
BIO 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	SITE J0106.
Wednesdays	10:00-11:30	SITE J0106.

Coordinator

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

Syllabus

(Not contractual and subject to change without notice.)

Week	Lect.	Date	Topic	Instructor
1	1	Sep 8	- Introduction	Aris-Brosou
	2	Sep 10	- Basics of Genetics (organisms, central dogma, genetics code, promoters)	Drouin
2	3	Sep 15	- Overview of Statistics I (random variables, distributions, likelihood, conditional probability, estimation, testing)	Aris-Brosou
	4	Sep 17	- Overview of Statistics II (stochastic processes, inference for stochastic processes)	Aris-Brosou
3	5	Sep 22	- Pairwise alignments	Aris-Brosou
	6	Sep 24	- Pairwise alignments and database searches	Aris-Brosou
4	7	Sep 29	- Multiple sequence alignments [MSA]	Aris-Brosou
	8	Oct 1	- Application of MSA I: model-based phylogenies, likelihood	Aris-Brosou
5	9	Oct 6	- Application of MSA II: model-based phylogenies, Bayesian approaches	Aris-Brosou
	10	Oct 8	- Genome rearrangement algorithms	Sankoff
6	11	Oct 13	<i>Thanksgiving - no class</i>	
	12	Oct 15	- Machine learning	Green
7	13	Oct 20	- Hidden Markov Models	Green
	14	Oct 22	- RNA structure prediction & motifs	Turcotte
8	15	Oct 28	- Protein structure prediction	Dumontier**
	16	Oct 30	- Interactions and pathways	Dumontier*
9	17	Nov 6	- Bioinformatics of disease	Dumontier*
	18	Nov 5	- Introduction to text-mining	Aris-Brosou
10	19	Nov 10	- RNA transcription and microarrays I	Aris-Brosou
	20	Nov 12	- RNA transcription and microarrays II	Xiong
11	21	Nov 17	- Information-theoretic analysis of -omics data	Bickel
	22	Nov 19	- High performance computing for bioinformatics	Dehne
12	23	Nov 24	- Application of MSA III: MCMC samplers	Rodrigue
	24	Nov 26	- study break (research projects)	
13	25	Dec 1	- oral presentations: TBA	
	26	Dec 3	- oral presentations: TBA	

*: these lectures will take place in CAREG 107 (** will be in Gendron 282) at 2pm. Note that the dates are also nonstandard.

Final reports (research projects) due by Dec 8, 5pm. Submit PDF only, by email. Note: final submissions should be formatted as a research paper.