



FID3026 Differentiable Probabilistic Programming Languages 7.5 credits

Differentierbara probabilistiska programmeringsspråk

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Enrolled as PhD student.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After passing the course, the doctoral student shall be able to:

- design and implement a simple probabilistic programming language using shallow embedding
- analyze and evaluate various Bayesian inference methods
- implement and analyze various methods for automatic differentiation
- analyze and explain semantics for differentiable and probabilistic programming languages
- model, apply, and reflect on differentiable or probabilistic programming techniques in various application domains, including domains within the UN Sustainable Development Goals

Course contents

The course covers different methods, algorithms, semantics, mathematical concepts, and applications within differentiable probabilistic programming. This includes frequentist vs. Bayesian statistics, Bayes' rule, conjugate priors, Markov chain Monte Carlo, Sequential Monte Carlo, Importance Sampling, Variational Inference, Automatic Differentiation (forward and backward accumulation modes), tools and languages for probabilistic and differentiable programming, probabilistic models and applications of differentiable and probabilistic programming (such as Latent Dirichlet Allocation, Equation-based Object-Oriented Modeling, and Neural Networks), and example areas related to UN's sustainable development goals.

Examination

- EXA1 - Examination, 7.5 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

The course is examined using individual hand-in assignments, seminars, individual presentations, a written report, and peer-reviewing tasks.

Other requirements for final grade

To pass the course, the student must receive a passing grade on all hand-in assignments, on the written report, on peer-reviewing tasks, and on individual presentations. The student must also actively participated in all seminars and lectures. If students cannot attend some seminars or lectures, they need to do complementary work as compensation.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.