ASEN 6519 Advanced State Estimation
Spring 2021
Final Project Proposal
Out: Thursday 03/04/2020 (posted on Canvas + Gradescope)
Due: Friday 03/19/2021, 11:59 pm (via Gradescope)

Your final project should relate class material to your research, work, etc. Strike a balance: something not entirely trivial but also something simple enough to be fun and interesting. A worthy target to shoot for is something that you might one day actually use or turn into a publication. You are encouraged to leverage existing work/literature for ideas. You may also consider significant variations/extensions of problems discussed in class, exercises, the book, etc. You can talk with Prof. Ahmed at any time to help scope out a project – **but you (and your partner, if applicable) must stick with your project idea once approved, so you can turn in an acceptable final report by semester's end (finals week).** You may work solo **or** in groups of 2 students (include both names; only one person needs to submit). Please address the following in ∼2-3 pages (incl. figures, equations, references):

1. **Application and Context:** Give a brief overview of your problem or application – why is it significant, and what are the relevant technical challenges related to the state estimation topics and techniques covered in class (give sufficient detail to see the connection)? What are the relevant uncertainties and estimation problems?

2. **Initial Problem Formulation:** Provide a first cut formal problem statement to mathematically define the key variables and assumptions needed for your problem (i.e. state variables, measurements, dynamics, noise, parameters, other uncertainties, equations, etc.). If different assumptions are needed for different parts of the project, explain how these would be adjusted accordingly. Cite references or other sources of information. It's fine if there are no firm numbers yet, as long as you can clearly describe how things will fit together and where required numbers would come from.

3. **Objectives:** Assuming 3-4 weeks of work, provide a bullet list of technical goals. Prioritize according to 'Levels of Success': **Level 1** = things you are quite sure you can do to *apply and demonstrate basic competency with course material and concepts*; **Level 2** = more ambitious goals that you really want to achieve by end of semester to feel good – these should be still reachable with a good chance of success, and build on Level 1 to *demonstrate mastery of course material and concepts*; and **Level 3** = ambitious 'stretch' goals beyond Level 2 (assuming things go smoothly). Be as precise, focused and realistic as possible for each level. Your technical approach must be relevant to the class, i.e. you must use/connect to concepts and techniques discussed in lecture or in the Ristic book.

4. **Task and Milestone Roadmap:** Outline key tasks to meet each objective. Describe major milestones that can help monitor and check progress along the way. Identify possible techniques for tackling your problem and metrics for evaluating success. Group projects should explain expected *technical contributions* of each team member for each level of success.