Organization

Venue
The courses may take place in parts or as a whole online (virtual conferences) if in-classroom teaching is not possible.

Registration
Deadline for registration is February 10, 2022.

Course fee
The fee for the course is € 470; discounted rate for affiliated with a university € 310.

Cancellation
The cancellation policy is as follows: 100% refund for cancellations till February 16; 75% refund for cancellations between February 17 and February 23; no refund for cancellations after February 24, 2022. Attendee substitutes may be made at any time.

Information
http://www.biometrie.uni-heidelberg.de/datascience

Concept and Contents
University of Heidelberg
Institute of Medical Biometry and Informatics
Department of Medical Biometry
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Organization
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3. – 4. March 2022
Aims
Course participants will be able to:
- conceptually distinguish between unsupervised and supervised learning and will know about the most important classes of unsupervised learning approaches
- frame unsupervised learning approaches in terms of manifold learning and probabilistic models and know about exemplary techniques
- phrase unsupervised learning as a deep learning task and known how to use specific tools in such a framework

Pre-requisites
The participants must have
- Basic knowledge of statistics and probability theory
- Basic knowledge in R

Course content
The course will cover following topics:
- Clustering
- Dimension reduction
- Deep learning basic principles
- Generative models

In a hands-on approach, we will explore the clustering tools available in R. To provide a conceptual framework for dimension reduction approaches, such as PCA or t-SNE, we will discuss the task of manifold learning. Besides understanding algorithms as performing non-linear transformations with respect to a manifold, this will also enable a probabilistic perspective. To implement the latter, we will discuss and apply deep learning, specifically variational autoencoders (VAEs).

Schedule (subject to change)
Thursday (3rd of March)
9:00 – 10:30   Clustering
11:00 – 12:30  Principles of Unsupervised Learning
13:30 – 15:00  t-SNE
15:30 – 17:00  Autoencoders

Friday (4th of March)
9:00 – 10:30   Variational Autoencoders (VAEs)
11:00 – 12:30  VAEs (continued)
13:30 – 15:00  Exercise
15:30 – 17:00  Exercise (continued)

Number of Participants
The number of participants is limited to 25 per course.

Course instructors
Prof. Dr. Harald Binder and Dr. Moritz Hess
Institute of Medical Biometry and Statistics
Faculty of Medicine and Medical Center
University of Freiburg

Further information
The course will involve individual work and working in groups, including web searches for R packages and documentation.

The practical parts will rely on the language Julia (https://www.julialang.org) and Jupyter notebooks (https://jupyter.org). Participants should install these on their laptops. In Julia, we will mainly rely on the packages Cairo, Clustering, DataFrames, Distances, Distributions, Flux, Gadfly, GZip, and TSne. Therefore, users should also install these on their laptops.