

## CAP 5515: COMPUTATIONAL MOLECULAR BIOLOGY

Time: Tuesday: 10:40am – 12:35pm & Thursday: 10:40am – 11:30am

Place: CSE, E122

Instructor: Dr. My T. Thai

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### Course Description:

This course emphasizes the design, analysis, and implementation of algorithms for problems motivated from molecular biology research. The course also provides some computational techniques, such as dynamic programming, Markov models, local search, and expectation-maximization as well as many optimization techniques. Topics discussed in this course include the following:

- Sequence Alignment, Multiple Sequence Alignment
- High-throughput screening
- Computational Genomics and Proteomics
- Phylogeny
- Protein Identification
- Genotype-Phenotype Association
- Structure Prediction

### Prerequisites:

There is no formal prerequisite for this class. However, students should have enough background in biology and algorithms.

### Textbooks:

Owing to the rapid evolution of the subject, there is no formal required book for this class. A collection of research related articles will be provided.

### *Recommended Textbooks:*

1. M.S. Waterman, *Introduction to Computational Biology: Maps, Sequences, and Genomes*, Chapman & Hall, 1995. ISBN: 0412993910
2. R. Durbin, S.R. Eddy, A. Krogh, and G. Mitchison, *Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids*, Cambridge University Press, 1998. ISBN: 0521629713
3. P.A. Pevzner, *Computational Molecular Biology: An Algorithmic Approach*, MIT Press, 2000. ISBN: 0262161974

### Grading and Approach:

1. At the beginning of the course, I will give several introductory lectures. Thereafter, students will read and present some important research papers assigned by me.
2. There will be no exams
3. There will be one project, which is assigned to you in the first month of the semester. At the end of the semester, you need to submit a written project report, the code (that you implement your solutions) and all the data you obtained.
4. The grades will depend on the following:
  - a. 20% on presentation
  - b. 30% on review reports
  - c. 50% on a final project