CS280 Spring 2023 Assignment 2
Part A

Convolutional Neural Network

Name:

Student ID:

1. Convolution Cost (10 points)

Assume an input of shape $c_i \times h \times w$ and a convolution kernel of shape $c_o \times c_i \times k_h \times k_w$, padding of (p_h, p_w) , and stride of (s_h, s_w) .

- What is the computational cost (multiplications and additions) for the forward propagation?
- What is the memory footprint?

2. Convolution Kernel (10 points)

Assume there are two convolution kernels of size k_1 and k_2 respectively (with no nonlinear activation function in-between).

- Prove that the results of the two convolution operations can be expressed by a single convolution operation.
- What is the dimensionality of the equivalent single convolution?
- Is the converse true, i.e., Can a convolution operation be decomposed into two smaller convolution operations?