Intelligent Systems' Design and Control Project Rubric

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Your grade on the project is determined by a combination of your written report (70 points) and your oral presentation (30 points) for a total of 100 points. You can also get extra credit for attending others' research presentations and summarizing their work in a paragraph or two (2 points per presentation summarized, for up to five presentations).

1 Rubric for the Written Report

- (10 points) *Introduction and Abstract*: Introduce your reader to the topic as you found it prior to your contribution.

- (10 points) *Challenge/Motivation*: Highlight what was lacking in that status quo and declare what your paper will contribute. It doesn't need to be a huge contribution, just clearly delineated. *(HINT: for those of you doing preliminary literature reviews for later research contributions, this review's contribution will be identifying a gap in the literature that needs solving).*

- (20 points) *Action*: This section's format is the most diverse between papers. Here are some suggestions on sections to include:

  - *Research Contributions* can introduce new ways of solving and conceiving of problems (math- and engineering-style) or reject null hypotheses about extant phenomena (science-style).
    * *Scientific Experimental contributions* should outline materials used in the experiment ("Materials" and "Methodology" sections), what was measured ("Experimental Design" section), what resulted ("Results" section) and what that implies about null hypotheses the field might have considered before ("Discussion" section).
    * *Theoretical contributions* should transform the field's typical formulation of the problem into a more tractable or elegant formulation. In intelligent systems' control, a formulation is judged by how its analyses can prove new theorems and/or translate into more powerful or efficient algorithms. Therefore, the Action section should introduce the tools ("Mathematical Background" section), assert the axioms and modeling assumptions ("Model of _____"/"_____ Formulation" sections), and outline the derivations ("Derivations"/"Proof of _____" sections) culminating in theorems and/or algorithm designs. For the latter, pull sections from the *Design contribution* styles' list of sections. Sometimes there's an experiment ("Demonstration" section)

to show the theory works on the real problem, but these experiments are less scientific measurements of extant phenomena and more proof-of-concept demonstrations.

  * *Design contributions* introduce a new approach for solving a problem. For algorithms, novel designs are linked to new formulations. For mechanisms, I believe novel designs must have a similar shift in thinking about the problem, but I'm not an expert in that area. With sufficient insight into their contribution, the author should be able to describe what change of thinking is necessary to conceive of the design.

    Therefore, the Action section should describe this change of thinking and how it induces the new design ("Analysis" section), describe the new design in detail ("Description of _____ Design" section), and show how it succeeds where previous approaches failed ("Results" section). This last item generally entails an experimental validation of the design, though it could also be by theoretical verification if the change of thinking is sufficiently formalized. Include appropriate sections from either the *Experimental* or *Theoretical contribution* styles.

- *Literature Reviews* analyze other research on a topic rather than the topic directly, but by combining multiple studies can find them more than the sum of their parts and conclude something novel about the topic.

  * *Distillation contributions* summarize a broad field by translating them into a unified language. Papers that focus solely on contributing distillation must have clearer thinking and writing than the original papers and be more concise too: otherwise the reader will prefer to just read the originals. These are generally only published after years in the field and many revisions and edits to hone the writing, and are then sold for hundreds of dollars and called Textbooks. The Action section must introduce all the foundational concepts (a section per concept), describe the complexities induced by settled disagreements (a section per development), and outline the arguments of the as-yet unsettled disagreements (a section per open problem).

  * *Meta-result contributions* tabulate the experimental results of several papers to yield a more generalized/statistically powerful conclusion. The Action section must describe each of the independent methodologies and how you can compare their results legitimately (possibly after some compensating for confounds, replication, or translating onto shared axes).

  * *Critique contributions* are the inverse of Meta-results: rather than analyze the literatures' various output results, the critique analyzes the literatures' input assumptions/axia that are used to even begin discussing the problem. The Action section must outline each papers' argument and what foundational axia and formulations they assume (a section per paper/argument). The author should then strike these assumptions against each other and discuss the strengths and weaknesses of each ("Discussion" section).

- (20 points) *Resolution/Conclusion*: Crystallize the argument to conclude changing the reader's way of thinking. This is the contribution the reader can take away from your paper and use in their own research.

- (- points) Page length (not counting Bibliography) should be less than 12 pages in

single column format with 1.5 inch margins (default LaTeX article formatting) or less than 6 pages in IEEE conference formatting. Every single column page over subtracts one point (so every double column page over subtracts two points).

Note that the *Scientific Experimental* and *Meta-Result* contributions are more common in science papers or areas emphasizing empiricism.

2 Rubric for the Oral Presentation

Being able to distill a research document into a linear, concise presentation is a vital skill for a researcher with impact. Translate the same four story beats above into your presentation.

- (6 points) *Introduction*: Did the presentation introduce all the necessary ideas and context?

- (6 points) *Challenge/Motivation*: Did the presentation motivate a question that needed to be answered?

- (12 points) *Action*: Did the presentation gradually teach the audience a new way of thinking (e.g. a formulation, design, conceptual overview of a field, critique of foundational assumptions) by unfolding an intelligible argument?

- (12 points) *Resolution/Conclusion*: Did the presentation conclude with a takeaway?

- (4 points) Time less than 15 minutes: 10 minutes for the presentation and 5 minutes for questions. Every minute you present past your 10 minutes will lose you one point from the 4 points allotted for timeliness. Finishing sharp at 10 minutes or less will net you a guaranteed 4 points, but make sure you don't leave out important information or you'll lose some of the other 36 points for content.

3 Rubric for engaging with Others' Research

These points are extra credit. Engage with another group's presentation and summarize their contribution and argument in a paragraph or two. These can be awarded for up to five presentation summaries for a total of 10 extra credit points.

- (2 points) Summarize another group's presentation:
  - (1 point) Answer "What was strong/useful about this research's argument and concluding contribution?"
  - (1 point) Answer "What could have been done differently in their methodology to achieve an even stronger result?"