

## EINLADUNG

Zeit: Montag, 27. Juni 2011, 10.00 Uhr

Ort: AH 6, Ahornstr. 55

Referent: Prof. Dr. Javier Esparza,  
TU München

Titel: Solving fixed-point equations on semirings

### Abstract:

Many problems in Computer Science, Physics, and Mathematics reduce to solving a system of fixed-point equations. Examples include the computation of thermal equilibria, shortest paths, dataflow invariants, critical radius of fissionable materials, multiset languages, stationary distributions, population levels, termination probabilities, and expected memory consumption. The equations are interpreted on a large variety of domains, including integers, reals, intervals, languages, and multisets, but all of them share a common algebraic structure: they are semirings with some continuity properties.

Computer Science has not produced much theory on **\*generic\*** solution methods, i.e., methods that work for **\*any\*** of these semirings. The ones around are based on Knaster-Tarski's and Kleene's theorems, but, unfortunately, they rarely terminate for infinite domains, and in metric interpretations their convergence order is very slow. In this talk I will present several surprising results we have obtained on this question. I will show that Newton's method, well-known from numerical mathematics, can be generalized to arbitrary semirings, and how this leads to intriguing and beautiful connections between language theory, stochastics, and traditional analysis, and to new and faster algorithms. Time permitting, I will sketch some applications to the problems above.

(Joint work with Stefan Kiefer and Michael Luttenberger.)

Es laden ein: Die Dozenten der Informatik