Final Project Proposal

Partial Differential Equations, Spring 2023   David Yang and Martina Kampel

- What is the topic and why is it significant?

- What is the mathematical or scientific context of your paper? (Analytical methods? Numerical methods? Application area?) Can list foundational ideas necessary to recall.

- Are there historical figures, or moments, that are relevant to this topic that you can describe in a way that enriches the introduction your topic?

- Are there applications of this topic, or discoveries related to this topic, that you can describe in a way that heightens a reader's interest in the topic?

- Preview the main "story" you plan to tell: describe (qualitatively) the PDE and "results" you will present (qualitative here, in detail in later sections)

1. The PDE that we plan on writing about in our report is the **McKendrick–von Forester equation**, discussed in Logan on page 230. The general form of the PDE is

$$u_t = -u_a - m(a)u,$$

   a form of the advection equation where $m(a)$ represents the maternity rate at some age and $u(a,t)$ represents the density at age a and time t.

   This PDE appears in the context of **age-structured models**, i.e. demographic models where the population at time t has an age distribution superimposed on it, and has general implications in mathematical biology.

2. Our group consists of David Yang and Martina Kampel.

3. We plan to derive the age-structured model with this equation, as well as discuss how one might go about finding the "growth" rate and stable age structure solution, as presented in Chapter 5.1 of our textbook.

   Our main resources will be Chapter 5.1 of Logan and other related papers, such as this one.