basque center for applied mathematics

Courses 2022-23

Dynamic modeling and statistical inference in the life sciences: philosophical and practical perspectives

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23rd – 25th November 2022
Wednesday - Friday (3 sessions)
14:00 – 18:00 (a total of 12 hours)

Part 1 — Introduction: History and overview
- Basic definitions: what modeling is and is not.
- Early history, classic models in the physical sciences, modeling in biology
- Dynamic models and statistical inference (basic defintions)
- Modeling expansion through computers, genomics-scale projects and data: (Is Bioinformatics/Big Data/AI/Machine Learning also modeling and inference?)
+ Philosophical perspective: modeling as process-based thinking
+ Practical perspectives: short example of research driven by model-based inference

Part 2 — State-of-the-art
- Specifying dynamic models implicitly by describing processes: differential equation (mostly ODE) and discrete time (including stochastic) models
- Generating the right data: experimental design for time course observations
- Parameterizing mathematical models: statistical inference (mostly bayesian, principles of MCMC sampling)

Part 3 — Perspectives and challenges
- How to formulate models with limited knowledge of its components?
- What are the limits of scaling inference to large models/parameter spaces?
- Is model selection effective for choosing between very complex models?
- (Everything that is possible in principle but difficult in practice)

***Registration is free, but inscription is required before 18th November 2022:** So as to inscribe go to https://forms.gle/w97a38V6P3GgoGxc6 and fill the registration form.