



Exchange programme Vrije Universiteit

Vrije Universiteit Amsterdam - Exchange programme Vrije Universiteit - 2022-2023

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 Sustainability Science

Course Code	AB_1288
Credits	6.00
Period	P4
Course Level	300
Language Of Tuition	English
Faculty	Faculty of Science
Course Coordinator	dr. E.E. Koks
Examiner	dr. E.E. Koks
Teaching Staff	dr. T.A. Pupo West, dr. E.E. Koks
Teaching method(s)	Study Group, Lecture, Computer lab

Course Objective

The key objectives of this course are:

to know how and when big data can be used to solve sustainability problems.

to gain a better understanding of methods and tools to analyze big data.

Course Content

Data is everywhere around us. But how can we make use of all this data to answer questions in sustainability sciences? How can twitter data help us to understand where and how severe people are affected by droughts? Or how can we use satellite data to understand how wildfires affect us?

In the course Big Data in Sustainability Science, students will learn the tools and knowledge to work with large datasets that are widely used within sustainability sciences. This ranges from machine-learning approaches to identify objects on satellite images, to working with international supply-chain data to understand global patterns in food, energy and material use.

The course is structured around six main data types and related methods. Specifically, we will:

(i) explore census data and use machine-learning methods to fill data gaps in data-scarce environments;

(ii) recognize objects on satellite imagery through deep-learning methods;

(iii) better understand how wildfires affect us using remote sensing data;

(iv) re-structure and analyze global shipping data to understand patterns in global trade;

(v) apply visualization methods to understand patterns in global supply chain data

(vi) apply natural language processing techniques to identify the occurrence of droughts through social media data

In the first week, we will provide a crash course in Python that will be used throughout the remainder of the course. Students are not expected to have any prior knowledge in Python before this course.

Additional Information Teaching Methods

This course will be a combination of lectures and tutorials. Each week will consist of an introductory lecture to the method and/or data type that will be applied and/or analyzed in that particular week. During the introductory lecture, students will gain the required theoretical

knowledge to apply the methods during the tutorial. The tutorial each week will be a half-day computer practical in which students will develop the skills and knowledge to work with the method and/or data-type through a hands-on assignment.

Method of Assessment

There will be six weekly assignments and a multiple-choice exam in the final week. The weekly assignments will account for 60% of the grade (10% per week), and the final exam will account for 40% of the grade. The weekly assignments will be made in groups of two, whereas the final exam will be individual.

Students must pass both elements (5.5 or higher).

Entry Requirements

There are no specific requirements, besides enrollment in the BSc Aarde, Economie & Duurzaamheid or another BSc for which the course is a possible elective.

Literature

Readings for each week are specified in the Canvas page. They consist of book chapters and papers, and aim to give you a broad understanding of the use of big data for sustainability sciences. It is very advisable to familiarize with the readers before the lecture. This helps you to actively engage in discussions during our meetings, to think of the questions you want to ask the lecturer, and also makes it easier to prepare for the final exam. The main notions of the readings can be tested at the exam. Some items are specified as "background reading", and they are meant as suggestions to explore specific subjects in higher detail. All readings are either freely available online from university computers and from home by using the VU proxy server, or are uploaded to Canvas.