DATAHOW

Applied Course on

Advanced Process Data Analytics

12,13 and 14 June 2023 @ ETH Zurich

Aim

The aim of this course is to provide an overview and advanced insight into data analytics and modeling methodologies for process data. Fundamental concepts to visualize high-dimensional and highly correlated process and product quality data, to identify the important process drivers as well as to forecast the process and product quality behaviour will be presented in lectures. Hands-on coding and brainstorming sessions will be used to solve case studies from the (biopharmaceutical) industry. After the course the participants will be aware of relevant techniques and literature for process data analysis and will be able to evaluate different analysis paths for a given problem.

Scope

- Special analysis techniques for process data
- Introduction to multivariate data analysis
- Introduction to machine learning techniques
- Hybrid process modeling based on process data and process know-how
- Model-based process understanding & optimization
- Model-based process monitoring and forecasting
- Application of techniques to industrial use cases

Who should attend?

The target group of the course encompasses scientists and engineers from academia and industry who encounter or are working with (bio)process data. The course shall motivate to utilize the presented techniques in ongoing and perspective projects. Previous experience in data analysis can be advantageous but is not mandatory.

Format

The course takes the form of lectures, industry examples and case studies as well as hands-on sessions with software tasks (Different software packages will be provided to the participant). Supervisors and graduate assistants will support the participants during the interactive workshops and data analysis sessions. The course will be intense in content, interactive in learning and interdisciplinary in application and vision.

Principal Lecturers

Michael Sokolov, Ph.D., MBA
COO of DataHow and Lecturer at ETH Zurich

Michael is an expert in bioprocess modelling and regular speaker on the potential of smart digital pharma solutions on international conferences. He conducted his research in close collaboration with the pharma industry and co-authored more than 25 publications.

"A lot of knowledge on a relevant topic in the pharma industry very well explained and delivered."

Participant from 2021

Alessandro Butté, Ph.D., MBA
CEO of DataHow & Lecturer at ETH Zurich

Besides a long-standing research experience in polymer, separation and biotechnological processes, Alessandro has several years of experience in the pharma industry. He is a co-author of more than 70 publications and 4 patents.

Moritz von Stosch, Ph.D.
Chief Innovation Officer of DataHow

Moritz is one of the leading experts for hybrid modelling of bioprocesses. He combines an academic career path with several years of experience in the pharma industry. He is a co-author of more than 50 publications on microbial and mammalian upstream as well as downstream processing.

Further Lecturers and Tutors

Fabian Feidl, Ph.D., CTO of DataHow and bioprocess digitalization expert

Nicolas Cruz, Ph.D., Modeling and automation expert

Prof. Massimo Morbidelli, Thought leader bioprocessing.

Adam Szalkowski, Ph.D., IT infrastructure expert

Martin Luna, Ph.D., DoE and optimization expert

Harini Narayanan, Ph.D. Machine learning expert

Venue and Organization

The in-person course will be held at the premises of ETH Zurich Hönggerberg Campus – see Hönggerberg campus | ETH Zurich.

The provided software from DataHow as well as the open-source packages can be used during and after the course.

The participants are welcome to provide their own case studies to be solved in the brainstorming sessions as well as in dedicated Q&A sessions.

Course date and program

Monday, June 12 till Wednesday, June 14, 2023.
A preliminary program is provided at the end of this document or at the link:
https://www.datahow.ch/education-events/june-course-2023/.
The course will be distributed over **3 days with teaching sessions**. A final program will be provided by June 5, 2023, when we will have collected some preferences of the registered participants.

Course fees

The course fee is **CHF 3'150.00,** CHF 1'950.00 for academia, and CHF 720.00 for students.
The fee includes lecture and case study summaries in electronic formats as well as the software packages used in the course. It also includes lunches and **one non-transferable free participation voucher** for the Symposium on Digitalization and Big Data Analytics preliminary scheduled in Switzerland on 15th June see:
https://www.datahow.ch/education-events/symposium/.

Terms and Conditions

Confirmation: A signed confirmation of completion will be delivered to each participant after the course.
Number of participants: A minimum of 8 will be accepted in the course.
Cancellation policy: Cancellation of registration must be submitted in writing or via email to f.costa@datahow.ch.

Cancellations made later than 3 weeks before the course start will be subject to a 30% cancellation fee. A colleague may be substituted without penalty. Full refunds will be made in the case that the course is cancelled, e.g., due to insufficient enrolment.

> *"Gives a great overview and clarifies many concepts in the data analytics jungle."*
> Participant from 2020

Registration

The link to register is
https://form.jotform.com/Costa_fcosta/registration
course2023a

Registration is only complete after payment or payment confirmation. Registration is binding unless the minimum of participants cannot be reached.

When registering you agree to receive any information regarding the course and other marketing campaigns of DataHow. By accepting the terms, you also agree to be filmed/photographed throughout the event and the materials will be used for commercial purposes by DataHow.

In case of questions or for additional information please contact:

Fátima Costa
Course Responsible
E-mail: f.costa@datahow.ch

We are looking forward to numerous registrations, a great knowledge transfer and a great exchange with our experts.

Your DataHow-team.

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Advanced Process Data Analytics Course
Agenda, 3 days:

Monday, June 12: Advanced Course (Day 1)

08:30 – 12:30 CET	**Multivariate Data Analysis (MVDA) Methods**
08:30 – 09:00	Introduction of the lecturing team and participants
09:00 – 10:00	Motivation for MVDA and Process data specialties
10:15 – 11:30	PCA and Missing Data Handling
11:30 – 12:30	Hands-on Experience & Industrial Use Cases
13:30 – 18:30 CET	**Advanced MVDA Methods**
13:30 – 14:15	Multivariate Regression – MLR, PCR, PLSR
14:15 – 15:15	PLS2 and Variable Importance
15:35 – 16:20	Decision Trees, Software landscape for process digitalization
16:20 – 17:00	Why do we need non-linear process models?
17:15 – 18:30	Hands-on Experience & Industrial Use Cases
18:30 -	Social Program

Tuesday, June 13: Advanced Course (Day 2)

08:30 – 12:30 CET	**Machine Learning (ML) Methods**
08:30 – 09:30	Introduction to Machine Learning
09:30 – 10:30	Examples of Machine learning tools
10:45 – 11:30	Gaussian Processes
11:30 – 12:30	Hands-on Experience & Industrial Use Cases
13:30 – 18:00 CET	**Combination of Data- and Knowledge-driven Approaches**
14:00 – 15:00	Basic Principles of Hybrid models
15:15 – 16:45	Examples of Hybrid models (USP and continuous processes)
17:00 – 18:00	Hands-on Experience & Industrial Use Cases

Wednesday, June 14: Advanced Course (Day 3)

08:30 – 12:30 CET	**Applications of smart digital solutions in bioprocessing**
08:30 – 09:00	Digital Twins in bioprocessing
09:00 – 10:00	Examples of Hybrid models (DSP)
10:00 – 11:15	Machine Learning models for Spectral Data, Kalman and Particle Filters
11:15 – 12:30	Hands-on Experience & Industrial Use Cases
13:30 – 18:00 CET	**Smart digital solutions to support decision taking**
13:30 – 14:15	Bayesian Inference and model-based experimental design
14:15 – 15:00	Application for parallel and robotic reactor systems
15:15 – 16:00	Robustness analysis and model-based process optimization
16:00 – 18:00	Mini Hackathon
18:00 – 18:15	Feedback & Certificates
19:00 -	Pre-Conference Dinner

Thursday, June 15: 3rd DataHow Symposium @ ETH Zurich

08:30 – 18:30 CET	See: https://www.datahow.ch/education-events/symposium/
	Symposium participation is included for course participants.