



Exchange programme Vrije Universiteit Amsterdam

Vrije Universiteit Amsterdam - Exchange programme Vrije Universiteit Amsterdam - 2024-2025

Exchange

Vrije Universiteit Amsterdam offers many English-taught courses in a variety of subjects, ranging from arts & culture and social sciences, neurosciences and computer science, to economics and business administration.

The International Office is responsible for course approval and course registration for exchange students. For details about course registration, requirements, credits, semesters and so on, please [visit the exchange programmes webpages](#).

Big Data in Biomedical Sciences

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| Course Code | AB_1256 |
| Credits | 6 |
| Period | P5 |
| Course Level | 200 |
| Language Of Tuition | English |
| Faculty | Faculty of Science |
| Course Coordinator | prof. dr. M.P. van den Heuvel |
| Examiner | prof. dr. M.P. van den Heuvel |
| Teaching Staff | prof. dr. M.P. van den Heuvel, prof. dr. D. Posthuma |
| Teaching method(s) | Seminar, Lecture, Computer lab, Study Group |

Course Objective

We are witnessing a rapid expansion of genetic, neuro- and biomedical data and the application of all this data to medical science. Being able to analyse all this data is becoming a new challenge in the field. In this course we will discuss developments in the field of "big data" analysis, discussing several techniques to analyse large datasets, discuss different forms of big data in the field of biomedical and neurosciences, and discuss general principles of data analysis.

The goal of this course is to get you familiar with some of the core principles of Data analysis techniques. We will go over different data analysis techniques by means of examples of big data in the field of neurosciences. We will familiarise you with the general elements of (Big) Data analysis, get you up to speed with ongoing revolutions in the field of big neuro, genetic, and biomedical data, and familiarise you with key techniques used in (big) data field. The course contains 3 core elements of Big Data in Biomedical Sciences. These elements are mixed through out the course and include:

- Principles of Big Data analysis
- Big Data types in neuroscience
- Data analysis techniques

Learning objectives of the course include:

- Students will learn how various types of biomedical and neuroscience data are acquired, how they can be analysed using Data Analysis methods and used in fundamental and translational research in disease. A focus will be on neuroscience data, including genetics, transcriptomics, proteomics and connectomics.
- Students will learn 'how-to' knowledge about how to work with raw vs structured data, merging and integration of datasets, statistics for big data, graph analytics, exploratory data analysis and predictive analytics.
- Students will have knowledge of principles on how to share and post data and coding.
- Student will understand the value of accurate and understandable metadata, computer programming and how to share data and scripts with others.
- Students oversee the potential and current challenges of big data applications in genetics, neuroscience, connectomics and transcriptomics.
- Students have hands-on experience with programming algorithms for data analysis or other bio- and neuroinformatics analyses.
- Students will have basic knowledge about strategies for big data data storage and processing
- Students have sufficient insight into bio- and neuroinformatics data workflows, possibilities and limitations to effectively communicate with neuro-informaticians.
- Students can independently collect up-to-date knowledge on the above topics ('metalearning').
- Students will learn how to communicate Data Analytic findings by means of a data science report.

Course Content

This elective addresses important concepts in bio- and neuroinformatics and big data analysis, with powerful applications in neurosciences. Lectures and practical assignments provide theory and hands-on experience in fast-moving fields of exploratory, graph and predictive data analytics, neuroscience, connectomics and metagenomics.

Additional Information Teaching Methods

Each week the course will offer lectures (8 weeks, 4hs per week) and computer practicals (8 weeks, 4hs per week + 4 hrs self-study). Expect to spend approximately 100 h on self-study and working on the computer assignments and student data report throughout the course.

Method of Assessment

- The knowledge in the lectures will be tested by a written exam with open and/or MC questions held at the end of the course.
- During the computer practical assignments the student will build a Data Report. The criteria for grading of the Data Report will be made accessible in the form of a RUBRIC, which will be published on Canvas.
- The final grade will be calculated as 50% (final exam) and 50% (Data Report).
- To pass the course, both the exam and assignments need to be graded 5.5 or higher.

Entry Requirements

This course is a course on Data Analytics and Big Data. The course consist for 50% about computer assignments, which involve computer programming. The programming language during the course will be MATLAB. These computer practicals assume previous basic experience with programming (knowledge about MATLAB and general programming and/other languages (Python, C++, Java) is highly recommended). Students should otherwise have a high affinity with programming, and willing and be highly motivated to invest (a number of) extra hours before and in the first weeks of the course to come up to speed with MATLAB and general programming. To help the student, BEFORE the course the course guide will provide links for online tutorials of MATLAB as well as two computer practicals to practice before the course (practicals will be discussed in detail in the first weeks) and test the skill levels.

Literature

Please see instructions on Canvas

Additional Information Target Audience

Accessible to the BSc Biomedical Sciences or the BSc Health & Life (see Requirements/Vereiste Voorkennis).

Additional Information

This elective is related to the learning track Bioinformatics.

It is highly recommended in preparation for the following minors:

Bioinformatics & Systems Biology,

Personalized Medicine,

Neurosciences,|

Research minor: Science in Medicine.

Explanation Canvas

The up-to-date course schedule will be available on Canvas

Recommended background knowledge

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