

Alexey Solovyev

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Date and place of birth: February 14, 1985 in St. Petersburg, Russia.

Education:

- 2007–2012 *Ph.D. in Mathematics*
University of Pittsburgh, Pittsburgh, Pennsylvania.
Thesis: *Formal Computations and Methods*
<http://d-scholarship.pitt.edu/16721/>
Advisor: Prof. Thomas C. Hales
Cumulative GPA: 4.0/4.0
- 2002–2007 *B.S. in Mathematics*
Saint-Petersburg State University, St. Petersburg, Russia.
Advisor: Prof. Andrey Y. Garnaev
Cumulative GPA: 5.0/5.0

Research Experience:

- 2014–present **University of Utah**, School of Computing.
Research Associate.
Rigorous error estimation and automatic precision allocation in floating-point programs.
Advisor: Prof. Ganesh Gopalakrishnan
- 2013–2014 **University of Utah**, School of Computing.
Postdoctoral Fellow.
Errors and stability of floating-point computations.
Advisor: Prof. Ganesh Gopalakrishnan
- 2012–2013 **University of Pittsburgh**, Department of Mathematics.
Postdoctoral Associate.
The Flyspeck Project (a formal proof of the Kepler conjecture).
Advisor: Prof. Thomas C. Hales
- 2009–2012 **University of Pittsburgh**, Department of Mathematics.
Graduate Research Assistant.
Formal Computations and Methods. The Flyspeck Project.
Advisor: Prof. Thomas C. Hales

May 2011–July 2011	Microsoft Research–INRIA , Saclay, France. <i>Summer Internship.</i> A formal proof of the Odd Order theorem. Advisor: Dr. Georges Gonthier
2008–2012	University of Pittsburgh , Department of Mathematics and Center for Inflammation and Regenerative Modeling. <i>Graduate Research Assistant.</i> Development of a new Agent-based Modeling framework for complex biological systems. Mathematical models of Traumatic Brain Injury. Advisors: Prof. Yoram Vodovotz, Prof. Qi Mi
2008–2011	University of Pittsburgh , Department of Mathematics. <i>Graduate Research Assistant.</i> Combinatorial Designs: Construction and Existence. Advisor: Prof. Gregory M. Constantine
2004–2007	Saint-Petersburg State University , Russia, Department of Applied Mathematics and Control Processes. <i>Undergraduate Research Assistant.</i> Investigation of N-player games of timing. An Investment Allocation Game. A Multi Stage Game of Employee Selection. <i>Thesis:</i> “On an Ecology Monitoring Game.” Advisor: Prof. Andrey Y. Garnaev

Teaching Experience:

Fall 2012	University of Pittsburgh , Department of Mathematics. Recitation instructor: MATH 413, Intro Theoretical Mathematics
Summer 2009	University of Pittsburgh , Department of Mathematics. MATH 290, Ordinary Differential Equations

Scholarships and Awards:

2013	Thomas C. Hales Distinguished Research Award
2011	Andrew Mellon Predoctoral Fellowship
2010	IGI Global’s Fourth Annual Excellence in Research Journal Award
2009	The Teplitz-Culver award
2007	Award to the Best Graduate of Saint-Petersburg
2006	Scholarship of the President of Russian Federation
2002	Silver medal: honor award for excellent studies in a secondary school

Publications:

Formal Methods

6. **Solovyev, A.**; Jacobsen, C.; Rakamarić, Z.; Gopalakrishnan, G. *Rigorous Estimation of Floating-Point Round-off Errors with Symbolic Taylor Expansions*, FM 2015, **2015**, 532–550. [link](#)
5. Jacobsen, C.; **Solovyev, A.**; Gopalakrishnan, G. *A parametrized Floating-Point Formalization in HOL Light*, NSV 2015 Workshop, **2015**, 115–120. [link](#)
4. Chiang, W.; Gopalakrishnan, G.; Rakamarić, Z.; **Solovyev, A.** *Efficient Search for Inputs Causing High Floating-point Errors*, PPoPP'14, **2014**, 43–52. [link](#)
3. Gonthier, G.; Asperti, A.; Avigad, J.; Bertot, Y.; Cohen, C.; Garillot, F.; Roux, S.; Mahboubi, A.; O'Connor, R.; Biha, S.; Pasca, I.; Rideau, L.; **Solovyev, A.**; Tassi, E.; Thery, L. *A Machine-Checked Proof of the Odd Order Theorem*, LNCS, ITP 2013, **2013**, 7998, 163–179. [link](#)
2. **Solovyev, A.**; Hales, T. *Formal Verification of Nonlinear Inequalities with Taylor Interval Approximations*, LNCS, NFM 2013, **2013**, 7871, 383–397. [link](#)
1. **Solovyev, A.**; Hales, T. *Efficient formal verification of bounds of linear programs*, LNCS, CISM 2011, **2011**, 6824, 123–132. [link](#)

Systems Biology

6. Ziraldo, C.; **Solovyev, A.**; Allegretti, A.; Krishnan, S.; Henzel, M.K.; Sowa, G.A.; Brienza, D.; An, G.; Mi, Q.; Vodovotz, Y. *A Computational, Tissue-Realistic Model of Pressure Ulcer Formation in Individuals with Spinal Cord Injury*, PLoS Comput Biol, **2015**, 11(6): e1004309 [link](#)
5. Dutta-Moscato, J.; **Solovyev, A.**; Mi, Q.; Nishikawa, T.; Soto-Gutierrez, A.; Fox, J.; Vodovotz, Y. *A Multiscale Agent-based in silico Model of Liver Fibrosis Progression*, Frontiers in Bioengineering and Biotechnology, section Systems Biology, 30 May **2014**, 2:18. [link](#)
4. **Solovyev, A.**; Mi, Q.; Tzen, Y.; Brienza, D.; Vodovotz, Y. *Hybrid Equation/Agent-Based Model of Ischemia-induced Hyperemia and Pressure Ulcer Formation Predicts Greater Propensity to Ulcerate in Subjects with Spinal Cord Injury*, PLoS Comput Biol, **2013**, 9(5): e1003070 [link](#)
3. Mi, Q.; Constantine, G.; Ziraldo, C.; **Solovyev, A.**; Torres, A.; Namas, R.; Bentley, T.; Billiar, T.R.; Zamora, R.; Puyana, J.C.; Vodovotz, Y. *A dynamic view of trauma/hemorrhage-induced inflammation in mice: Principal drivers and networks*, PLoS ONE, **2011**, 6(5): e19424 [link](#)
2. **Solovyev, A.**; Mikheev, M.; Zhou, L.; Dutta-Moscato, J.; Ziraldo, C.; An, G.; Vodovotz, Y.; Mi, Q. *SPARK: A Framework for Multi-Scale Agent-based Biomedical Modeling*, International Journal of Agent Technologies and Systems, **2010**, 2, 18–30. [link](#)
1. Mikheev, M.; **Solovyev, A.**; Maltsev, A.; Bartels, J.; Chang, S.; Mi, Q.; Vodovotz, Y. *A parallel implementation of an agent-based modeling platform with application in modeling calcium releases in cardiomyocytes*, Journal of Critical Care, **2009**, 24, N 3, e21 [link](#)

Other

2. Garnaev, A.; **Solovyeu, A.** *An Investment Allocation Game with a Cost*, Int. J. Math. Game Theory and Algebra, **2006**, 15, Issue 2, 221–229.
1. Garnaev, A.; **Solovyeu, A.** *On a Two Department Multi-Stage Game (in Russian)*, Vestnik St. Petersburg University, Seria 10, Applied Mathematics, **2005**, N 3-4, 3–12.

Presentations:

10. **Solovyeu, A.** *The Flyspeck Project: A Formal Proof of the Kepler Conjecture*, Microsoft Research, 13 May, **2014**
9. **Solovyeu, A.**; Hales, T. *Formal Verification of Nonlinear Inequalities with Taylor Interval Approximations*, NFM, NASA Ames Research Center Moffett Field, CA, USA, 14–16 May, **2013**
8. **Solovyeu, A.**; Hales, T. *Efficient formal verification of bounds of linear programs*, CISM, Bertinoro, Italy, 18–23 July, **2011**
7. **Solovyeu, A.** *A Formal Proof of the Kepler Conjecture: the Flyspeck Project*, TypiCal seminar, École Polytechnique, France, 24 May, **2011**
6. **Solovyeu, A.**; Mikheev, M.; Zhou, L.; Dutta-Moscato, J.; Ziraldo, C.; An, G.; Vodovotz, Y.; Mi, Q. *SPARK: A Framework for Multi-scale Agent-based Biomedical Modeling*, ADS Symposium 2010, Orlando, Florida, USA, 12–14 April, **2010**
5. Mi, Q.; Constantine, G.; **Solovyeu, A.**; Susick, E.; Okonkwo, D.; Vodovotz, Y. *Patient-Specific Mathematical Models of Traumatic Brain Injury*, ICCAI 2009, Stanford University, Palo Alto, California, USA, 28–30 August, **2009**
4. Garnaev, A.; **Solovyeu, A.** *On an Ecology Monitoring Game*, Control Processes and Stability, SPbSU, St. Petersburg, Russia, **2006**
3. Garnaev, A.; Galegov, A.; **Solovyeu, A.** *An Investment Allocation Game*, The International Conference in Memory of V.I. Zubov “Stability and Control Processes”, SPbSU, St. Petersburg, Russia, 29 June–1 July, **2005**
2. Garnaev, A.; **Solovyeu, A.** *On A Two Department Multi-Stage Game*, The International Workshop “Optimal Stopping and Stochastic Control”, Petrozavodsk, Russia, August 22–26, **2005**
1. Garnaev, A.; **Solovyeu, A.** *A Multi-Stage Game of Employee Selection*, Control Processes and Stability, SPbSU, St. Petersburg, Russia, **2005**

Software

SPARK	A cross-platform free software for multi-scale Agent-based modeling Authors: Alexey Solovyev, Qi Mi, Maxim Mikheev http://www.pitt.edu/~cirm/spark/
SPARK-PL	A programming language for rapid development of Agent-based models in SPARK Author: Alexey Solovyev http://code.google.com/p/spark-abm/
Flyspeck	A formal proof of the Kepler conjecture Author: Thomas Hales http://code.google.com/p/flyspeck/
SSReflect/HOL Light	An implementation of the SSReflect proof language in HOL Light Author: Alexey Solovyev http://code.google.com/p/flyspeck/downloads/list
Formal Verification of Nonlinear Inequalities	A tool for formal verification of multivariate nonlinear inequalities in HOL Light Author: Alexey Solovyev http://code.google.com/p/flyspeck/downloads/list
Guided Random Testing for Floating-point Error Estimation	A tool for detecting high floating-point errors Author: Wei-Fan Chiang http://www.cs.utah.edu/formal_verification/Gauss/Pages/grt/
FPTaylor	A tool for rigorous estimation of floating-point round-off errors Author: Alexey Solovyev https://github.com/soarlab/FPTaylor