Possible Projects for MAT 451

Dieter Armbruster

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Here are some of the possible projects that I see in this class. Feel free to come up with new ones. I don’t have exact project descriptions right now and we will develop them together as we move along. I want everybody to sign up for at least one of the projects by Monday 1/14/13.

• Biology project: Discuss the biological features of fingerprints and their evolution in the human embryo. Read the Fingerprint sourcebook Chapters 2 and 3, look up possible background material and present a talk in class on 1/23

• Theory of Pattern Formation. I will present the fundamental material over the next few weeks. However, there is much more to learn about pattern formation than what I will discuss in class. People with a more theoretical interest may find this area to their liking.

• Create a finite difference code for one of the pattern forming partial differential equations

• Create a spectral code for one of the pattern forming partial differential equations

• Study defects. This is potentially the most important sub-project in the whole fingerprint project. It seems it will be straightforward to determine the overall level one shapes of the flow lines but the real important stuff is how to generate the right number of defects at the right place. There is also a theoretical component to this involving the algebraic classification of defects. We can easily make two groups out of this topic.

• Statistics
  – What is known about the statistics of the minutiae?
  – How do you compare two sets of distributions for them

• In order to determine the statistical distribution of the defects we need an automatic way to detect them. Is there such a code around? If not, can we develop one?

• - any other issues that you come up with and discuss with me.