Final Project Ideas

Below is a list of project ideas. Some of them are of an appropriate scope for a whole project; some are just a starting point. They're roughly sorted into categories, but there is quite a bit of overlap for some fields (especially physics and engineering). So if you don't see something you like under your "preferred" section, then look under the other ones as well.

As long as your project has to do with differential equations, there are no restrictions on what you may do. If you don't see something you like here, feel free come up with your own idea, draw ideas from other courses, or search the Internet for something you are interested in.

If you need some help picking a project or finding a place to start with an idea you've chosen, I'm always available to chat before/after class, during office hours, or via email.

Behavioral Science

- The Spread of Gossip

Biology

- Cancer Growth
- Drug Quantity in the Bloodstream After Ingestion
- Epidemics
- Fishery Management (or other such harvesting)
- Gene Regulation
- Invasive species
- Metapopulations (a population divided into multiple regions)
- Neuron Transmission (Hodgkin-Huxley Model)
- Predator-Prey Models
- Resource Competition
- Size or Age-Structured Populations
- Spread of pollutant in the Great Lakes
- Symbiosis

Chemistry

- Chemical Reactions between Multiple Chemicals (there are many examples of these; try and choose a specific one)

Economics

- Multi-Region Growth Model
- Ramsey Model
- Solow-Swan Model

Engineering

- Bridge (suspension or otherwise)
- Building in an Earthquake
- RLC Series Circuit

Meteorology

- The Lorenz System
- Ozone Depletion

Numerical Methods

- Adams Methods (this is what SciPy defaults to for most ODEs)
- Difference Equations
- Heun's Method (also called the Improved Euler's Method)
- Runge-Kutta Method

Theory

- Bessel's Equation (a form that arises in lots of applications)
- Poincaré-Bendixson Theorem
- Proof of Existence and Uniqueness (Picard's Iteration Method)

Physics

- Diffraction of Light (Airy's Equation)
- Two/Three-Body Problem
- Oscillating Pendulum
- Spring with Mass in Series