

Background

A large portion of engineering is modeling physical systems. Often, these physical systems are complex and our models are incomplete, inaccurate, or computationally expensive. In this assignment, you will learn about modeling physical systems and how surrogate models can be used to approximate complex systems.

Assignment

Start a new local branch and push it to your github repository. Name it something relevant to the project. Create github issues for at least steps 3-6. You should use these issues to write down questions you have about those steps of the assignment for reference in your weekly meeting with your graduate student mentor. Close each issue you create with a comment as you finish each step.

1. Read through the chapter 2 in the ME EN 515 Text (linked below), specifically sections 5 and 6. As you read and come across unfamiliar terms, look them up and include them in an appendix in your report. As part of the definitions, include images and equations to add clarity where applicable. Additionally, include the following terms in your appendix:
 - Analytical model
 - Surrogate model
 - Neural Network
 - Empirical model
 - Interpolation
 - Computational model
 - Extrapolation
2. Learn about different surrogate modeling techniques. Write a brief summary of the different methods you find and include a list of the methods in your appendix.
3. Familiarize yourself with the surrogate model [NeuralFoil](#). Take notes on which functions you'll need for the rest of the assignment and how to use them (i.e. write some pseudo code). Provide several plots similar to the ones in the airfoil analysis assignment to show how the surrogate model works.
4. Write a short write on your methods, results, and takeaways. You should include introduction and discussion material on what you learned in steps 1-6, giving special attention to the methods and results from steps 3-6.
5. Submit your code and paper (.tex and .pdf files) via a pull request for your assignment branch on github.
6. Stretch goals:
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Hint: Here are some common terms that you may want to include in your appendix dictionary. You should also include other terms you come across that are unfamiliar.

Useful Resources

- [ME 515 Textbook : Chapter 2 Sections 5 & 6](#)
- [Original XFoil Documentation](#)
- [Xfoil.jl Documentation](#)
- [Google](#)
- [Adding wiki pages to your repository.](#)