DEEP LEARNING: Project Proposal

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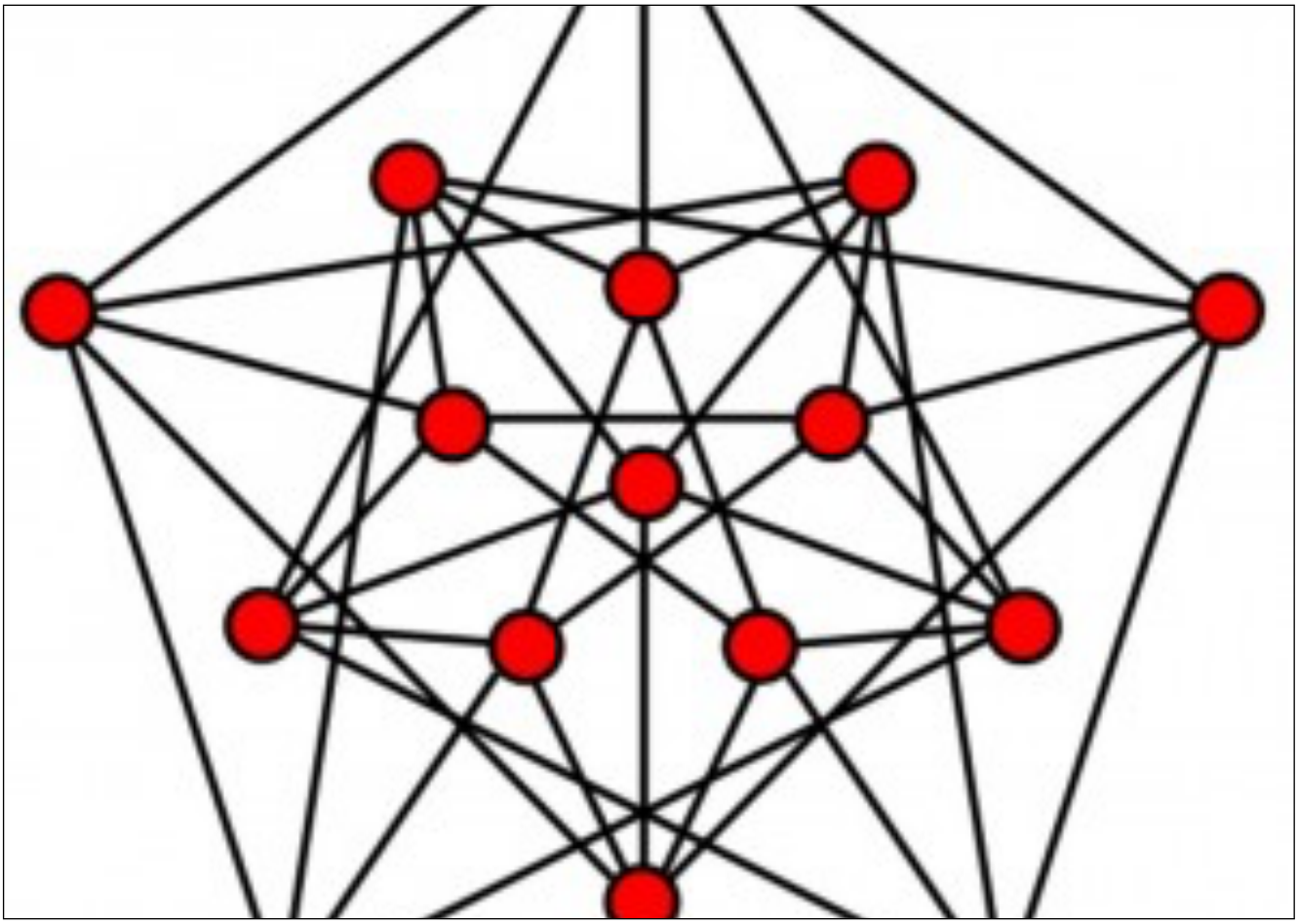

Learning Complexity for Deep Learning

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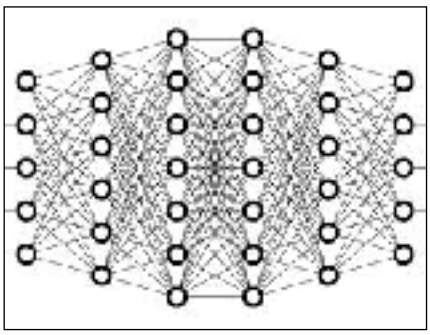

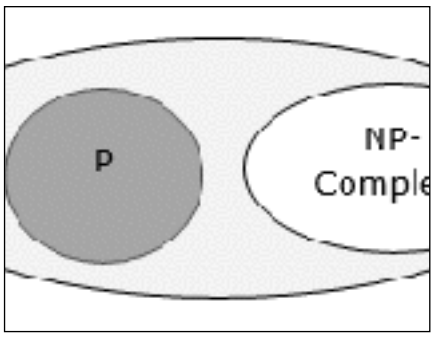

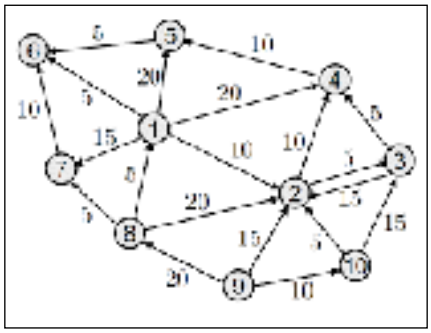

Project Objective:

We would like to look at a few problems, which are easy for humans to solve, and have an intuitive aspect to it, and we'll try to see if deep learning does equally well on it. We would essentially like to characterize what problems are inherently hard from a deep learning point of view. We'll look at a few traditional notions of complexity such as say First order definability and see how they compared to ease of learnability for deep learning.

Methodology :

We shall be working with Aalok, a graduate of CMI, whom Vineeth Sir introduced to us. We shall try to identify a few traditional notions of complexity and see how they compare to learnability for DL. We are still trying to identify the problems that we could look at, so at this point methodology is not yet decided.

Contribution: Since there are no strong theoretical guarantees for deep learning, we shall try to make some progress in that direction. Although it won't be purely theoretical guarentees, by empirically noting the relation between other notions of complexity and DL, we shall try to motivate a few further lines of research.

Datasets and planned experiments: Not yet clear at this stage. We shall maybe even generate data sets on our own, since our novel proposal might not have readily available datasets.

Performance Metrics : Compare rate of convergence for different problems and see if there is a relation between this rate, and the underlying complexity of the model in terms of again say something like quantifier depth. There might be some correlation between these two. However we have not yet decided what all complexity notions we shall be considering.