Assignment 05: Building Convolution and Pooling Layers from Scratch

CSci 560: Neural Networks and Deep Learning

Description

Welcome to our first assignment for the classes Computer Vision and Convolutional Networks section. In this assignment you are going to implement functions to perform the convolutional and pooling layer operations in numpy. Each function you will implement will have detailed instructions that will walk you through the steps needed:

- Convolution functions, including:
  - Zero Padding
  - Convolve window
  - Convolution forward
  - Convolution backward (TODO)
- Pooling functions, including:
  - Pooling forward
  - Create mask
  - Distribute value
  - Pooling backward (TODO)

This notebook will ask you to implement these functions from scratch in `numpy`.

Instructions:

- The forward pass convolution and pooling functions could be vectorized. However for this assignment, the purpose is to learn conceptually how the convolution and pooling operations work. So you should use for loop iterations as described for these function. We leave it as an exercise for the student to think how you might go about fully vectorizing the convolution and pooling function.
- As with the previous assignment, you will need to create the function declarations asked for in `src/assg_tasks.py`. Make sure you use Python Docstrings and are generally following Pep8 Python Style Guide for your code.

Objectives

You will learn:

- How to figure out the resulting size of an output height x width shape for a convolution or maxpooling operation given the stride size, padding and kernel sizes being used.
- How convolutions are computed at the basic level for a convolution layer.
- How max pooling and average pooling works and is implemented

Overview and Setup

Assignment Tasks

Assignment Submission

Additional Information