Course Announcement
Spring, 2004
Math 496/896, Sec. 002
Mathematical Aspects of Bioinformatics

Instructor: Leo Chouinard
Text: Mathematics of Genome Analysis, by Jerome K. Percus
Supplementary material may be taken from some other sources.
Prerequisite: Math 208 or permission of the instructor.
Time/place: MWF 10:30-11:20, Oldfather 305

We will study some of the mathematics underlying the growing field of bioinformatics. (If any of you who don't know what that is, see below*!) We'll focus on math used in the assembly and comparison of DNA sequences, though we'll also point out some of the similarities and differences when using such procedures in analyzing proteins.

We'll start the semester with a brief summary of the biological structures that we're trying to analyze, for those with little background in that area. Then we'll move on to a brief treatment of probabilities and expected values for those who have never studied probability or statistics. Once that is done, we'll move into the heart of the material - chapters 2 through 4 of Percus' book. Chapter 2 discusses recomposing DNA from fragments of various types. Chapter 3 discusses the local and long-range properties of the sequences that come up in DNA. Chapter 4 is about various methods of sequence comparisons. Chapter 5, which we may or may not get to, is about spatial structure and topics like the thermal behavior of DNA.

Grading will be based on homework and either a project or participation - researching a suitable topic and giving a reasonable lecture on it will substitute for doing the project. The homework will be based on the mathematics, NOT use of the programs which exist out there to perform these functions. However, those familiar with such programs will have the option of using them in their project.

* Bioinformatics is at its core the creation, coordination, understanding, and application of the massive amounts of molecular biology information that are being discovered in laboratories around the world. The field has origins dating back to the discovery by Watson and Crick 50 years ago of the double helix structure of DNA and its role in encoding most of the "core instructions" of cell-based life. It has expanded to include questions like the chemical and physical structure of proteins, which are involved in almost all of the chemical reactions inside living cells.