
BNF 5106 / BIOL 5515 BIOINFORMATICS

Course description

Major concepts and methods of bioinformatics. Topics may include, but are not limited to: genetics, statistics & probability theory, alignments, phylogenetics, genomics, data mining, protein structure, cell simulation and computing.

Textbook

Deonier RC, Tavaré S and Waterman MS. 2005. *Computational genome analysis*. Springer, New York. [availability: <http://www.springerlink.com/content/g71507/?p=b5409bac8d9f48b9968ac2dc14020fea&pi=0>]

Evaluation

Mini-review papers (two in total)⁽¹⁾: 40% (20% + 20%)

Research seminar⁽²⁾: 60%

1. Students will have to write two short reviews (one per half term; up to five pages plus one page of references) on an imposed topic extending the concepts covered in class.
2. Students will present a research seminar individually or by groups of twos. Research topics can be suggested, although students are encouraged to submit their own. A computational component is required.

Times & location

Mondays	01:00-02:30	Morisset Hall (MRT) 221.
Wednesdays	10:00-11:30	Cube (CBE) 202.

Coordinator

Dr Stéphane Aris-Brosou
30 Marie Curie Pr., Gendron 251
email: sarisbro@uottawa.ca
Ph: (613) 562 5800 x6354
Office hours: Fridays 2-5pm and appointments.

Syllabus

(Not contractual, subject to change without notice.)

Week	Lect.	Date	Topic	Instructor
1	1	Sep 9	- Introduction	Aris-Brosou
	2	Sep 14	- Basics of Genetics (organisms, central dogma, genetics code, promoters)	Drouin
2	3	Sep 16	- Overview of Statistics I (random variables, distributions, likelihood, conditional probability, estimation, testing)	Aris-Brosou
	4	Sep 21	- Overview of Statistics II (stochastic processes, inference for stochastic processes)	Aris-Brosou
3	5	Sep 23	- Pairwise alignments	Aris-Brosou
	6	Sep 28	- Pairwise alignments and database searches	Aris-Brosou
4	7	Sep 30	- Multiple sequence alignments [MSA]	Aris-Brosou
	8	Oct 5	- Application of MSA I: model-based phylogenies, likelihood	Aris-Brosou
5	9	Oct 7	- Application of MSA II: model-based phylogenies, Bayesian approaches	Aris-Brosou
	10	Oct 12	- <i>Thanksgiving - no class</i>	
6	11	Oct 14	- Genome rearrangement algorithms	Sankoff
	12	Oct 19	- Machine learning	Green
7	13	Oct 21	- Hidden Markov Models	Green
	14	Oct 26	- RNA structure prediction & motifs	Turcotte
8	15	Oct 28	- NO LECTURE: Dr. MELLO'S CONFERENCE	
	16	Nov 2	- RNA transcription and microarrays I	Aris-Brosou
9	17	Nov 4	- RNA transcription and microarrays II	Aris-Brosou
	18	Nov 9	- Introduction to text-mining	Aris-Brosou
10	19	Nov 11	- Protein structure prediction	Dumontier
	20	Nov 16	- Ontologies and the Semantic Web	Dumontier
11	21	Nov 18	- Empirical Bayes analysis of -omics data	Bickel
	22	Nov 23	- Course evaluation; Application of MSA III: MCMC samplers	Rodrigue
12	23	Nov 25	- High performance computing for bioinformatics	Dehne
	24	Nov 30	- Oral presentations*: TBA	
13	25	Dec 2	- Oral presentations*: TBA	
	26	Dec 7	- Oral presentations*: TBA	

*: presentations will last for 15 minutes each and will be followed by 5 minutes of discussion; remember to outline the biological question first, to provide the computational solution to a naive audience ("self contained" presentation) and to give preliminary results where applicable; you will need to discuss and provide evidence of a good understanding of the potential limits of your approach.

Final reports (research projects) due by Dec 9, 5pm. Submit PDF only, by email. Note: final submissions should be formatted as a research paper.