

Genome Analysis (I002616)

Cursusomvang *(nominale waarden; effectieve waarden kunnen verschillen per opleiding)*

Studiepunten 5.0 **Studietijd 150 u**

Aanbodsessies in academiejaar 2023-2024

A (semester 2) Engels Gent

Lesgevers in academiejaar 2023-2024

De Meyer, Tim LA26 Verantwoordelijk lesgever

Aangeboden in onderstaande opleidingen in 2023-2024

	stptn	aanbodsessie
Master of Science in Bioscience Engineering: Cell and Gene Biotechnology	5	A
Uitwisselingsprogramma bio-ingenieurswetenschappen: cel- en genbiotechnologie (niveau master-na-bachelor)	5	A

Onderwijstalen

Engels

Trefwoorden

Genome analysis, high-throughput data analysis, omics, next-generation sequencing, microarrays, RNA-seq

Situering

Many recent methods in molecular biology generate huge amounts of data. This course aims at familiarizing students with these data, how to process and statistically analyze them using state-of-the-art methods, and where/how to find or deposit this type of data. Ethical implications, including scientific integrity and sustainability, are discussed. We'll particularly focus on transcriptomics data for in depth analysis (both in theory and practical sessions), yet we'll also touch upon several other omics techniques, data types and analytical considerations.

Inhoud

The following methods and concepts will be discussed and illustrated for common omics data, such as microarrays, RNA-seq, ChIP-seq, bisulfite sequencing, single-cell methods, ...

- Omics data repositories and databases, ethical considerations/sustainability
- Multiple hypothesis testing: family-wise error rate / false discovery rate
- Data preprocessing for omics data: alignment (conceptual), background correction, summarization, data normalization, quality control
- Relevant data formats, bv. FASTQ, GTF/GFF, SAM/BAM, ...
- Moderated statistical methods for hypothesis testing
- Gene set analysis / pathway analysis
- Evolution of omics technologies and their (dis)advantages for specific applications
- Capita selecta (may vary from year to year): bulk-seggregant analysis, GWAS, data integration and visualization, genotyping

The course focuses on conceptual insight in concrete problems and solutions and their application rather than the statistical/mathematical/software implementation.

Begincompetenties

Genetics and molecular biology, solid knowledge of basic data analytical methods (e.g. ANOVA, regression, GLM, PCA)

Eindcompetenties

- 1 able to find relevant omics datasets
- 2 able to solve common research questions with appropriate data-analytical methods, using the R and Bioconductor software environment
- 3 have basic insight in several important methods for preprocessing and analysis of omics

datasets

4 have insight in different omics technologies and their (dis)advantages, also from an ethical point of view

5 report scientifically on omics data analysis

6 work in a team in a constructive and responsible manner

Creditcontractvoorwaarde

Toelating tot dit opleidingsonderdeel via creditcontract is mogelijk mits gunstige beoordeling van de competenties

Examencontractvoorwaarde

Dit opleidingsonderdeel kan niet via examencontract gevolgd worden

Didactische werkvormen

Groepswerk, Werkcollege, Hoorcollege

Toelichtingen bij de didactische werkvormen

Online teaching methods only as back up, cf. COVID19 measures.

Leermateriaal

Annotated slides, scientific papers

Referenties

Vakinhoudelijke studiebegeleiding

During the practical sessions in the PC classes, the students are coached by an assistant. Q&A sessions are organized to solve practical problems with the assignment. For non-assignment related questions, students may communicate with the lecturer/assistant by E-mail, which may lead to an appointment if required.

Evaluatiemomenten

periodegebonden en niet-periodegebonden evaluatie

Evaluatievormen bij periodegebonden evaluatie in de eerste examenperiode

Schriftelijke evaluatie open boek

Evaluatievormen bij periodegebonden evaluatie in de tweede examenperiode

Schriftelijke evaluatie open boek

Evaluatievormen bij niet-periodegebonden evaluatie

Mondelinge evaluatie, Peer en/of self assessment, Werkstuk

Tweede examenkans in geval van niet-periodegebonden evaluatie

Examen in de tweede examenperiode is mogelijk

Toelichtingen bij de evaluatievormen

The final examination consists of a written examination (open book). Most of the questions aim to assess the insight of the student in omics data-analysis and how this results in conclusions. The assignment relates to a real life problem and students may work together in groups. The result of the assignment will be reported by means of a written report and a presentation, upon which both results and used methods will be further discussed ("oral examination"). Depending on the group size, peer-evaluation may be used. This may lead to a score modification of at most two points for the assignment, unless a student did clearly insufficiently contribute (should be reported by fellow group members during semester), in which case a more severe penalty is possible.

Eindscoreberekening

The total mark is a weighted average of:

- Assignment (12/20)

- Open book examination (8/20)