Fourier Analysis

Fourier techniques are the most widely used methods to analyze signals. The Fourier transform extracts key elements of the signal that are otherwise hidden when the signal is recorded. With these projects, different aspects of of the Fourier analysis of signals will be introduced.

This project will consist of two parts. In the first section, each team will be given a signal from a *physical system* to be analyzed. Each team will extrapolate important information from the signal, or manipulate the signal in ways described in the individual project descriptions. For the second part, each team member will read the article. In that article, a discussion of the experience of a visually impaired scientist is described. Each student will write a reflection (a paragraph or two) on how they imagine their career trajectory through STEM would be affected with this or any, physical limitation.

The delivarables for this project are:

(1) A basic description of the physical system, if any.

(2) The `MatLab` code for each section.

(3) A PowerPoint presentation in which results are presented. All results should include any associated estimates of the goodness of fits, etc.

(4) A short narrative reflecting on

   (i) What were the key concepts you learned from this project

   (ii) What were the most difficult obstacles to overcome

   (iii) What parts of the project were most completely addressed, which were not, and why you felt that.

   (iv) What more would you like to learn about this topic.

   (v) A 1–2 paragraph reflection on the article on determism and free will.

The following rubric will be used to assess your presentatiion

Content :

4. **Expert** Clear articulation and use of all the key concepts, synthesis of all results, conclusion supported by results
3. **Proficient** A general sense and use of key concepts, synthesis of key results, conclusion supported by results
2. **Almost Proficient** Some key results or synthesis omitted, conclusion not entirely supported by results
1. **Developing** Most of the key results not included, little to no synthesis, conclusion not supported by results

Communication and Organization :

4. **Expert** Oral presentation had clear organization, and each part was effectively and concisely delivered
3. **Proficient** Oral presentation had clear organization, was easy to follow, and included relevant information
2. **Almost Proficient** Oral presentation had some organization but was somewhat difficult to follow (e.g., too detailed, too general, missing important sections)
1. **Developing** Oral presentation was disorganized or unclear

Visuals :

4. **Expert** Tables/graphs summarize data and/or conclusions, figures and images explained and described well, axes labled and units listed.
3. **Proficient** Most figures and images explained and described well,
2. **Almost Proficient** Visuals were of uneven quality; Labels and legends somewhat unclear, relation to conclusions not clear or not drawn from figures
1. **Developing** Visuals were confusing, unprofessional, and/or not clearly relevant