

Thank you for organizing such a unique opportunity!

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Relevant background: I have extensive background in computational complexity theory, computability theory, and logic (such as Gödel's Incompleteness Theorems). I understand basics of category theory (e.g. what is on the wikipedia page) and am interested in learning more, and am generally comfortable with learning new pure math topics.

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PhD schedule: I am planning right now to defend during the Spring or Summer semesters of 2019. I am primarily writing on the complexity of boolean functions and the relationship of various (often "atypical") complexity measures, such as sensitivity vs decision tree complexity.

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Project preference: "Complexity classes, computation, and Turing categories", definitely is my first preference. Though, I found the project "Simplifying quantum circuits using the ZX-calculus" also intriguing, as a second choice.

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Travel: I am currently planning on traveling to Europe early to mid July, so it's much easier for me to add an Oxford visit (than if I were coming from California) even without funding (intra-Europe flights are usually cheap). July 22-26 would be quite feasible, especially if I'm let know ASAP (so I can book my other travel around it).

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Statement: I am currently looking for new research projects and collaborators in topics related to computational complexity theory, or more broadly any theoretical computer science topics. I believe the ACT2019 school is a good way to get exposure to new projects and researchers I otherwise wouldn't have a chance to interact with. Since I assume other participants may have more of a category-theory background, I hope that I can be a resource on complexity-theory for them, so that there is a useful bidirectional exchange of information.

Particularly if new research projects arise out of the school, I would want to collaborate in an interdisciplinary team, so that the projects are built on expertise on each topic. I would likely only pursue a combined category theory/complexity theory research project as part of a broader effort, along with researchers who have suitable category theory background as well.

My short-term career goals include publishing more frequently on a wider variety of topics, and I would be thrilled if collaborations coming out of the ACT2019 school yielded publications in the appropriate ACT or complexity theory conferences.

## Joseph Bebel

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CONTACT INFORMATION	Department of Computer Science University of Southern California Joseph Bebel c/o CS Department 941 Bloom Walk Los Angeles, CA 90089-0781 USA <i>E-mail:</i> <a href="mailto:bebel@usc.edu">bebel at usc dot edu</a> <i>WWW:</i> <a href="http://www.joebebel.com">www.joebebel.com</a>
RESEARCH INTERESTS	Theory of Computation, Classical Computational Complexity Theory, co-Nondeterministic Computational Complexity, Complexity of Boolean Functions, Sensitivity Conjecture, Complex Analysis and Applications
EDUCATION	<b>University of Southern California</b> , Los Angeles, California  Ph.D., Computer Science, In progress <ul style="list-style-type: none"><li>• Advisor: Professor Leonard Adleman</li><li>• Area of Study: Theoretical Computer Science</li></ul> M.S., Computer Science, May 2013  B.S., Electrical Engineering, May 2010. Graduated <i>Magna cum Laude</i>
AWARDS AND FELLOWSHIPS	ARCS Scholar Award, Oct. 2015 - May 2019 2014 Rockwell Dennis Hunt Scholastic Award, April 8, 2014 Best Poster for Visual Presentation, USC Computer Science Annual Research Review, March 6, 2014. Annenberg Graduate Fellowship, Aug. 2010 - May 2014 Rose Hills Foundation Undergraduate Research Fellowships, May 2007 - Aug. 2010
UNPUBLISHED RESEARCH	Leonard Adleman, Dustin Reishus, <b>Joseph Bebel</b> , Henry Yuen, Rolfe Schmidt. Strata in Complex Analysis. Complete book documenting original research. Manuscript in preparation as of Jan. 2019.
PUBLICATIONS	<b>Joseph Bebel</b> , Henry Yuen. Hard SAT instances based on factoring. A. Balint, A. Belov, M.J.H. Heule, and M. Järvisalo (eds) 2013, Proceedings of SAT Competition 2013: Solver and Benchmark Descriptions. Department of Computer Science Series of Publications B, vol. B-2013-1, University of Helsinki.  <b>Joseph Bebel</b> , Benjamin L. Raskob, Alice C. Parker, Donald J. Bebel. Managing Complexity in an Autonomous Vehicle. IEEE Aerospace and Electronic Systems Magazine, vol. 23, no. 3, pp. 3-13, March 2008  <b>Joseph Bebel</b> , Benjamin L. Raskob, Alice C. Parker, Donald J. Bebel. Managing Complexity in an Autonomous Vehicle. In Proc. IEEE/ION Position Location and Navigation Symposium 2006

**Joseph Bebel**, Nathan Howard, Tej Patel. An Autonomous System Used in the DARPA Grand Challenge. In Proc. 7th International IEEE Conference on Intelligent Transportation Systems 2004

TEACHING  
EXPERIENCE

*Teaching Assistant*

**September 2012 to Present**

- CSCI 670: Advanced Analysis of Algorithms
  - Ph.D level algorithms course
- CSCI 581: Logic and its Applications (now CSCI 681)
  - Masters and Ph.D level mathematical logic, with Gödel Completeness and Incompleteness Theorems
- CSCI 570: Analysis of Algorithms
  - Graduate level introduction algorithms course for CS Masters students and Ph.D students from other engineering fields
- CSCI 303: Analysis of Algorithms
- CSCI 270: Introduction to Algorithms and Theory of Computing
  - Undergraduate algorithms classes, covering algorithm design, NP-completeness, and undecidability

*Grader*

**August 2014 to December 2014**

- CSCI 476: Cryptography: Secure Communication and Computation

PROGRAMS AND  
ORGANIZATIONS

Annenberg Graduate Fellowship Program  
IEEE, Upsilon Pi Epsilon, Eta Kappa Nu, Tau Beta Pi  
W.V.T. Rusch Undergraduate Engineering Honors Program, Jan. 2006 - May 2010

CITIZENSHIP

USA

LANGUAGES

English (Native), Hungarian (A2)

Joe is a brilliant young PhD student in theoretical computer scientist with a significant background in pure math. He contributed substantially to my research project, Strata in Complex Analysis, and co-authored a book on that topic with myself and several others.

I recommend him for the ACT school.

Leonard Adleman, USC