

MASTER OF SCIENCE IN BIOINFORMATICS

MAIN SUBJECTS: BIOSCIENCE ENGINEERING · SYSTEMS BIOLOGY · ENGINEERING

Jointly offered by three faculties of Ghent University: Faculty of Sciences / Bioscience Engineering / Engineering and Architecture

120 ECTS CREDITS – LANGUAGE: ENGLISH – DEGREE: MASTER OF SCIENCE

COURSE CONTENT

Recent technological advances have dramatically changed our view on life science research and have turned biology in a data-driven science. It is in this context that bioinformatics, a booming interdisciplinary field, has evolved from a new research domain to a basic discipline in only 15 years. Bioinformatics aims at gaining a better and preferentially more quantitative molecular understanding of cellular processes by integrating and modeling large amounts of molecular data.

Therefore, if ...

- you like problem solving through data analysis and data mining,
- you are intrigued by understanding and modeling complex biological processes,
- you want to make biological discoveries by decoding big data,
- you like working in an interdisciplinary environment

... then bioinformatics is something for you.

As a bioinformatician you will become an interdisciplinary scientist or engineer who can develop or use state-of-the-art statistical and computer science techniques to mine molecular data in order to answer fundamental or applied biological and biomedical questions. Ghent University offers an interfaculty Master of Science in Bioinformatics programme, which - depending on the chosen track - can result in an Engineering or Bioscience Engineering degree.

The programme

- offers a track tuned toward your specific interests and background that prepares you for different job profiles in the bioinformatics domain (respectively bioinformatics scientist and bioinformatics engineer);
- offers both theoretical deepening and data analytical/problem solving skills;
- is embedded in a strong bioinformatics and biotechnology research environment, located at the Faculty of Sciences, Medicine, Bioscience Engineering and Engineering and Architecture and is affiliated with the VIB and IMEC.

COURSE STRUCTURE

> Master of Science in Bioinformatics: Engineering

With a bachelor degree in Engineering or Computer Science, you have the optimal background to become a bioinformatics engineer.

As bioinformatics engineer, you are skilled in developing new algorithms and complex software implementations, primarily focusing on, but equally applicable outside the bioinformatics domain. You will follow a module of 'biologically oriented' courses (9 credits) that will provide you with the basic domain knowledge to understand a data-driven biological problem. However, the major part of your curriculum (engineering module of 42 credits) will focus on advanced engineering and computer science techniques that elaborate on an already advanced knowledge obtained during your bachelor. The applied bioinformatics module (33 credits) will make you familiar with the data specificities of the bioinformatics domain (preprocessing techniques, noise and potential biases, assumptions etc.) and allow you to acquire the essential interdisciplinary skill set that is needed to be successful in modern science and engineering. The master thesis corresponds to 30 credits and focuses on a research topic. Within your programme, you have the opportunity to do an internship in order to become familiar with the role and expectations of a bioinformatics engineer in the industry or a governmental institution.

> Master of Science in Bioinformatics: Systems Biology / Master of Science in Bioinformatics: Bioscience Engineering

With a bachelor degree in Biochemistry and Molecular Biology or in Bioscience Engineering, you can decide to become a bioinformatics scientist/bioengineer.

A bioinformatics scientist applies (bio)informatics tools and techniques to understand a biological system or to solve an innovative research question. You are trained as a problem solver who can creatively and efficiently combine bioinformatics tools and algorithms to analyse, integrate and model data. Having the essential programming and data analysis skills requires a deep understanding of statistics, programming and data analytical techniques (applied mathematics and informatics module of 21 credits). The applied bioinformatics module (33 credits) will make you familiar with the basic data analytical methods (e.g. NGS analysis), help you to acquire interdisciplinary skill sets and illustrate how theoretical concepts of statistics and data mining are used to build bioinformatics tools.

The difference between the Bioscience Engineering and the Systems Biology track is that the former deepens the engineering skills (Bioscience Engineering track of 27 credits), whereas the Systems Biology track (30 credits) pays more attention to advanced (systems) biological knowledge. The master thesis corresponds to 30 credits and focuses on a research topic. Within your programme, you have the opportunity to do an internship in order to get familiar with the role and expectations of a bioinformatics scientist in the industry or a governmental institution.

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CAREER PERSPECTIVES

Technological advances have turned biology in a data-driven science. The avalanche of molecular data enables key discoveries in biology, ecology and molecular evolution, drives innovation in biotech and pharma industry and supports medical and governmental decision making.

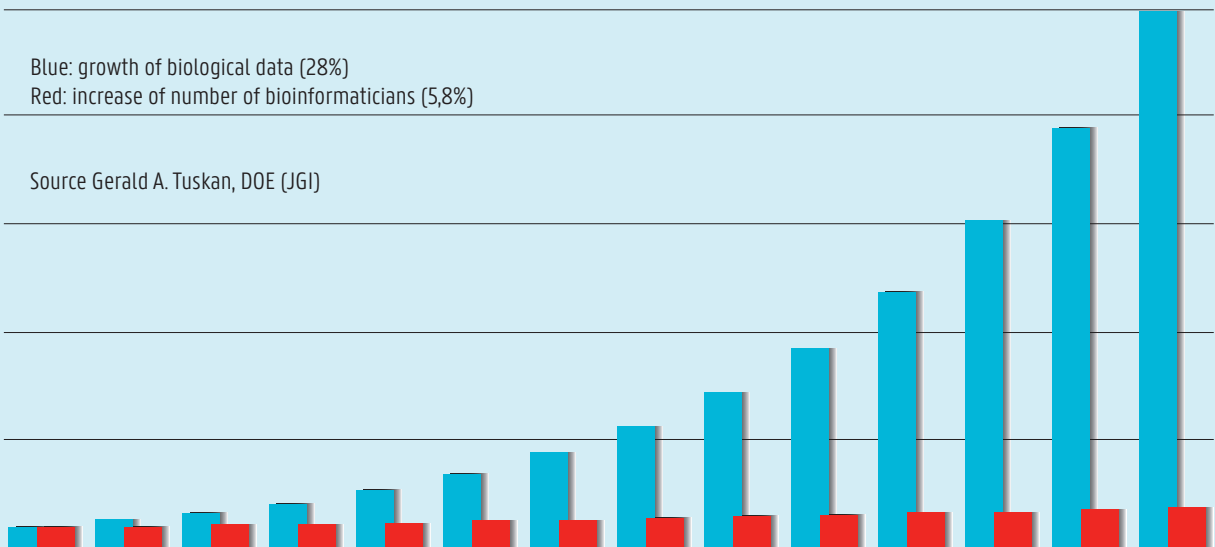
However, the power of using these data for innovation depends on interdisciplinary skills to analyse, integrate and interpret the data. There is thus an urgent need for bioinformatics scientists and engineers with an interdisciplinary mind set. Currently a large discrepancy exists between the exponential increase of biological data (28% each year) and the number of newly educated bioinformaticians (increase of only 5,8%) who typically find a job in agro, biotech and pharma industry, in research and governmental institutes, and in genetic centra and hospitals. Because of their interdisciplinary and analytical skill sets bioinformaticians also find their way in consultancy, in spin offs and in data analytics.

Need for bioinformaticians

Blue: growth of biological data (28%)

Red: increase of number of bioinformaticians (5,8%)

Source Gerald A. Tuskan, DOE (JGI)



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TOELATINGSVOORWAARDEN TOT AFSTUDEERRICHTING BIOSCIENCE ENGINEERING VOOR HOUDERS VAN EEN VLAAMS DIPLOMA

Rechtstreeks:

- Ba bio-ingenieurswetenschappen
- Ba biochemie en biotechnologie

Via uitgebreid voorbereidingsprogramma:

- Ba biologie
- Ba chemie
- Ba biomedische wetenschappen
- Ba informatica
- Ba computerwetenschappen
- Ba ingenieurswetenschappen (alle)
- Ba/Ma biowetenschappen
- Ba/Ma industriële wetenschappen: biochemie/chemie/
milieukunde

TAAL

Je voldoet aan de taalvoorwaarden op basis van je Vlaams diploma.

TOELATINGSVOORWAARDEN TOT AFSTUDEERRICHTING SYSTEMS BIOLOGY VOOR HOUDERS VAN EEN VLAAMS DIPLOMA

Rechtstreeks:

- Ba biochemie en biotechnologie
- Ba bio-ingenieurswetenschappen (afstudeerrichting cel- en
genbiotechnologie of zwaartepunt 'cel- en gentechnologie')
- Ba Molecular Biotechnology (GUGC Korea)

Via voorbereidingsprogramma:

- Ba bio-ingenieurswetenschappen (andere dan vermeld bij
rechtstreeks)
- Ba biologie
- Ba chemie
- Ba biomedische wetenschappen
- Ba geneeskunde
- Ba wiskunde
- Ba fysica en sterrenkunde
- Ba informatica
- Ba computerwetenschappen
- Ba ingenieurswetenschappen (alle)
- Ba/Ma biowetenschappen
- Ba/Ma industriële wetenschappen: biochemie/chemie/
milieukunde

Via schakelprogramma:

- Ba biomedische laboratoriumtechnologie, afstudeerrichting:
farmaceutische en biologische laboratoriumtechnologie
- Ba chemie, afstudeerrichting chemie
- Ba chemie, afstudeerrichting biochemie
- Ba bioinformatica (Ba-na-Ba)

TAAL

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TOELATINGSVOORWAARDEN TOT AFSTUDEERRICHTING ENGINEERING VOOR HOUDERS VAN EEN VLAAMS DIPLOMA

Rechtstreeks:

- Ba ingenieurswetenschappen: computerwetenschappen
- Ba informatica
- Ba computerwetenschappen

Rechtstreeks: (naar brugprogramma - 120 studiepunten)

- Ma industriële wetenschappen: elektronica-ICT, afstudeerrichting
ICT of MIT
- Ma industriële wetenschappen: informatica
opleiding(en) oude structuur:
 - industrieel ingenieur elektronica, optie: ICT
 - industrieel ingenieur informatica
 - industrieel ingenieur bouwkunde

Via voorbereidingsprogramma:

- Ba ingenieurswetenschappen: elektrotechniek
- Ba wiskunde (enkel indien minor informatica of minor
biowetenschappen)
- Ba biochemie en biotechnologie
- Ba bio-ingenieurswetenschappen

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PRAKTISCHE INFORMATIE

Studieprogramma:

<https://studiegids.ugent.be>

> faculteiten > opleidingstypes > ga naar de opleiding van je keuze

Infomomenten

Masterbeurs

www.ugent.be/masterbeurs

Contact

Ghent University

Prof. dr. Kathleen Marchal - kathleen.marchal@intec.ugent.be

www.bign2n.ugent.be/master

Meer info

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ADMISSION REQUIREMENTS FOR INTERNATIONAL DEGREE STUDENTS

Diploma equivalence of international bachelor's degree students will be checked by the OC on the base of their individual dossier.

LANGUAGE

More information regarding the required knowledge of English:
www.ugent.be/specificlanguage

PRACTICAL INFORMATION

Study programme:

www.ugent.be/coursecatalogue
> by Faculty > Programme types > select your programme

Application deadline

- for students who need a visa: 1st of March
 - for students who do not need a visa: 1st of June
- www.ugent.be/deadline

Enrolling institution

Ghent University

Tuition fee

More information is to be found on:
www.ugent.be/tuitionfee

Contact

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