Due Date Dec 7. Fall 2017. Homework 5

Prof. Alan Yuille

November 20, 2017

Due on Dec 7 . Submit pdf file on Blackboard by 11:59:59 PM on the due date. Format file name as *firstname-lastname*-hw5.pdf. Do not include the iPython notebook code in the pdf submission as it is not required. If you have any questions about the homework, email TA Donald Li: sli97@jhu.edu

Question 1. Multilayer Perceptron (14 points)

1. Describe the basic ideas and structure (you may want to sketch it!) of multilayer perceptrons – at level of detail of the handout. (4 points) Why are multilayer perceptron better than single layer perceptrons? (3points)

2. What does the backpropagation algorithm do? (3 points) Derive the backpropagation equation for the peceptrons with one hidden unit with a sigmoid activation function. (4 points)

Question 2. Deep networks (26 points)

1. Describe the idea and the structure (you may want to draw or sketch it too!) of a convolutional neural network. (5 points) What is the main difference

between multi-layer perceptrons and convolutional networks? (3 points) How does the convolution layer help convolutional networks do a better job in a image classification task? (3 points)

2. What is max-pooling? (2 points) What is average-pooling? (2 points) Why do we need pooling in deep network? (3 points)

3. What is the potential problem of using a sigmoid activation function in a deep convolutional networks?(3 points) What is a ReLU function and how does the ReLU activation function help solve the problem? (5 points)

Question 3. Experimental Section: Neural network (15 points)

In this question, you will build your own neural network to finish a classification problem. This project will require you to install the Tensorflow package in order to run the deep neural network training. Before you open the iPython notebook, follow Tensorflow to install Tensorflow. IPython notebook is used for this project, download the material from either :

`https://github.com/shipui2005/ProbHW5/blob/master/HW5.tar.gz` or

`https://github.com/shipui2005/ProbHW5/blob/master/HW5.zip`