing insights into their workings and applications. From foundational knowledge to practical skills, participants will gain the expertise to construct powerful predictive systems, uncover latent patterns in extensive datasets, and further advance their understanding through practical examples, including measuring performance to address real-world challenges.

Target Audience: Students with a strong foundation in Python and the common libraries: SciKit-Learn, Pandas, NumPy, and Matplotlib, foundational knowledge of statistics, unsupervised machine learning algorithms, and classification algorithms

Technologies: Python and Anaconda

Prerequisites: Any student in this program must have a strong foundation in Python and the common libraries: SciKit-Learn, Pandas, NumPy, and Matplotlib. Additionally, students should have a foundational knowledge of statistics, unsupervised machine learning algorithms, and classification algorithms.

Student References: Class slides, exercises and exercises with answers, class code.

Bootcamp Syllabus

Day 1

- Introduction to Neural Networks
  - Introduction to neural networks
  - Identify the components of a neural network
  - Use cases of neural networks

- Building Neural Networks
  - Identify data processing steps and prepare data for analysis
  - Introduce MLPClassifier for building a simple neural network
  - Implement and evaluate a simple neural network using MLPClassifier
  - Explain the concept of backpropagation

Day 2

- Building Neural Networks
  - Introduce activation functions and their types
  - Visualize training history accuracy and loss
- TensorFlow
  - Introduce TensorFlow and Keras
  - Define a neural network model using TensorFlow
  - Prepare data for implementing neural network
  - Implement and evaluate model on test data

Day 3

- Model performance and fit
    - Summarize the role that batch size and epochs play in neural network training
    - Implement a custom neural network to demonstrate model fit with different learning rates
    - Compare methods to assess fit of a neural network
    - Methods to improve the fit of a neural network
    - Introduce loss functions in TensorFlow

Day 4

- Model performance and fit
    - Backpropagation and gradient descent using TensorFlow
    - Implement a custom neural network
    - Evaluating neural network for different batch size and epochs