Data Science and Machine Learning in Python

Virtual international collaborative course offering between March to July 2022

Prof. Dr. Stephan Weyers

INDU TWIN Bachelor Program

Fachhochschule Dortmund
University of Applied Sciences and Arts

Background

This course is part of InduTwin funded by DAAD. The goal of this project is to establish and extend double degree agreements in the fields of Business Management, Engineering and Computer Science between FH Dortmund and partner universities in Latin America and China.

Students of the bachelor study programs International Business, Betriebswirtschaft and Betriebswirtschaftliche Logistik at FH Dortmund are invited to choose this course as an elective.

Students from the InduTwin partner universities UGTO Guanajuato, UTTEC Tecamac, UBA Buenos Aires, UDEM Medellin, Universidad de Valparaiso, and ESAN Lima are invited to participate in this course. Please apply at your International Office or via the InduTwin contact persons of your university. You can receive a certificate of attendance and a transcript of records. Whether or not this course can be acknowledged at your home university is out of the responsibility of FH Dortmund.

The main focus of this course is on collaborative case study work in international student teams. You will get to know people from other countries and continents and work together with them on realistic Data Science tasks.

Organization

Lectures

- Tuesdays between March 29th, 2022, and June 28th, 2022
- 14:30-19:20 German local time (CEST/UTC+2)
- German students can attend classes on-site, if pandemic situation allows
- International students attend lectures online (hybrid setup)
- Very interactive including break-out rooms in small groups
- Course language: English

Preparation and teamwork

- Self learning in preparation of lectures expected (DataCamp courses and textbooks)
- Weekly assignments
- Self organized collaboration in international student teams outside of classroom
- Students are recommended to start individual preparation mid of March 2022
- Deadline for last team assignment until mid of July 2022

Course Materials

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Preparation and course material

- Google Colaboratory (free Google account required)
  https://colab.research.google.com/
- Optional: Jupyter Notebook
  https://www.anaconda.com/products/individual
- Textbooks (available in library of FH Dortmund, partner students to check own libraries)
  - McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython. O'Reilly Media.
    https://ebookcentral.proquest.com/lib/fh-dortmund/detail.action?docID=5061179
  - Müller, A. C., & Guido, S. (2016). Introduction to machine learning with Python. O'Reilly Media.
    http://ebookcentral.proquest.com/lib/fh-dortmund/detail.action?docID=4698164
- Courses on DataCamp.com (free access available for participants between Mar-Aug 2022)
  - Introduction to Python https://learn.datacamp.com/courses/intro-to-python-for-data-science
  - Intermediate Python https://learn.datacamp.com/courses/intermediate-python
  - Supervised learning https://learn.datacamp.com/courses/supervised-learning-with-scikit-learn
  - Unsupervised learning https://learn.datacamp.com/courses/unsupervised-learning-in-python
- ILIAS learning platform at FH Dortmund (registration via TAN for partner students)

Syllabus

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Part 1: Data Science Basics

	Date	Topics covered
1	Mar 29th	How to use Google Colaboratory Python types and lists
2	Apr 5th	Loops, if/else, functions Tuples, lists, dictionaries
3	Apr 12th	Numpy basics and operations Image processing
4	Apr 26th	Pandas Series, DataFrame Import/export files
5	May 3rd	Principles of data visualization Data cleaning and preparation Join, combine and reshape data
6	May 10th	Data visualization in Python How to write Data Science reports Data aggregation and grouping

Part 2: Machine Learning

	Date	Topics covered
7	May 24th	(Un-)supervised learning in scikit-learn k-Nearest Neighbors Linear regression (ridge and lasso)
8	May 31st	Linear classification models Ensembles of decision trees
9	Jun 7th	Kernel support vector machines Neural networks
10	Jun 14th	Preprocessing and scaling Dimensionality reduction Principal component analysis
11	Jun 21st	k-means, hierarchical clustering, DBSCAN
12	Jun 28th	Representing data, engineering features Model evaluation and improvement Text data analysis

Use Cases (selection)

- Market Basket Analysis
- Inventory analytics
- Motor insurance dataset
- World development indicators
- Customer Churn Prediction
- Social Irresponsibility Survey
- Happiness dataset
- Fraud Detection

Workload and Grading

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Workload

- Total expected workload: 10 ECTS / 200-300 hours
- Part 1: Introduction to Data Science with Python (5 ECTS / 100-150 hours)
- Part 2: Machine Learning with Python (5 ECTS / 100-150 hours)
- https://ec.europa.eu/education/resources-and-tools/european-credit-transfer-and-accumulation-system-ects_en

Grading

- 10% Self-study courses on DataCamp.com
- 40% Individual assignments
- 50% Team case studies

Prerequisites

This course is designed for Bachelor students in the field of Business and Management. However, students of other disciplines like Engineering and Computer Science are very welcome. Data Science is interdisciplinary and can be applied to many different types of problems.

Participants are expected to have basic knowledge in Mathematics, Statistics and Microsoft Excel.

Some pre-knowledge in programming is recommended. Although the course starts from scratch, quite a lot of topics will be covered in a relatively small amount of time. If you don’t have any pre-experience in programming, you can still take part and can be very successful, but you should expect a high workload. It is definitely helpful to already start with the DataCamp courses before the first lecture. All materials and detailled information will be provided well in advance.

Student Feedback 2021

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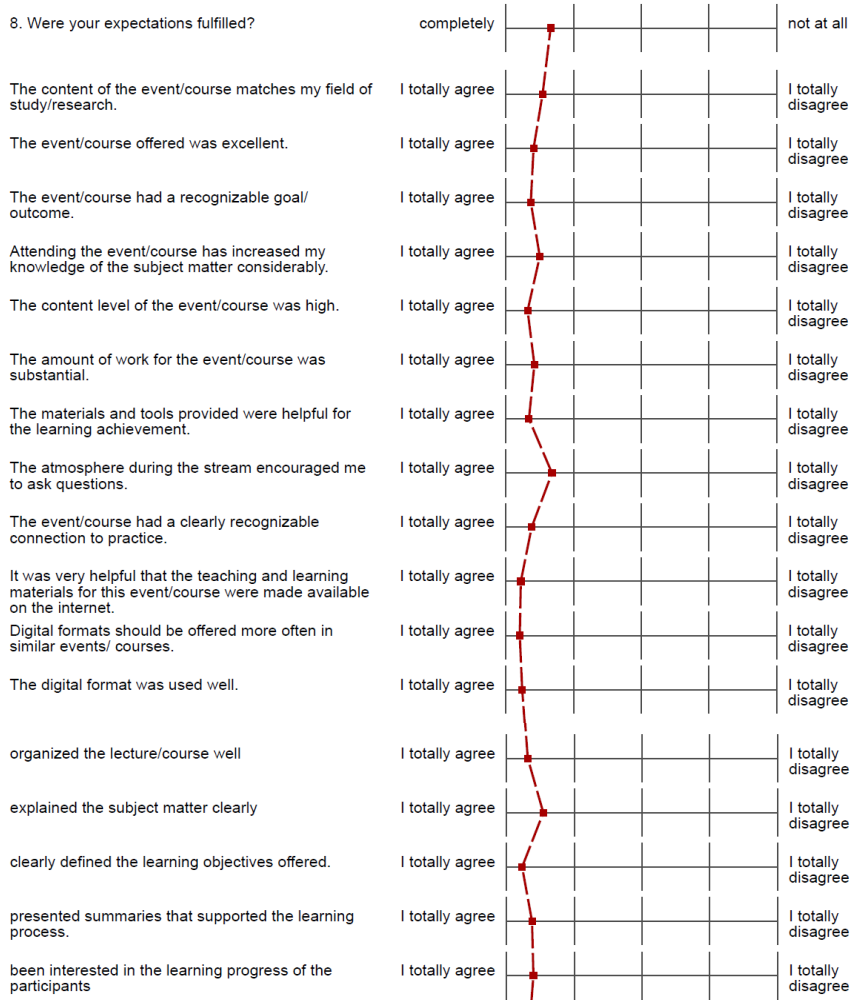

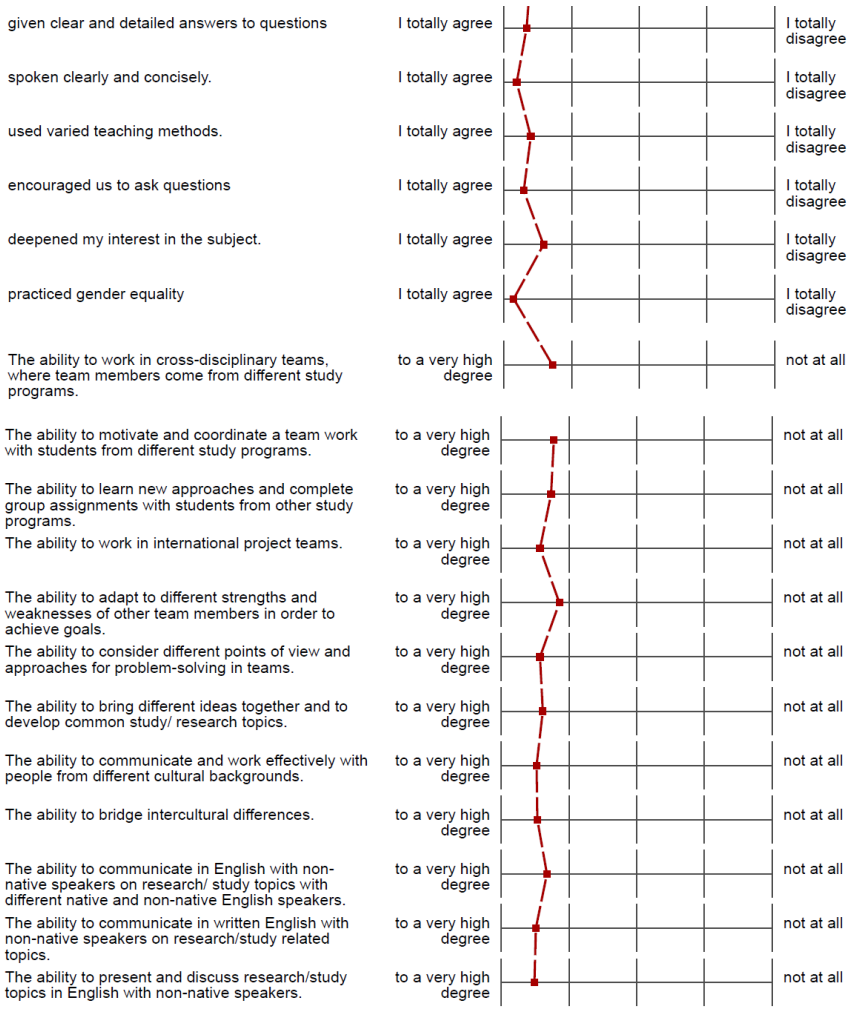

Lecturer and Registration

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Registration deadline and selection process

Students from Dortmund may choose this course as Wahlpflichtmodul. If you are a student of FH Dortmund, please consider the due dates of the internal selection process. About 45 German students may participate in this class.

InduTwin partners may send the contact details of the interested preselected students as soon as possible but not later than March 15th, 2022.

In total at most 100 students may participate in this course. That means, each of the 6 Latin American partner universities can send about 10 students. If more students are interested, feel free to send a longer list.

Lecturer

Stephan Weyers has been a professor for Mathematics, Statistics and Supply Chain Management at Fachhochschule Dortmund since March 2019. From 2014-2019 he was professor for Mathematics and Didactics at Technische Hochschule Mittelhessen in Gießen. In his professional career he worked as a Senior Analytic Specialist at McKinsey & Company between 2007-2014.

Stephan Weyers is Project Director of InduTwin.

Contact

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