Methods in Computational Biology and Bioinformatics

# Introduction

Computational biology is a field of which few are aware, despite the fact its impact can be felt across many fields. A person who works in the field of computational biology uses a variety of ideas from computer science, mathematics, and statistics to solve problems in the field of biology. Computational biologists are responsible for commercial genetics analysis such as 23 and Me, aiding in drug trials for substances we use every day, and much more.

But how computational biologists accomplish these tasks? That is what I hope to investigate throughout the course of my HNR 499 project. Throughout the semester, I will take a look at the diverse subfields of bioinformatics and computational biology and learn about the

A review which covers the many facets of the field has not yet been done. There exist plenty of introductory material for specific subfields within computational biology (i.e. functional genomics, epidemiological modeling, protein-protein interaction prediction, etc.) but none which seek to compare and contrast these subfields.

# **An Overview**

My aim for the semester is to investigate several of the subfields within computational biology by reading a relevant source—whether that be an article from a peer-reviewed journal, or a web page published by a course or lab at another university—and replicating what the authors have done. In this replication, I will seek to understand not only *what* the authors did, but *why* they did it, and how their methods can be further extended.

# The Final Goal

At the end of this project, my main goal is to have a breadth of knowledge of the computational biology field that spans across many distinct topics. Additionally, I aim to have an idea of the techniques I may use in my future as a student of computational biology.

The culmination of all my work will be a web page that will serve as a source of information for students like myself who are interested in becoming involved in computational biology or bioinformatics. The page will list and concisely explain potential research areas one could pursue within the field of computational biology. This web page will also provide links to relevant resources and articles (including the sources I read throughout the semester) that could aid an individual in their journey into the field.

# Sources

(citations for all of the papers

# Tentative Schedule

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| **Week of** | **Tasks/Due Dates** |
| Before Jan 8 | Prerequisite reading (Molecular biology primer, basic info on ML, HPC) |
| January 8th | Paper 1: |
| January 15th |  |
| January 22nd |  |
| February 5th |  |
| February 12th |  |
| February 19th |  |
| February 26th |  |
| March 5th |  |
| March 12th |  |
| March 19th |  |
| March 26th |  |
| April 2nd |  |
| April 9th | Student Scholar’s Day: Wednesday, April 11th  Project due Friday, April 13th for consideration for Honors College project awards |
| April 16th |  |
| April 23rd | Final Exams |