BIOL 568: Bioinformatics Programming
Computational Analysis for Biologists

FALL 2010

Instructor: Scott Kelley; Office Hours by Appointment
Day/Time/Location/Credits:
   Lecture: Monday and Wednesday; 1 – 1:PM; LS132
   Lab:Section 1 Monday; 2 – 4:20 PM; LS126
       Section 2 Wednesday; 2 – 4:20 PM; LS126

Grading:
   • 30% - Labs, Homework, and Quizzes (on Reading – prepare for class)
   • 20% - Lab Practical
   • 20% - Midterm
   • 15% - Python Exam
   • 15% - Final Project

Computational resources limit enrollment to number of available computers.

EMAIL CONTACTS:
(1) TO CONTACT INSTRUCTOR (ask a question): skelley@sciences.sdsu.edu
(2) TO TURN IN ASSIGNMENTS (e.g. LABS): biol568sdsu@gmail.com
   Only use the second email to turn in assignments!! I will not answer those emails.

LS-126 Open Hours: Check whiteboard in class.

Textbooks:
   • REQUIRED: Bioinformatics for Dummies, 2nd Edition
   • (Optional) How to Think Like a Computer Scientist: Learning with Python – free online!

Content: The content includes fundamental concepts in Bioinformatics (computational algorithms), working knowledge of Bioinformatics software and resources and practical programming skills.

Learning Objectives: Students will
   • Master and apply computational algorithms for biological research
   • Use modern biological software applications for analyzing molecular sequence data
   • Learn fundamental programming concepts
   • Gain basic programming skills useful for analyzing biological data

General Course Overview
This course is designed for biology students who wish to quickly develop practical Bioinformatics skills relevant to biological studies, with an emphasis on biological sequence analysis. This course includes hands-on learning in a lecture/lab format. The first part of each class will include a short lecture (30-45 minutes) on Bioinformatics concepts or programming language basics. The rest of the class will then be spent practicing on the computer. The professor will be available during the lab time to provide additional instruction and help students debug their code during the completion of in-class exercises or class projects. Students will also be encouraged to help one another with concepts and exercises.
Grading Range

A: 93-100%
A-: 90-92%
B+: 88-89%
B: 83-87%
B-: 80-82%
C+: 78-79%
C: 73-77%
C-: 70-72%
D+: 68-69%
D: 60-67%
F: >=59%

Grades are rounded to the nearest percent.

There will be two parts to the course:

**Part 1**: Bioinformatics Tools and Concepts
**Part 2**: Useful Programming skills for biologists

**Part 1** of the course will cover *ESSENTIAL TOOLS* for biologists, including:

- **National Center for Biotechnology Information Resources**: Pubmed, BLAST, PSI-BLAST, Entrez, Genomics, Sequence Databases, Sequin
- **Sequence Manipulation, Sequence Alignments, Phylogenetics**: CLUSTAL W, BioEdit, PAUP*, Phylip, Mr. Bayes, Arlequin, Treeview
- **Modelling Software, Protein & RNA**: Protein Explorer, MFOLD RNA structure prediction

**Part 2** of the course will cover *USEFUL PROGRAMMING SKILLS* for biologists.

This second part of the course will introduce programming concepts and teach them in the easy-to-learn *Python programming language* used heavily in Bioinformatics.

**NO BACKGROUND IN PROGRAMMING NECESSARY!**

Assuming no prior programming experience, the course will teach programming skills and tasks handy to biologists in many fields. The focus will be on “parsing” sequence databases, but the course will cover other topics like crunching numbers and searching online databases.