Winter 2018 - CSE 641 Deep Learning
Mid Sem - Feb. 21, 2019

Maximum score: 60 **Time: 60 mins**

Instructions:

- Try to attempt all questions.
- Keep your answers short, succinct and to the point. Unnecessarily long and convoluted answers may cost you some points. Make sure that you define all variables in your equations.
- Do not copy. Institute plagiarism policy is strictly enforced.
- In the unusual case that a question is not clear, even after discussing with the invigilators, please state your assumptions *clearly* and solve the question. Reasonable assumptions will be accounted for while grading.

1. (*25 points*) RNN and LSTMs:

a) (5) What are the pros and cons of LSTMs over RNNs?

b) (10) List the additional components introduced in an LSTM block and describe their function by providing appropriate equations, learnable parameters and activations.

c) (2+3+5=10) What is attention? With the help of a block diagram, show how attention is used for Neural Machine Translation. Describe the attention component with necessary equations, learnable parameters and activations.

2. (*25 points*) Object Detection

a) (10) It has been generally observed that RCNN and its variants (Fast/Faster) have better accuracy but are slower compared to YOLO or SSD. Can you argue about the reasons for it to be so.

b) (4+6=10) Why is the RoI-Pool layer necessary in Faster-RCNN? Describe the functioning of the RoI-Pool layer.

c) (5) What is the full-form of the evaluation metric mAP. Define it with necessary equations or formulae.

3. (*10 points*) Semantic Segmentation

a) (3) What kind of loss function would you use for a Semantic Segmentation problem? Write the expression for the loss.

b) (4+3=7) Comment on the need for an upsampling layer in Fully Convolutional Networks (FCNs) for semantic segmentation? Why can't we have same sized convolutional layers throughout the network and avoid the upsampling layer altogether? On the other hand, why do we need the skip connections?