6th Eawag Summer School in Environmental Systems Analysis 2014

10.06.2014/ PR/CA/AS/DK

Lecturers: Peter Reichert (PR), Carlo Albert (CA), Andreas Scheidegger (AS), Dmitri Kavetski (DK), Jasper Vrugt (JV). Practice sessions and support in R: Dario Del Giudice (DDG) and David Machac (DM)

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

Sunday, June 15: Optional Preparatory Course

09:15 - 10:00	lecture	AS	**Review of probability theory and statistics**
10:15 - 11:00	lecture	AS	**Review of the formulation of model likelihood functions**
11:15 – 12:00	Lecture	DK	**Review of optimization techniques**
13:00 - 14:00	lecture	DM	**Review of the R programming language**
14:30 - 16:00	practice	DM	Practice in R

Monday, June 16: Frequentist Inference

08:30 - 09:15	lecture	DK	**Introduction to the Course**
09:30 - 10:15	lecture	PR	**Mathematical representation of models**
10:45 - 11:30	lecture	PR	**Sensitivity and identifiability analysis**
11:45 - 12:30	lecture	CA	**Frequentist inference**
14:00 - 17:00	practice	all	Practice of sensitivity analysis, identifiability analysis and frequentist inference (Exercises 1-3)
17:00 - 17:30	discussion	DM	Discussion of exercises

Tuesday, June 17: Introduction to Bayesian Analysis

08:30 - 09:15	lecture	PR	**Concepts of Bayesian analysis**
09:30 - 10:15	lecture	DK	**Simple Bayesian schemes, identifiability, diagnostics**
10:45 - 11:30	lecture	CA	**Bayesian computation with Monte Carlo methods: Rejection, importance sampling, Markov chains**
11:45 - 12:30	lecture	DK	**Alternative methods for model calibration**
13:45 – 14:00	*course picture*		*Outside or in the atrium, depending on the weather*
14:00 - 17:00	practice	all	Practice of Bayesian inference / simple techniques (Ex. 4)
17:00 - 17:30	discussion	DK	Discussion of exercises
18:00 – 21:00	*barbecue*	*all*	*At the small river close to Eawag; only if the weather is nice*

Wednesday, June 18: Advanced Elements of Bayesian Analysis

08:30 - 09:15	lecture	PR	**Model structure uncertainty, consideration of model bias**
09:30 - 10:15	lecture	DK	**Hierarchical models (including Gibbs sampling)**
10:45 - 11:30	lecture	CA	**Advanced Monte Carlo methods**
11:45 - 12:30	lecture	AS	**Practical aspects of Bayesian Computation**
14:00 - 17:00	practice	all	Practice of Bayesian inference / advanced methods (Ex. 5,6)
17:00 - 17:30	discussion	DDG	Discussion of exercises

Thursday, June 19: Outlook to Research Topics and Applications

08:30 - 09:15	lecture	DK	**Hydrological modeling, uncertainty and hypothesis-testing**
09:30 - 10:15	lecture	CA	**Approximate Bayes Computation, Emulators**
10:45 - 11:30	lecture	JV	**Adaptive and particle MCMC (DREAM)**
11:45 - 12:30	lecture	JV	**Multi-objective optimization**
14:00 - 17:00	practice	all	Practice of Bayesian inference (Ex. 7,8) / own problems
17:00 - 17:30	discussion	CA	Discussion of exercises

Friday, June 20: Discussion of Problems of the Participants

08:30 - 09:15	discussion	all	**Discussion of problems of the participants**
09:30 - 10:15	discussion	all	**Discussion of problems of the participants**
10:45 - 11:30	discussion	all	**Discussion of problems of the participants**
11:45 - 12:30	discussion	all	**Feedback to the course**
14:00 - 17:00	practice	all	Practice and discussion of topics suggested by participants