GBIO0002 – Genetics and Bioinformatics

Montefiore Institute - Systems and Modeling

GIGA - Bioinformatics

ULg

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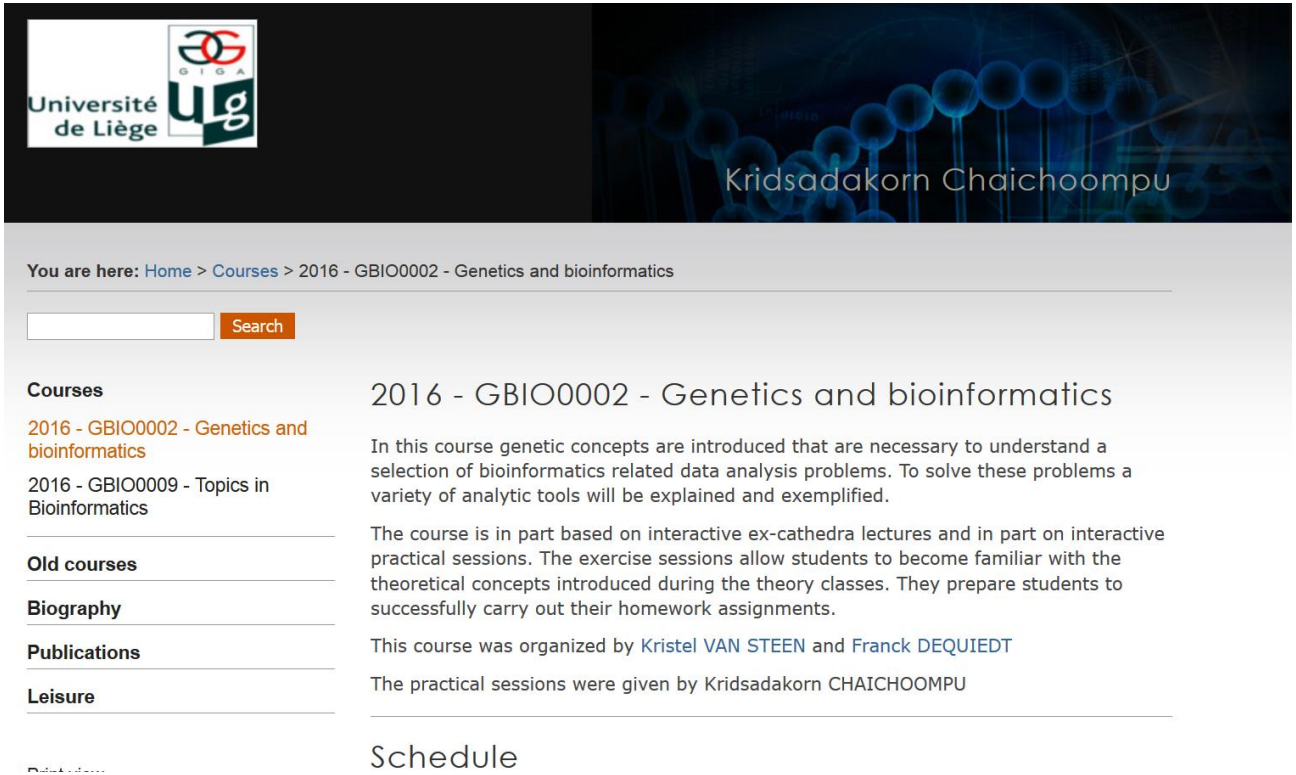
Administration

- Course website: http://www.montefiore.ulg.ac.be/~chaichoompu/CK/?Courses___2016_-_GBIO0002_-_Genetics_and_bioinformatics



Kristel Van Steen, PhD²

Home

CV (Long - Updated)

Synopsis of activities

Consultancy Charter

FNRS CR Rita Brandão

References

Links to affiliations

- ULg homepage
- Institut Montefiore
- GIGA-R
- Center for Medical Genetics Ghent (at UG)
- Center for Human Genetics (at K.U.Leuven)
- ----X Marie Curie ITN: Machine Learning for Personalized Medicine
- ----X Pancreas COST Action: An integrated European platform for pancreas cancer research: from basic science to clinical and public health

Contact Information

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http://www.montefiore.ulg.ac.be/~kvansteen/

Administration

- Course instructors

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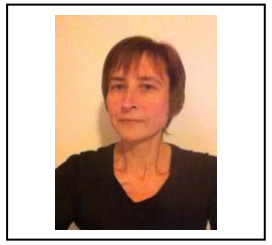

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Administration

- Tutor-student commitments (progcours.ulg.ac.be)

Activités d'apprentissage prévues et méthodes d'enseignement	Planned learning activities and teaching methods
Le cours est basé en partie sur des lectures interactives ex-cathedra et en partie sur des sessions pratiques interactives. Les sessions d'exercices permettent aux étudiants de se familiariser avec les concepts théoriques introduits pendant les cours théoriques. Ils préparent les étudiants à réaliser avec succès leurs 3 travaux à domicile. A propos des travaux à domicile, 2 types de travaux peuvent être présentés : 1) basé sur la littérature (i.e. discuter un article lié au sujet du cours; 2) un travail à domicile classique qui peut contenir un mélange de questions théoriques et des questions d'analyse de données. Les étudiants peuvent travailler en groupes. A la fin du cours, chaque groupe devrait avoir sélectionné chaque type de travail à domicile au moins une fois. Les travaux à domicile basés sur la littérature seront discutés en classe	The course is in part based on interactive ex-cathedra lectures and in part on interactive practical sessions. The exercise sessions allow students to become familiar with the theoretical concepts introduced during the theory classes. They prepare students to successfully carry out their 3 homework assignments. Regarding the homework assignments, two homework styles may be presented: 1) literature-based (i.e., discussing a paper related to the class topic); 2) a classic style homework which may involve a mix of theoretical questions and data analysis assignments. Students can work in groups. At the end of the course, each group should have selected each homework style at least once. The literature-based homeworks will be discussed in class.

What will we be doing?

- General course content

In this course genetic concepts are introduced that are necessary to understand a selection of bioinformatics related data analysis problems. To solve these problems a variety of analytic tools will be explained and exemplified. Different topics typically include:

  - The genome and genetic markers [genetics]
  - Genome-wide association studies [analytics]
  - Sequence technologies [genetics]
  - Sequence comparisons [analytics]
  - The transcriptome and proteome [genetics]
  - Random forests to uncover biological interactions [analytics]

What will we be doing?

- General course content
  - Genetics + Analytics
  - Focus on
    - Understanding key concepts / terminology and their context
    - Interpreting findings / analysis results

How will we do it?

"Theory" classes

- Course notes are primarily in English
- Main instructors: K Van Steen and F Dequiedt

- The "theory" course will be interactive in English/French:
  - In class discussion papers
  - Interpreting analysis findings: discussing different viewpoints
  - Slides as supporting framework ("syllabus")

How will we do it?

"Practical" classes

- "Homework assignments" constitute an important part of this class and make links to the theory and practical classes.
- Main tutor: K Chaichoompu
- Homeworks: 2 styles
  - Reading assignment with presentation and in-class discussions (graded)
  - Classic homework style (Questions / Answer) assignments (graded)
- Homework assignments result in a "group" report and should be handed in electronically in English (Q/A on genetics can be in French) (K Chaichoompu: step by step guide)
- See documentation on course website + next slide

Organization of GBIO0002 Homework Assignments
Genetics and Bioinformatics

- Form groups of 2-3 people: the same group for all assignments!
- Homeworks should be submitted via the available electronic submission system

Style 1: Literature project

This involves choosing a paper from the literature that extends or provides additional background on the material of the course (chapter) and then summarizing the paper, its objectives, results.

Do not copy the paper, but show you have understood the main ideas of the paper and "discuss" the paper. Such a discussion could include thoughts on what was the key idea, strengths or weaknesses of the methods/experiments, comments on the writing, ways to extend the work, flaws in the argument/data/experiments, etc. Anything is fine, as long as it demonstrates some real thought.

A selection of papers will be provided, but if you have another interesting paper to discuss, please send your suggestion to the TA. The course instructors will then decide whether the paper is eligible or not.

All literature projects will be presented and discussed in class. No report is needed. Only slides will do.

Style 2: Classic Q/A

Via representative questions, the idea is to further understand concepts provided in class. Occasionally, simulated or real-life data problems may be provided, that have been analyzed and for which the results require an interpretation. Use the material provided in class but be not afraid to consult the literature. As long as you can answer the given questions, everything is allowed. When you do use the literature, please provide references.

Please follow instructions in class, regarding how to draft your report.

General information regarding homework reports

Every homework assignment involves writing a short report of no more than the equivalent of 5 single-spaced typed pages of text, excluding figures, tables and bibliography. It should contain an abstract (e.g., depending on the homework style: description of the paper content, description of the problem) and a discussion part (see before). If citations are made to other papers, there should be a bibliography! Only one report per group is needed.

Evaluation

Homeworks count for 60% of your final score. Hence it is worthwhile to spend time on them…

Solutions will be provided to everyone, once the homeworks have been corrected. Opportunities will be created to discuss the homeworks in class or in private.

What will be evaluated?

Acquis d'apprentissage (objectifs d'apprentissage) de l'unité d'enseignement	Learning outcomes of the learning unit
A la fin du cours, les étudiants ont acquis une certaine connaissance de la génétique (en particulier les aspects relatifs à la génomique, la transcriptomique et les technologies utilisées) et d'une sélection d'outils analytiques de pointe tout en restant basiques. Les étudiants seront évalués sur des concepts clés liés à la génétique et les approches analytiques présentées pendant le cours. (en ce compris leurs avantages et désavantages, ainsi ques les contextes généraux).	At the end of the course, students have acquired knowledge about genetics (in particular genomics, transcriptomics, technology-related aspects) and about a selection of state-of-the-art, yet basic, analytic tools. Students will be evaluated about key concepts related to genetics and the analytic approaches presented during the course (incl. pros and cons, general contexts).

What will be evaluated?

- At the end of the course, you have acquired knowledge about **genetics** (in particular genomics, transcriptomics, technology-related aspects) and about a selection of state-of-the-art, yet basic, **analytic tools**.

- You will be evaluated about key concepts related to **genetics** and the analytic approaches presented during the course (incl. pros and cons, general contexts) and will be presented with a **few analysis results to interpret**.

How will be evaluated?

HW1		HW2		Written Exam	Presentation participation
Genetics	Analytics	Genetics	Analytics		
15	15	15	15	35	5

- No final grade without homeworks
- Homeworks not handed in in time: 0
- Written exam in January (terminology, basic analytic contexts, interpretation – see before; multiple choice + open questions; printed course notes as “open book”)

How will be evaluated?

Literature style homeworks

[homework = discuss a paper]

- Discuss the paper in your slides
- Make links
  - with other papers,
  - between the paper(s) and the course,
  - between the paper(s) and additional info outside the course

Evaluation criteria – presentation

Criterium	Key words
Clarity	Concepts, slides content, slides composition, fellow students do not have questions regarding “new” statements (i.e., not covered in class) made on the slides or during the presentation
Illustrations on slide	Not too much; not only copy and paste from course but novel illustrations; supportive
Presentation Skills	Eager beaver (a person who is very enthusiastic about doing something)
Understanding	Presentation content as presented is understood: adequate reply to questions and comments (incl. those from fellow students)
Group dynamics	Scoring will be done on an individual basis; balanced partitioning of tasks

Evaluation criteria – report

- Ability to formulate the research problem and to sketch the context (introductions, data description, tool description, etc)
- Presentation summary of the analysis workflow (methods, analysis section)
- Discussion (of the analysis tools, of the quality of the analysis, validity of results – when put in a broader context, …)
- Creative input (stuffing, conclusion section)
- General structure of the report (sectioning)

Tentative course layout

[changes will be communicated via the course website]~

Genetics and bioinformatics (room R21, B28)							
2016							
Sep-20		KVS	Intro, organization, pace*				
Sep-27		FD	Genetics				
Oct-04		KC	Tutorial population stratification			HW1 FD	
Oct-11		KVS	GWAs			HW1 KVS	
		KVS	How to present? Report?				
Oct-18		KC	Q/A				
Oct-25		FD	DNA-Seq			HW1 FD	
Nov-08		ALL	Presentation association studies			due HW1 (for the paper assignment)	
Nov-15		KVS	Sequence analysis - rare variants				
Nov-22		FD	Gene expression			HW2 FD	
Nov-29		FA	Basic tutorial interactions			HW2 KVS	
Dec-06		ALL	Q&A				
Dec-13		ALL	Presentations networks and inte			due HW2 (for the paper assignment)	

Questions?