4^{th} Milestone Report for 15-400, Spring 2017

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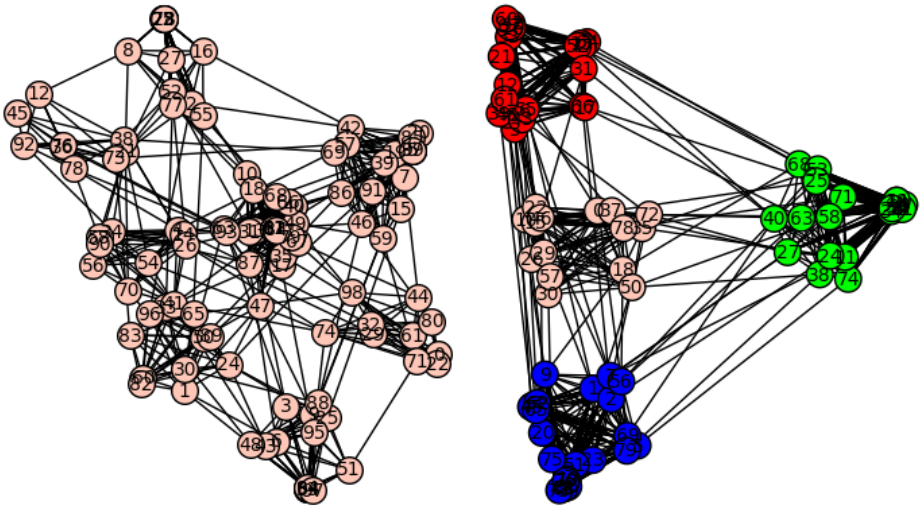
Major Changes :

There have been no major changes.

Accomplishments So Far :

1. An interesting model or random graphs is the mixed membership stochastic block (MMSB) model, which assumes a Dirichlet prior distribution on the community membership vectors of the vertices. We thought that this might be an interesting setting to test the Mishra et al (α, β)-clustering algorithm. I did some simulations to figure out the range of parameters where the algorithm performs well and recovers the underlying communities. Here are a couple of nice pictures from the simulations :



2. Another idea we discussed was to fix a community size t in the Balcan et al model, and delete all but t votes from each node. The idea of fixing a community size is slightly unconventional for randomized models, but it might lead to better parameters.

Meeting The Milestone :

I did not meet this milestone. I was supposed to generalize the algorithm to harder instances, whereas my simulations haven't lead to good performance (of the (α, β)-clustering algorithm) on even moderately complex MMSB graphs. I'm currently trying to figure out

how to fix this, and also reading about spectral methods for recovery in the (non-mixed) stochastic block model. I think this calls for a revision to my milestones.

Surprises :

No unpleasant surprises.

Revisions To 15-400 Milestones :

March 20th Analyze the range of MMSB parameters on which the (α, β)-clustering algorithm recovers communities properly.

April 3rd Try to mathematically prove such guarantees in the given range of parameters.

April 17th Try to extend the work to recover model parameters (similar to Van Vu's approach to non-mixed stochastic block model in [1]), and figure out if the algorithm is competitive with spectral methods.

May 1st Refine the work done during the semester and write it up for presentation.

Resources Needed :

I haven't felt the need for any more non-trivial resources so far.

References :

1. Vu, Van. "A simple SVD algorithm for finding hidden partitions." arXiv preprint arXiv:1404.3918 (2014).