Major Changes:

None

What You Have Accomplished Since Your Last Meeting:

Since the last meeting, I've come up with some new ideas. I've noticed that we can represent each polynomial test via +-1 or {0,1} indicators. In the former case, we can potentially use tools from discrete Fourier analysis to make progress with our problem, which I plan to think more about soon. In the later case, we see that each test is just the weighted sum of monomials, each of which is a 0/1 indicator for some not-necessarily connected subgraph existing in G. If our distribution is symmetrical (i.e. the probability of a structure existing in any two locations within the graph is the same), then really this is just a weighted sum of counts of sub-graphs in the graph. It feels like if a good distribution exists it will probably have this symmetry property (or at least there will exist a good symmetrical distribution, but I don't quite have a rigorous proof of this). Using some elementary statistics, I've concluded that we can't restrict our attention to polynomials counting just one subgraph or to a single polynomial, which would have been quite useful. This idea has inspired some new partial ideas, such as picking color membership via the naïve algorithm described last week but having the probability of being assigned a color not be the same for all colors, or to restrict our distribution to an even smaller set of graphs: those for which the complement is also sqrt n colorable, which allows us to have graph complements in our distribution.

Meeting Your Milestone:

Yes, I thought about some new ways to tackle the problem from the distribution perspective and also came up with some partial results from the polynomial side. Less progress than hoped was made, though, due to a rather hectic covid situation that evolved last week.

Surprises:

None

Looking Ahead:

Hopefully continue to think about some of the ideas described above

Revisions to your future Milestones:

It's definitely somewhat difficult to come up concrete goals on a theory project, but here are some ambitious revised milestones:

March 1st: Come up with new partial results from the distribution and polynomial side of things (in particular, figure out whether basic ideas in Fourier analysis will help us)

March 15th: Come up with new partial results (depending on what is found in previous weeks)

March 29th: prove result for planted-n^k-coloring for some k < 0.5

April 12th: prove result for planted-n^0.5-coloring

April 26th: Investigate implications of positive or negative result on pseudo calibration conjecture or Dr.Kotharis work with Peter Manohar

Resources needed:

None