

Bootcamp Info Sheet

Instructor

Name: *Martin Laptev*

Bio: *Martin Laptev, a data scientist with a broad scientific background that ranges from molecular biology to epidemiology, has taught with Data Society since 2019. Martin uses the JavaScript, Python, and R programming languages along with command line tools to explore, analyze, visualize and present data. Martin holds an MPH in Epidemiologic and Biostatistical Methods for Public Health and Clinical Research and a certificate in Data Science from Johns Hopkins University, a PhD in Tumor Biology and a teaching certificate from Georgetown University, an MS in Biotechnology from Jagiellonian University in Poland, and a BA in Biology from St. Mary's College of Maryland.*



Bootcamp Details

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, tuning algorithms, and accelerating neural networks 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
 - Overview of TensorFlow / Keras building blocks
 - Describe how to define, compile, and fit a neural network model
 - 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