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. [ISBN-10: 0387987851; availability: `https://link.springer.com/book/10.1007/0-387-28807-4`]

Evaluation

Mini-review paper(1): 25%
Case study presentation(2): 50%
Case study evaluations(3): 25% (continuous; peer evaluation)

1. Students will write one short review (up to five pages plus one page of references) on an imposed topic, not covered in class.

2. Students will present one research seminar based on their thesis. A computational component is required.

3. Students write a 250-word abstract based on the case study presentation (two each week during second half of the term, except presenter; peer evaluated).

Times & location

Mondays	01:00-02:30	MS Teams / Zoom.
Wednesdays	11:30-01:00	MS Teams / Zoom.

Coordinator

Dr Stéphane Aris-Brosou
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Ph: (613) 562 5800 x6354
Office hours: by appointment only *via* MS Teams / Zoom.

Syllabus

(Not contractual, subject to change without notice.)

Week	Lect.	Date	Topic	Instructor
1	1	Sep 9	- Introduction	Aris-Brosou
2	2	Sep 14	- Basics of Genetics (organisms, central dogma, genetic codes, promoters)	Aris-Brosou
	3	Sep 16	- Overview of Statistics I (random variables, distributions, likelihood, conditional probability, estimation, testing)	Aris-Brosou
3	4	Sep 21	- Overview of Statistics II (stochastic processes, inference for stochastic processes)	Aris-Brosou
	5	Sep 23	- Pairwise alignments	Aris-Brosou
4	6	Sep 28	- Pairwise alignments and database searches	Aris-Brosou
	7	Sep 30	- Multiple sequence alignments [MSA]	Aris-Brosou
5	8	Oct 5	- Application of MSA I: model-based phylogenies, likelihood	Aris-Brosou
	9	Oct 7	- Application of MSA II: model-based phylogenies, Bayesian approaches	Aris-Brosou
6	10	Oct 12	- Application of MSA III: model-based phylogenies, clocks	Aris-Brosou
	11	Oct 14	- Hidden Markov models in bioinformatics	Aris-Brosou
7	12	Oct 19	- More machine learning in bioinformatics	Aris-Brosou
	13	Oct 21	- NGS for genomics and transcriptomics	Aris-Brosou
8	14	Oct 26	- *Study Week (no class)*	—
	15	Oct 28	- *Study Week (no class)*	—
9	16	Nov 2	- Case study‡: TBD	Aris-Brosou
	17	Nov 4	- Case study‡: TBD	Aris-Brosou
10	18	Nov 9	- Case study‡: TBD	Aris-Brosou
	19	Nov 11	- Case study‡: TBD	Aris-Brosou
11	20	Nov 16	- Case study‡: TBD	Aris-Brosou
	21	Nov 18	- Case study‡: TBD	Aris-Brosou
12	22	Nov 23	- Course evaluation; Case study‡: TBD	Aris-Brosou
	23	Nov 25	- Case study‡: TBD	Aris-Brosou
13	24	Nov 30	- Case study‡: TBD	Aris-Brosou
	25	Dec 2	- Case study‡: TBD	Aris-Brosou
14	26	Dec 7	- Case study‡: TBD	Aris-Brosou
	27	Dec 9	- Case study‡: TBD	Aris-Brosou

‡: **a 40-minute presentation is given by each student based on his / her thesis research topic, followed by a discussion**; remember to outline the biological question first, to provide the computational solution to a naïve 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. Following each presentation, non-presenter students write a 250-word summary (± 10%) that is evaluated by both presenter and course instructor.

Please also note:
`https://www.uottawa.ca/administration-and-governance/policies-and-regulations/regulation-on-bilingualism`
`https://www.uottawa.ca/vice-president-academic/academic-regulations-explained/academic-fraud`