

# jacobdenson

Mathematician

## Interests

Harmonic Analysis,  
Ergodic Theory, and  
Complex Geometry.

## Contact Information

Additional Contact  
Info Redacted For  
Web Version  
denson@ualberta.ca

## Websites

Github Profile: [jake](#)

Stack Overflow Profile:  
[jacob-denson](#)

<https://jake.github.io/>

## Languages

English, Elementary  
German and Chinese,  
Python, Perl, C++, C,  
C#, Matlab, HTML,  
Javascript, Latex (This  
resume is proof!)

## Summary

I am a senior at the University of Alberta, intending to apply my strong and diverse knowledge of mathematics to become a solid aid to a future research group in mathematics. My previous work in software engineering at Microsoft has given me strong communication skills, which I hope to apply to the mathematics world. My current breadth of knowledge, and my eagerness to learn more should be a useful asset to your research group.

## Talks<sup>1</sup>

- |      |   |  |
|------|---|--|
| 2016 | <b>Abstract Harmonic Analysis Graduate Class</b>  | University of Alberta, Canada            |
|      | Gave two 20 minute talks, one on the Fourier Stieltjes transform, and the other on Pontryagin duality. In the first, I emphasized the naturality of the generalization of the Fourier transform by proving the weak $*$ density of $L^1(G)$ in $M(G)$ . In the latter, we generalize the Poincare summation formula, which hints at the depth of the duality theorem. |  |
| 2016 | <b>CUMC Undergraduate Conference</b>  | University of Victoria, Vancouver Island |
|      | 'On Molecular Gases and the Natural Numbers', a quick, 20 minute talk introducing Ergodic theory to undergraduate students, and emphasizing its relation to a variety of problems in mathematics, especially number theory.   |  |
| 2016 | <b>Algebraic Topology Graduate Class</b>  | University of Alberta, Canada            |
|      | A 20 minute talk on the Brouwer fixed-point theorem, emphasizing the intuitive vector field interpretation of the theorem, and discussing how the fixed-point theorem relates to the combinatorial game of hex, reflecting the nice interweaving of discrete and point-set methods in algebraic topology.   |  |
| 2015 | <b>Microsoft Intern Talks</b>   | Microsoft Campus, Redmond                |
|      | 'Category Theory for Computer Programmers', My original talk on category theory, shortened to a 20 minutes talk, and edited to reduce mathematical prerequisites and to emphasize the practical uses for the average programmer. Ran a weekly meeting for interns to give talks to the group about various interesting topics.  |  |
| 2015 | <b>Honours Computing Science Seminar</b>  | University of Alberta                    |
|      | 'Category Theory and its relation to Computing Science', an hour-long talk introducing the subject to Honours computing scientists and emphasizing its relation to the Curry Howard isomorphism.  |  |
| 2014 | <b>NLP Research Group</b>   | University of Alberta                    |
|      | 'Cognates for Reconstruction of Native American Language groups', a 20 minute talk emphasizing my work over the summer and explaining the organization method and SVM classification method for identifying cognates.   |  |
| 2013 | <b>RLAI Tea Time Talks</b>  | University of Alberta                    |
|      | 'Room Abstraction in Sokoban', a 15 minute talk introducing the game of Sokoban, its combinatorial issues, and room abstraction as an aid to attacking the game.  |  |

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<sup>1</sup>Notes for my talks can be found on my website: <https://jake.github.io/>

# Experience

## Selected Mathematics Courses (3.96 Math GPA, 3.8 General GPA)<sup>2</sup>

### FUNCTIONAL ANALYSIS

- Banach Spaces (MATH 418 - A)
- Operator Algebras (MATH 519 - A+)
- Abstract Harmonic Analysis (MATH 642)
- Locally Convex Spaces (MATH 518)\*

### COMPLEX ANALYSIS

- Complex Variables (MATH 411 - A-)
- Modular Forms (MATH 681)

### ALGEBRA

- Galois Theory (MATH 424 - A)
- Representation Theory of Lie Algebras (MATH 682)\*

### TOPOLOGY

- Topology (MATH 447 - A+)
- Algebraic Topology (MATH 530 - A+)

### DISCRETE MATHEMATICS

- Combinatorial Optimization (CMPUT 675)
- Fourier Analysis of Boolean Functions\*

### PROBABILITY THEORY

- Stochastic Processes (STAT 580 - A+)
- Multi Armed Bandits (CMPUT 654)

### LOGIC AND THEORETICAL COMPUTING SCIENCE

- Mathematical Logic (PHIL 420 - B+)
- Nonstandard Logical Systems (PHIL 422 - A)
- Formal Language Theory (CMPUT 474 - A)

## Relevant Work & Experience

2015	<b>UNIVERSITY OF ALBERTA</b> 'Tangible Introduction To Computing Science' Teaching Assistant Advised students in the honours stream of Computing Science who were taking CMPUT 275, a class which introduced students to basic algorithmics, such as asymptotic analysis, divide and conquer, dynamic programming, and such. Led office hours weekly and marked assignments.	Edmonton, Alberta
2013-Now	<b>Competitive Programming club</b> Competitor Strong Competitor in Competitive Programming, which presses competitors to find fast solutions to combinatorial problems. Won the Microsoft 2014 Coding for Cash competition, placed 4th in the Alberta Collegiate programming contest in 2014 and 2015. Coached by Zachary Friggstadt (zacharyf@ualberta.ca), ACM world finalist.	

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<sup>2</sup>An asterix indicates a course I plan to take in the winter semester

## Summer Internships

2016	<b>Microsoft</b> Universal Store Mobile Device Forensics Developed algorithms for the mobile section of the Microsoft fraud detection team, which uses machine learning techniques on large data sets to predetermine fraud and protect the accounts of Microsoft store customers. The software I designed is set to be implemented on the two most popular Microsoft phone applications.	Redmond, Washington
2015	<b>Microsoft</b> Universal Store Spell Correction Developed algorithms for data linkage. Utilizing various data-cleansing methods together with the Azure and Bing data-analysis packages, cleansed Microsoft's business partner database, removing redundant info, reducing database entries by 20%. My manager for this project was Aman Kansal (Kansal@microsoft.com). I also worked off-hours with a group of interns to send robot adventurers around the world ( <a href="http://www.projectatlas.ms/">http://www.projectatlas.ms/</a> ), and organized weekly talk sessions!	Redmond, Washington
2014	<b>University of Alberta</b> Natural Language Processing and Cognate Identification Worked with the NLP group at the University of Alberta to develop cognate recognition algorithms. Successfully pushed to create a centralized database for storing cognate information, simplifying the learning process. This program was successfully used by linguists at the University of Alberta to understand the Totonac language group. Garrett Nicolai supervised the project (Nicolai@ualberta.ca).	Edmonton, Alberta
2013	<b>University of Alberta</b> Reinforcement Learning GAMES group Implemented efficient abstraction algorithms to create a Sokoban solver for the RLAI group at the University of Alberta, under mentor Harm Van Seijen (Harm.Van.Seijen@gmail.com).	Edmonton, Alberta

## Awards

2014	<b>Jason Lang Scholarship</b> Awarded to students Alberta post-secondary students continuing full-time in undergraduate programs with outstanding academic achievements.	Alberta Scholarships
2013	<b>Academic Excellence Scholarship</b> Awarded to students with superior academic achievement entering the first year of an undergraduate degree program at the University of Alberta.	University of Alberta
2013	<b>Faculty of Science Academic Excellence Scholarship</b> Awarded annually on the basis of superior academic achievement to students entering the first year of an undergraduate degree program in the Faculty of Science at the University of Alberta.	University of Alberta
2013	<b>Alexander Rutherford Achievement Scholarship</b> To recognize and reward academic achievement at the senior high school level and to encourage students to pursue post-secondary studies.	Alberta Scholarships

## Education

2013-2017	<b>Bachelors in Computing Science</b>	The University of Alberta
2011-2013	<b>International Baccalaureate High School Diploma</b>	Harry Ainlay High School