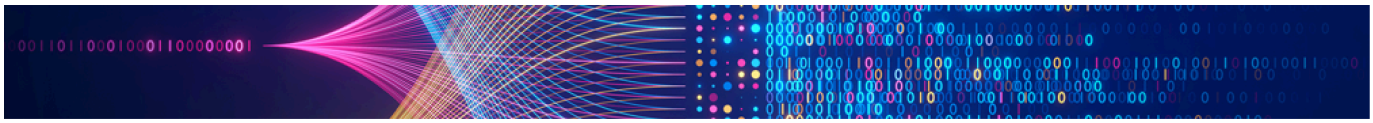
Week 2 Overview



Week 2 Overview

Last week, we explored how neural networks can handle binary and multi-label classification using a sigmoid output and cross-entropy loss. This week, we learn how to perform multi-class classification tasks with a network. To accomplish this, we extend the sigmoid to the softmax function, which outputs a probability distribution over all classes. We'll see how this leads to a generalized form of cross-entropy loss function suitable for multi-class targets. Then, we'll turn to the training process itself — learning how the neural network adjusts its internal weights using backpropagation and gradient descent, including practical enhancements such as mini-batching, momentum, and the Adam optimizer. These techniques form the backbone of modern deep learning and are an essential part of your toolbox as a data scientist.

Week 2 Introduction

Watch the video for an introduction to Week 2.

(03:39)

Learning Objectives

At the end of this week, you should be able to:

- Understand the difference between multi-class classification tasks and other classification tasks in deep learning and how the softmax function generalizes the sigmoid function to produce a probability distribution over multiple classes.
- Understand how cross-entropy loss is computed for multi-class classification using both one-hot and integer label formats.
- Outline the steps of the training loop: forward pass, backpropagation, and gradient descent.
- Interpret how backpropagation uses the chain rule to compute gradients of the loss with respect to each network parameter.
- Understand the basic weight update rule used in gradient descent.
- Identify common enhancements to gradient descent, such as mini-batching, momentum, RMSProp, and Adam.
- Explain the purpose and benefits of learning rate scheduling during training.

This Week's Activities

Assignment	Title	Type	Graded / Not Graded	Due
Knowledge Check	Week 2 Knowledge Check	Multiple choice	Not graded	Sunday
Assignment	Coding Homework	Jupyter Notebook	Graded	Sunday

Weekly Cadence

- Faculty Live Session: Monday 7-8 pm ET
- Sunday deadline: 11:59pm ET