— Bachelor's or Master's Thesis —

Computing the Post for a Probabilistic Program

What is it all about? The denotational semantics map an initial distribution (even state value) to the post resulting after executing the probabilistic program. However, the question is whether/or in which cases this transformer is computable. Especially for loops this seems challenging because of the fixed point. Also the conditional could be a challenge, because you need to check for all sigma in the support of mu whether they satisfy bool and this can be infinitely many?! So maybe we need to assume the support to be finite.

What is to be done?

The goals of this project are:

1. Implement the denotational semantics transformer for probabilistic programs, i.e. given a program with the exact syntax and an initial distribution, the program shall automatically output the post if possible
2. Find an as large as possible subset for probabilistic programs/distributions/bools such that the automatic output is possible

This list is of course non-exhaustive! The above suggestions may be changed, shortened and/or extended while we work on our project and gain more insights on how difficult the topic is.

What we expect:

- Solid background in theoretical computer science and maths – ideally you have already taken theoretical CS electives
- Passion and endurance for solving theoretical problems

What you can expect:

- Get a chance to work on relevant problems of both theoretical and practical nature
- You can work in the student room at our chair – we have a coffee machine, lots of tea and sometimes cookies :)

Apply

- Daniel Zilken (daniel.zilken@cs.rwth-aachen.de)
  Please introduce yourself briefly and say why you're interested in this topic!