Chris Beck

CONTACT
INFORMATION

mobile: (upon request)
e-mail: beck.ct@gmail.com

EDUCATION

Princeton University, Princeton, New Jersey, USA

Doctor of Philosophy: Computer Science **2009 − 2014**
- Advisors: Professor Sanjeev Arora and Professor Russell Impagliazzo
- GPA: 3.94/4.0

California Institute of Technology, Pasadena, California, USA

Bachelors of Science with Honor: Mathematics **2005 − 2009**
Bachelors of Science with Honor: Computer Science **2005 − 2009**
- GPA: 3.7/4.0

Selected course titles: Algorithms and Data structures, Information security, Machine Learning
Algebra, Geometry, Topology, Analysis, Probability, Combinatorics, Algebraic Geometry

SELECTED
PUBLICATIONS

P. Beame, C. Beck, R. Impagliazzo. Time-Space Tradeoffs in Resolution: Superpolynomial Lower
Bounds for Superlinear Space. *Proceedings of the 44th Annual ACM Symposium on Theory of
Computing* (STOC 2012). **Also in special issue of SIAM Journal on Computing 2016 45:4,
1612-1645 .**

C. Beck, R. Impagliazzo, S. Lovett. Large Deviation Bounds for Decision Trees and Sampling Lower
Bounds for AC0-circuits. *Proceedings of the 53rd Annual IEEE Symposium on Foundations of
Computer Science* (FOCS 2012).

C. Beck, J. Nordström, B. Tang. Some Tradeoffs in Polynomial Calculus. *Proceedings of the 45th
Annual ACM Symposium on Theory of Computing* (STOC 2013).

C. Beck, R. Impagliazzo. Strong ETH Holds for Regular Resolution. *Proceedings of the 45th Annual
ACM Symposium on Theory of Computing* (STOC 2013).

HONORS AND
AWARDS

Wu Prize for Excellence, 2013
Simons Award for Graduate Students in Theoretical Computer Science, 2012-2014
NSF GRFP Honorable Mention, 2009
The G. Wallace Ruckert '30 Fellowship, 2009
SURF Fellow, 2006 and 2008

PROFESSIONAL
EXPERIENCE

Tesla Inc., Palo Alto, California, USA

Senior Software Developer **Oct 2017 − Present**
Autopilot Software Infrastructure. Interprocess communication frameworks for tasks with real-time
safety constraints. Modern C++ utility libraries and data structures. Rewrote large parts of logging
and telemetry infrastructure to minimize overhead in real-time tasks. I also contribute to our coding
guidelines. I am interested in leveraging modern C++ for safety without losing portability, efficiency.

Institute for Advanced Study, Princeton, New Jersey, USA

Postdoctoral Scholar **Sept 2014 − August 2016**
Research in computational complexity theory, especially time space tradeoffs and pseudorandomness.

Princeton University, Princeton, New Jersey, USA

Teaching Assistant **Sept 2011 − May 2012**
Teaching assistant for undergraduate courses in theory of computation, computational geometry.

California Institute of Technology, Pasadena, California, USA

Teaching Assistant   **Mar 2009 – June 2009**

Teaching assistant for undergraduate course in approximation algorithms.

PROGRAMMING   C++, Python, Lua, Matlab, Bash scripting, Git. Currently learning Rust.

OPEN SOURCE   **visit_struct** (Lead developer)   https://github.com/cbeck88/visit_struct
CONTRIBUTIONS A tiny library that provides for struct-field reflection in C++11. It is portable to many versions of
gcc, clang, and msvc, and many github users tell me they have used it in production. As of 2018 it
is used in Tesla autopilot code for certain code-gen tasks.

strict_variant (Lead developer)   https://github.com/cbeck88/strict_variant
A simple and efficient type-safe union for C++11, which is embedded / real-time friendly, meaning
it is very easy to use it in a way that avoids C++ exceptions and dynamic allocations. As of 2018 it
is used in Tesla autopilot code.

spirit_po (Lead developer)   https://github.com/cbeck88/spirit_po
A library that parses the gettext po format, and can replace the use of GNU libintl in projects
that use the GNU gettext system for internationalization of software. spirit_po is written using the
boost::spirit parser framework, it is in total about 900 lines of code. It has been used in the Battle
for Wesnoth project for several years now.

CEGUI   https://cegui.org.uk
CEGUI is a GUI framework written in C++ and distributed under a permissive license. It is highly
performant, flexible, and configurable, with minimal dependencies, and has been used in a lot of
projects.
Porting to WebGL   https://github.com/cbeck88/cegui-emscripten
I ported the CEGUI samples framework to javascript using the emscripten cross compiler. This
means the user can view the samples in their webbrowser, rendered using WebGL. This uncovered
some bugs in the CEGUI OpenGL renderer, and I submitted a patch upstream to fix these problems.

wesnoth   https://github.com/wesnoth/wesnoth
The Battle for Wesnoth is a turn-based strategy game developed as a community project since about
2004. I made patches to this project in the years 2014-2015, and I have commit access to it.
xBRZ scaling engine
Wesnoth graphics are based on software rendered sprites, drawn in a pixel art style. In several
patches, I fixed some bugs in scaling algorithms that had been used, and merged a new patch which
allowed the use of a modern scaling algorithm called xBRZ. xBRZ attempts to scale pixel art in a
way that preserves features and details.

INVITED TALKS   • **John Templeton Foundation Workshop**: "Limits of Theorem Proving". Rome, Sept 2012.
• **China Theory Week** Aarhus, August 2012.
• **Symposium on Theory of Computing** New York City, May 2012.
• **University of Toronto** Theory Group Seminar. May 2012.
• **KTH Royal Institute of Technology** Theory Group Seminar. January 2012.
• **Institute for Advanced Study** Computer Science Discrete Math Seminar. December 2011.
• **University of Chicago** Theory Group Seminar. November 2011.
• **BIRS Workshop**: "Proof Complexity". Banff, October 2011.
• **University of Chicago** Theory Group Seminar. December 2012.
• **Symposium on Foundations of Computer Science** New Brunswick, September 2012.
• **Symposium on Theory of Computing** Palo Alto, May 2013.
• **University of California, San Diego** Theory Group Seminar, August 2013.
• **Insitute for Advanced Study** Computer Science Discrete Math Seminar. March 2015.

REFERENCES   *Additional contact information available upon request.*

Dr. Mehdi Amini
Engineering Manager - Autopilot Software Tools & Infrastructure
Tesla Inc.
Palo Alto, California, USA
e-mail: mamini@tesla.com

Professor Sanjeev Arora
Professor of Computer Science
Princeton University
Princeton, New Jersey, USA
e-mail: arora@cs.princeton.edu

Professor Russell Impagliazzo
Professor of Computer Science
University of California, San Diego
San Diego, California, USA
e-mail: russell@cs.ucsd.edu

Professor Shachar Lovett
Asst. Professor of Computer Science
University of California, San Diego
San Diego, California, USA
e-mail: slovett@math.ias.edu

Professor Paul Beame
Professor of Computer Science
University of Washington
Seattle, Washington, USA
e-mail: beame@cs.washington.edu