12th Eawag Summer School in Environmental Systems Analysis 2021

14.09.2021/ PR/CA/AS/DK

Lecturers: Carlo Albert (CA), Peter Reichert (PR), Andreas Scheidegger (AS), Dmitri Kavetski (DK), Marco Baity Jesi (MBJ).

Practice sessions and support in R: Marvin Höge (MH), Tom Lorimer (TL), Ambuj Sriwastava (AS), Marco Bacci (MB).

Sunday, September 26: Optional Preparatory Course

10:30 - 11:30	lecture	AS	**Review of probability theory**
13:00 - 14:00	lecture	MB	**Review of the R programming language**
14:30 - 16:00	practice	MB	Exercises

Monday, September 27: Probabilistic Models

08:45 - 09:00	lecture	CA	**Introduction to the Course**
09:00 - 09:30	lecture	PR	**Probabilistic models and likelihood functions**
09:30 - 10:00	discussion	CA, all	**Introduction and expectations of participants**
10:30 - 11:30	lecture	AS	**Sensitivity analysis**
11:45 - 12:30	lecture	CA	**Monte Carlo simulation**
14:00 - 17:00	practice	MH, all	Practice of likelihood functions and sensitivity analysis, ex.1
17:00 - 17:30	discussion	MH	Discussion of exercises
18:00 - 21:00	*barbecue*	*all*	*At the small river close to Eawag; if weather is nice*

Tuesday, September 28: Introduction to Bayesian Analysis

08:30 - 09:15	lecture	PR	**Concepts of Bayesian analysis**
09:30 - 10:15	lecture	DK	**Simple Bayesian schemes**
10:45 - 11:30	lecture	CA	**Bayesian computation with Monte Carlo methods**
11:45 - 12:30	lecture	DK	**Identifiability analysis and posterior diagnostics**
14:00 - 17:00	practice	MB, all	Practice of elementary Bayesian inference, ex. 2
17:00 - 17:30	discussion	MB	Discussion of exercises

Wednesday, September 29: Advanced Bayesian Computation

08:30 - 09:15	lecture	DK	**Optimization techniques**
09:30 - 10:15	lecture	CA	**Ensemble methods and filters**
10:45 - 11:30	lecture	AS/PR	**Inference with hierarchical models**
11:45 - 12:30	lecture	MBJ	**Variational Bayes**
13:30 - 14:30	*guided tour*	*Thomas L.*	*Guided tour through the building and to the river*
14:30 - 17:00	practice	TL, all	Practice of Bayesian inference / advanced methods, ex. 3
17:00 - 17:30	discussion	TL	Discussion of exercises

Thursday, September 30: Applications and Alternative Methods I

08:30 - 09:15	lecture	DK	**Hydrological modeling, uncertainty and hypothesis testing**
09:30 - 10:15	lecture	CA	**Approximate Bayes computation (ABC)**
10:45 - 12:30	discussion	all	**Discussion of problems of the participants**
13:45 - 14:00	*course picture*		*Outside or in the atrium, depending on the weather*

			FC-C24	FC-C20
14:00 - 15:00	practice	all	Ex. 4: Inference with hierarchical models (?)	Repetition (AS) / problems of participants
15:00 - 16:00	practice	all	Ex. 5: ABC (MH)	
16:00 – 17:00	practice	all	Ex. 6 : Variational Bayes (MBJ)	

Friday, October 1: Applications and Alternative Methods II

08:30 - 09:15	lecture	PR	**Stochastic models in hydrology and ecology**
09:30 - 10:15	lecture	DK	**Alternative methods of model calibration**
10:45 - 11:15	discussion	all	**Discussion of problems of the participants**
11:30 - 12:00	discussion	AS	**Summary of the course**
12:00 - 12:30	discussion	all	**Feedback to the course**
14:00 - 16:30	practice	all	Practice of Bayesian inference

Lectures and practice sessions will take place in FC-C20, lunch will be provided in the restaurant downstairs.