Computational Modeling in Engineering and the Sciences
UT Computer Science Directed Reading Program
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Mentor
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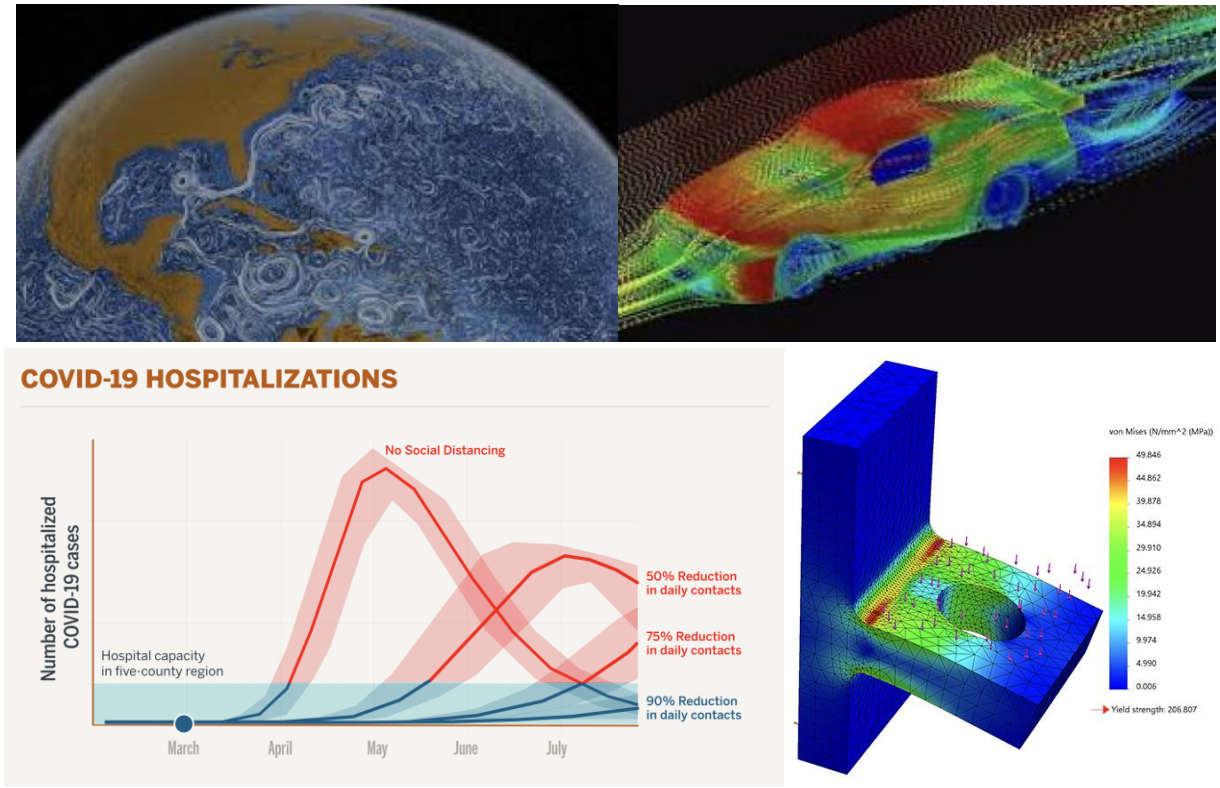

Some fun visualizations of various computational models: ocean currents, air flow around a car, COVID predictions, and deformation of a metal bracket.

Summary
In this beginner-friendly group, we will broadly explore the field of computational modeling: the kind of work done at the Oden Institute. We will practice both reading papers and coding simple, fun, GitHub-worthy projects. Since the field itself is broad, topics can follow the group's interests.

Goals
- **Learn about computational modeling.** We will explore at the surface level the various kinds of computational models in use and where they are applied, e.g., finite element modeling, agent-based modeling, and machine learning.

- **Explore research and academia.** The Oden Institute and TACC supercomputers make UT one of the best universities in the country for this kind of research. We will take some time to learn about the institute and TACC's resources.
- **Build our own simple simulations of cool things.** Although many modeling techniques require advanced math and powerful computers, there are also many possibilities for beginner-friendly projects. Here are some ideas.
    - Orbital dynamics (n-body problem)
    - PDE's: wave equation, heat equation, Poisson equation
    - Fluid dynamics (like this web-based simulator)
    - Evolution (example by Primer on YouTube)
    - Disease (example by 3Blue1Brown on YouTube)
- **"Leave things better than we found them."** If anything, this is a chance to immerse yourself in research, try new things, and grow as a person.

Prerequisites

None! Although background knowledge in programming, calculus, and linear algebra are probably helpful, this is supposed to be a fun, beginner-friendly group. Whatever people don't know, we'll learn together!