

Aaron Goldsmith

About Me

My mathematical epiphany came to me when I was twelve. Before that event, I still took interest in and competed in math. I honed both the accuracy and speed of my calculations, whether mental or on a calculator, so that I could give my best at the next competition. But after the event, I was captured by beauty and wonder. Competition faded into a pastime while discovery slipped into the front seat.

What was the event? I merely asked my father how my calculator performed trigonometric computations so easily. Expecting an inscrutable algorithm somewhere behind my LCD display, I had little hope of gleaning anything satisfactory. What he showed me (a few special Taylor series) was unbelievably simple to use, yet I could not imagine how it was discovered. I have since imagined various such paths, yet the simplicity keeps me amazed.

This is also the nature of progress, often. Whether it be the Greeks grappling with the inadequacy of fractions or a modern student suspicious of this "square root of -1," we are invited to dig deeper. The path may be jagged and circuitous, but we are less comfortable not knowing than resting.

My background is in big data and empirical processes. I like to find patterns in data and exploit them in novel ways. I am glad to be part of Assured Science in creating a platform which automates and objectifies the reputation of scientists, allowing them to devote their energy primarily to discovery, rather than grant writing. Particularly, I am interested in allowing postdocs and young professors to become more quickly established through our platform and exploring ways to nicely integrate the field of mathematics into the Assured Science Platform.

Curriculum Vitae

Education

2008–2015 **Doctor of Philosophy, Mathematics**, *Texas A&M University*, College Station, GPA – 3.76.

2005–2007 **Bachelor of Science, Applied Mathematics**, *Missouri University of Science and Technology*, Rolla, GPA – 3.50.
Minor in Physics

Doctoral Thesis

Title *LASSO Asymptotics for Heavy Tailed Errors*
Supervisor Professor Joel Zinn

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Experience

- 2017 **Associate Lecturer**, UNIVERSITY OF WISCONSIN, Madison.
○ Teaching business calculus (117 students).
- 2012–2014 **Instructor**, TEXAS A&M, College Station.
○ Teaching business calculus (93 students).
○ Preparation for graduate real analysis qualifying exam.
○ Summer program or undergraduates entering graduate school.
- 2011–2015 **Grader**, TEXAS A&M, College Station.
○ Ordinary Differential Equations (2 semesters).
○ Undergraduate Probability (5 semesters).
○ Graduate Algebraic Number Theory (1 semester).
- 2008–2011 **Engineering Calculus Teaching Assistant**, TEXAS A&M, College Station.
○ Involved recitation 3 hrs/week and MATLAB 3 hrs/week. I wrote and graded weekly quizzes and exams.

Presentations

- 2013 GRADUATE STUDENT SEMINAR, THE OTHER WORLD I argued that the normal distribution is somewhat overrated and that heavy tail phenomena may be more prevalent than commonly assumed.
- 2011 GRADUATE STUDENT SEMINAR, NUMBERS JUGGLING I talked about Shannon's Juggling Theorem, siteswap notation, and Mobius inversion.
- 2011 GRADUATE STUDENT SEMINAR, HAM SANDWICH THEOREM I highlighted some pretty results like the Borsuk-Ulam and Ham Sandwich Theorems. The turnout was unusually high, since the math department agreed to serve gourmet sandwiches instead of pizza.
- 2007 MS&T OPEN LECTURES These talks were the culmination of a summer self study in Raymond Smullyan's and Melvin Fitting's book "Set Theory and the Continuum Problem." After presenting the necessary background, I led up to Gödel's Consistency Proofs.

Projects

- 2010 MULTIDIMENSIONAL MEDIANS The median of a set of numbers is not difficult to define because \mathbb{R} is an ordered field. Multidimensional data, on the other hand, has no obvious notion of a median. In fact, there is a whole shelf for kinds of medians in \mathbb{R}^p ($p \geq 2$). I tested the viability of a dubious extension (originally proposed by Lopez and Pintado-Romo) of band depth to infinite dimensional functional data. Often, the definition is meaningless in the infinite dimensional setting, so I changed topics.
- 2012 NEAR LASSO REGRESSION The popular LASSO estimator is ℓ^1 -regularized regression. The sharp nature of $\|\cdot\|_1$ near 0 is its main asset, but it can also be a drawback for analysis. To wield more tools from calculus, I considered ℓ^p regularized regression for p slightly larger than 1.

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2013 DISTRIBUTIONS WITH INFINITE VARIANCE Extended a law of large numbers due to Feller for i.n.i.d. distributions (not necessarily identically distributed) with infinite mean. Proved several multidimensional versions of general i.n.i.d. CLT theory.

Problem Solving

- 2005 Invited participant to the USA Mathematical Olympiad
- 2006 Top MS&T William Lowell Putnam Competition scorer since 1991
- 2007 1st place team at Missouri Collegiate Mathematics Competition
- 2008-2015 See Service section for continued leadership and involvement

Service

- 2008-2015 PROBLEM SOLVING I have had great satisfaction in leading problem solving competition teams. I led my high school team to win the Texas state competition in 2005 and my university to win their first Missouri title in 2007. Upon entering graduate school, I spent less time with contrived problems, but still took every opportunity I could find to share the fun. I co-led the Texas A&M Putnam class and am eager to spur on any other undergraduates I happen to cross. I started and led a problem solving group as an off-shoot of the Texas A&M Math Circle. As a consequence, I formed a group of 6th-10th graders to mentor in various competitions ranging from AMC to math debates to summer camp qualifying quizzes.
- 2012-2015 TEXAS A&M MATH CIRCLE The university hosted meetings every Saturday for mathematically curious students in grades 5-8. We particularly focused on dazzling polyhedra, hat games, card tricks, and many other tactile activities. I was involved with generating activities, presenting, setting up, and cleaning up.
- 2009-2011 COLLEGE BOUND Mentored a child from an underprivileged school to encourage him to think about going to college. We met for one hour every week to work on homework. Then, we spent the next hour playing outside with other mentor-mentee pairs.

Interests

- Backgammon
- Juggling
- Traveling
- Hanabi (information theory game)
- Basketball
- Hiking

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