Week 1

11-777

Due: Thursday, Sept 7, by 4:30 pm

Instructions

A small yet significant part of the course is answering a few questions based on a paper you just read. By design, some of these questions are open-ended and the purpose is to start a thinking process. Some of those questions may already have been answered in recent literature (or in the given paper itself). We encourage you to, both, come up with your own ideas and survey recent papers before answering these questions.

A few key points to take care of:

- Answer **two out of the three questions** (you are welcome to answer all 3), unless stated otherwise.
- A lot of questions ask you to suggest changes or make alterations. It would be nice to support it with logical / mathematical arguments. Cite all sources used in the process of coming up with your answer. Figures and equations, if they support your arguments will be appreciated.

Questions

Representation Learning: A Review and New Perspectives

1. Compare and contrast the concepts of distributed and deep representations, as they are described in the paper. What is the significance of each of these in the multi-modal setting?

2. The paper describes three distinct lines of research in representation learning - the probabilistic models, the reconstruction-based algorithms related to auto-encoders, and the geometrically motivated manifold-learning approaches. Briefly summarize each, and how they are interconnected.

3. Evaluating representation learning models could be tricky. One way to is to check its performance on a particular task. While this is useful to judge the representations' utility for specific tasks, but this does not say anything about other tasks. What could be some potential approaches to measure performance while maintaining the generality of the tasks?