Robert Fitzner

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Personal information

Name: Robert Jörg Fitzner

Date of Birth: 27.07.1981

Place of Birth: Berlin, Germany

Citizenship: German

Research areas

Percolation, Statistical Mechanical Models, Mathematical Physics, Random Graphs, Algorithms

Professional Experience

Eindhoven University of Technology — **Eindhoven**
Postdoctoral Research Fellow at the Department of Mathematics — *09/2015–present*

Stockholm University — **Stockholm**
Postdoctoral Research Fellow at the Department of Mathematics — *10/2013–08/2015*

Eurandom / Eindhoven University of Technology — **Eindhoven**
PhD Student at the Department of Mathematics — *09/2008–07/2013*

Non-academic work experience

Forschungsverbund Berlin e.V. — **Berlin**
System administrator — *01/2005–06/2008*
System administration and user support to the accounting office.
(Unix server administration, SAP/R3 support)

Education

Eurandom/Eindhoven University of Technology — **Eindhoven**
PhD July 2013 — *10/2008–07/2013*

Supervisor: Remco van der Hofstad

Thesis title: *Non-backtracking lace expansion*

Thesis abstract: We extend a technique, known as lace expansion, to improve mean-field results for various models in the nearest-neighborhood setting. The grand challenge was to prove that nearest-neighbor percolation above 6 dimensions displays mean-field behavior. Currently such results are only known above 18 dimensions.
We derive the non-backtracking lace expansion (NoBLE) for percolation, self-avoiding walk, lattice trees and lattice animals. The lace expansion is a perturbation technique that requires the inverse dimension $1/d$ to be small. The proof, that $1/d$ is small enough to successfully perform the analysis, requires the assistance of the computer. These computations are non-trivial, so that proof that percolation shows mean-field behavior in dimension d bigger then 18, were never published.
We developed an analysis that is substantially simpler and currently proves critical mean-field be-

havior percolation in $d > 10$. Our numerical computations, in the form of Mathematica-notebooks, are available on my homepage.

Berlin University of Technology **Berlin**
dipl.math.oec. (German version of Master) *10/2002–08/2008*

Major: finance mathematics

1st minor: computer science

2st minor: economics (with a focus on accounting)

Diploma thesis:
Title: *Superhedging under soft constraints in discrete-time market model*
Supervisor: Alexander Schied

Grants

Magnusons fond by the Royal Swedish Academy of Science, (15.000 SEK)	*(2014)*
Travel grand by the ESF to participate the Winder School: Spatial Models in Statistical Mechanics in Darmstadt (500 Euro)	(2014)
Travel grand by the PIMS to participate the Summer School in Probability 2009 at PIMS-UBS (1100 CAD)	(2009)

I received three similar grants to cover travel and lodging expenses to attend given conferences.

Research interests

My research interests are in the field of statistical physics and probability. I am interested in the spatial evolution of systems, such as the occurrence of phase transitions and critical phenomena. Here are some keywords about my core interests:

- random walks
- percolation
- random graphs
- stochastic (spatial) growth models

Having a solid background in programming I am also interested in algorithms. I am always looking for optimal solutions to obtain simulations of the complex systems analyzed in my research. These simulations can be used to obtain schematic representations for talks and estimates of relevant quantities.

My Master thesis(Diplomarbeit) was in the field of financial mathemicatics. In this mathematical model were used to compute the price of trading options, when the possible hedging strategies are constrained. Additionally, I taken all courses for master in business studies at the TU Berlin and obtained a minor in auditing (Rechnungslegung).

Publications

Publications

[1]: L Albertazzi, D. van der Zwaag, C.M.A. Leenders, R. Fitzner and R. van der Hofstad. Probing Exchange Pathways in One-Dimensional Aggregates with Super-Resolution Microscopy. (2014), Science Magazine

[2]: R. Fitzner and R. van der Hofstad. The non-backtracking random walk. (2013), Journal of Statistical Physics.

[3]: R. Fitzner and R. van der Hofstad. Generalized approach to the non-backtracking lace expansion. (2017), Probability Theory and Related Fields

[4]: R. Fitzner and R. van der Hofstad. Nearest-neighbor percolation function is continuous for $d > 10$, (2017), Electronic Journal of Probability

[5]: M. Deijfen and R. Fitzner. Birds of a feather or opposites attract - effects in network modelling (2017)

Preprints

[6]: R. Fitzner and R. van der Hofstad. NoBLE for lattice animals and trees. (2016) Under preparation

Mathematica notebooks for computer-assisted proofs

[7]: R. Fitzner, Numerics of the lace expansion for self-avoiding walk (2012), On my webpage

[8]: R. Fitzner, Numerics of the NoBLE for percolation (2016), On my webpage

[9]: R. Fitzner, Numerics of the NoBLE for lattice trees (2013), On my webpage

[10]: R. Fitzner, Numerics of the NoBLE for lattice animals (2013), On my webpage

Selected Talks

Invited Talks

Probability Seminar Essen — **Essen** *20/10/2015*

Workshop: Probability and Graphs — **Eindhoven** *08/01/2014*

Oberseminar: Biological Models and Statistical Mechanics — **Berlin** *22/10/2012*

Mark Kac Serminar — **Utrecht** *05/10/2012*

Contributing talks

Cluster expansions: from combinatorics to analysis via probability — **Oberwolfach** *08/02/2017*

12th German Probability and Statistics Days 2016 — **Bochum** *02/03/2016*

Spatial Models in Statistical Mechanics — **Darmstadt** *24/02/2014*

40th Probability Summer School — **Saint Flour**, *06/07/2010*

PIMS-UBC Summer School in Probability — **Vancouver**, *22/06/2009*

Teaching

Eindhoven University of Technology — **Eindhoven**, *02/2015–04/2015*

Lecturer of a Bachelor course in financial mathematics

Stockholms Universitet — **Stockholm**, *04/2014–01/2015*

Lecturer of Bachelor and Master course in financial mathematics

- Advanced financial mathematics (Spring 2014)
- Introduction to financial mathematics (Fall 2014)
  This introductory course is aimed at bachelor students in mathematics and people working in industry (mostly insurances). For this mixed audience I design a new course that is applied and gives a brought overview of financial mathematics.

Eindhoven University of Technology — **Eindhoven**, *09/2008–2011*

Instructor for seven courses on bachelor level for statistic, probability and calculus

- Statistics for architecture (Fall 2008,Fall 2008,Spring 2010)
- Statistics for innovation sciences (Spring 2011)
- Introduction to mathematics for applied physics (Fall 2011)
- Calculus for engineering (Fall 2010,Fall 2011)

Supervision

Since 2017 I supervise Master and Bachelor projects.

Supervisor for students in an online learning project: Technology Enhanced Learning of Mathematics for Master Education (TELMME, http://dam02.win.tue.nl/elmi/). The TELMME project is an online platform, where students are supposed to solve weekly exercises. My task was to supervise their learning progress and offer assistance for technical problems.

Creation of supplementary material for the course

Together with a colleague, Tim Hulshof, I created a 30 page summary for a bachelor course on probability and statistic for non-mathematicians in Dutch. This summary is based on the text book: Applied Statistics and Probability for Engineers (Montgomery).

R. Fitzner and T. Hulshof, Algemeen overzicht inleiding kansrekening en statistiek. (2010)

While giving a course on probability and statistics, Tim Hulshof and I realized that many of our students struggled with the notions of the course, due to their non-mathematical background. As courses at this level are given at the TU Eindhoven for at least 500 students each year we decided to create a summary of the material in Dutch. This summary is now used by the students as an addition to the text book. On my homepage you can find a link to this document.

Languages

German: Mother tongue

English: Fluent

Dutch: Good

French: Basic

Computer skills

Languages: Java,C++, Javascript, Perl

Work related: Linux (Red hat, Ubuntu, slashware) and Solaris

Simulator: I created an applet that generates images and real-time animations for several stochastic models that is intended to be used within teaching/research. The model creates simulations of random walks, percolation, bootstrap percolation and the sandpile model. The program has already been used by me and others to introduce the percolation model and its phase transition in talks and courses on percolation. The program can be found on my homepage.