

- CONTACT**            United States Naval Academy            Office: 342 Michelson Hall  
Computer Science Department            (410) 293-6814  
572M Holloway Rd Stop 9F            Email: [roche@usna.edu](mailto:roche@usna.edu)  
Annapolis, MD 21402            Web: <http://www.usna.edu/Users/cs/roche/>
- EXPERIENCE**            **United States Naval Academy**, Annapolis, MD, USA.  
Assistant Professor, Department of Computer Science. Fall 2011–present.
- Symbolic Computation Group**, U. of Waterloo.  
Research assistant and Instructor. Fall 2006–Summer 2011
- Quantum Leap Innovations**, Newark, DE, USA. Research intern, Summer 2006.
- LinBox Research Group**, U. of Delaware.  
Undergraduate researcher, Summer 2004–Spring 2006.  
B. David Saunders, principal investigator.
- EDUCATION**            **University of Waterloo**, Waterloo, ON, Canada. Degree completed April 2011.  
Ph.D., Computer Science  
Thesis: **Efficient Computation with Sparse and Dense Polynomials**
- Supervisors: Mark Giesbrecht and Arne Storjohann
  - Committee: Erich Kaltofen, Kevin Hare, Ian Munro, Jeffrey Shallit
  - Area: Symbolic Computation
  - Average: 96.75/100
- University of Delaware**, Newark, DE, USA. Degrees conferred May 2006.  
B.S., Computer and Information Sciences  
B.S., Mathematical Sciences  
B.Music, Applied Music Instrumental, Tuba
- Summa Cum Laude
  - General Honors Award
  - Average: 3.96/4
- MAJOR AWARDS**            **Outstanding Achievement in Graduate Studies**, June 2011.  
Awarded to one Ph.D. student per year in the faculty of mathematics.
- NSERC Vanier Canada Graduate Scholarship**, Spring 2009–Winter 2011.  
\$50,000/year, top prize in Canada for graduate students in Science and Engineering
- David R. Cheriton Graduate Scholarship**, Winter 2008–Spring 2009.  
**Quantum Leap Innovations Outstanding Senior Award**, Spring 2006.  
**William D. Clark Prize**, Spring 2006.

PEER-REVIEWED  
JOURNAL  
PUBLICATIONS\*

Mark Giesbrecht, Daniel S. Roche, and Hrushikesh Tilak.  
**Computing sparse multiples of polynomials.**  
*Algorithmica*, in press. [arXiv:1009.3214](https://arxiv.org/abs/1009.3214)

Daniel S. Roche. **Chunky and Equal-Spaced Polynomial Multiplication.**  
*Journal of Symbolic Computation*, Vol. 46, Issue 7, Jul. 2011, pp. 791–806.  
[doi:10.1016/j.jsc.2010.08.013](https://doi.org/10.1016/j.jsc.2010.08.013)

Mark Giesbrecht and Daniel S. Roche.  
**Detecting lacunary perfect powers and computing their roots**  
*Journal of Symbolic Computation*, Vol. 46, Issue 11, Nov. 2011, pp. 1242–1259.  
[doi:10.1016/j.jsc.2011.08.006](https://doi.org/10.1016/j.jsc.2011.08.006)

Mark Giesbrecht and Daniel S. Roche.  
**Complexity of Shifted-Lacunary Polynomial Interpolation**  
*Computational Complexity*, Vol. 19 No. 3, 2010, pp. 333–354.  
[doi:10.1007/s00037-010-0294-0](https://doi.org/10.1007/s00037-010-0294-0)

REFEREED  
CONFERENCE  
PUBLICATIONS\*

Mark Giesbrecht and Daniel S. Roche. **Diversification improves interpolation.**  
International Symposium on Symbolic and Algebraic Computation (ACM ISSAC), 2011.  
[doi:10.1145/1993886.1993909](https://doi.org/10.1145/1993886.1993909)

Mark Giesbrecht, Daniel S. Roche, and Hrushikesh Tilak.  
**Computing sparse multiples of polynomials** (extended abstract).  
International Symposium on Algorithms and Computation (ISAAC), 2010.  
[doi:10.1007/978-3-642-17517-6\\_25](https://doi.org/10.1007/978-3-642-17517-6_25)

David Harvey and Daniel S. Roche. **An in-place truncated Fourier transform and applications to polynomial multiplication.**  
International Symposium on Symbolic and Algebraic Computation (ACM ISSAC), 2010.  
[doi:10.1145/1837934.1837996](https://doi.org/10.1145/1837934.1837996)

Daniel S. Roche. **Space- and Time-Efficient Polynomial Multiplication.**  
International Symposium on Symbolic and Algebraic Computation (ACM ISSAC), 2009.  
[doi:10.1145/1576702.1576743](https://doi.org/10.1145/1576702.1576743)

Mark Giesbrecht and Daniel S. Roche. **On Lacunary Polynomial Perfect Powers.**  
International Symposium on Symbolic and Algebraic Computation (ACM ISSAC), 2008.  
[doi:10.1145/1390768.1390785](https://doi.org/10.1145/1390768.1390785)

Daniel S. Roche. **Adaptive Polynomial Multiplication.**  
Milestones in Computer Algebra (MICA), 2008.

Mark Giesbrecht and Daniel S. Roche.  
**Interpolation of Shifted-Lacunary Polynomials [Extended Abstract]**  
Mathematical Aspects of Computer and Information Sciences (MACIS), 2007.

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\*All authors listed alphabetically

TEACHING

**United States Naval Academy**, Assistant Professor.

- SI 413: Programming Languages and Implementation, Fall 2011.

**University of Waterloo**, Instructor, Instructional Apprentice, Teaching Assistant.

- CS 240: Data Structures and Data Management, Winter 2010 & Spring 2011.
- CS 135: Designing Functional Programs, Fall 2008.
- CS 135: Designing Functional Programs, Fall 2007.
- CS 136: Elementary Algorithm Design and Data Abstraction, Spring 2007.
- CS 134: Principles of Computer Science, Winter 2007.
- CS 341: Algorithms, Winter 2009.
- CS 487/687: Introduction to Symbolic Computation, Winter 2008.
- CS 134: Principles of Computer Science, Fall 2005.

**University of Delaware**, Teaching Assistant.

- CISC 181: Introduction to Computer Science, Spring 2006.
- CISC 105: General Computer Science, Fall 2005.
- MATH 245: Introduction to Proof, Fall 2005–2006.
- MUSC 285/6: Advanced Ear Training and Sight Singing. 2005–2006.
- MUSC 185/6: Ear Training and Sight Singing. 2004–2005.

SEMINARS AND  
INVITED TALKS

**Stable Sparse Interpolation with Fewer Samples.**

Fields Workshop on Hybrid Methodologies for Symbolic-Numeric Computation, November 18, 2011.

**Between Dense and Sparse Polynomial Multiplication.**

Computer Science Colloquium, Drexel University, May 9, 2011.

**Sparse interpolation and small primes in arithmetic progressions.**

Number theory session, CMS Winter Meeting,  
Windsor, Ontario, Canada, December 5, 2009.

**Fast and Small: Multiplying Polynomials without Extra Space.**

CECM Day, Simon Fraser University, July 24, 2009.

**Memory Efficiency in Polynomial Multiplication.**

ACA Session on High-Performance Computer Algebra,  
Montréal, Québec, Canada, June 26, 2009.

**Techniques for Finite Field Arithmetic.**

Number Theory Learning Seminar, U. of Waterloo, June 4, 2009.

**Fast Multiplication without Extra Space.**

Symbolic Computation Group (SCG) Seminar, U. of Waterloo, February 23, 2009.

**Interpolation of Shifted-Lacunary Polynomials.**

SIG Theory and Algorithms Seminar, U. of Delaware, January 9, 2009.

**Fast Multiplication with Low Space Complexity.**

AMS Special Session on SAGE and Mathematical Research Using Open Source Software, Joint Mathematics Meetings, Washington, D.C., U.S.A., January 8, 2009.

**The LinBox Project for Linear Algebra Computation: A Practical Tutorial.**

MOCAA M<sup>3</sup> workshop in computational algebra, U. of Western Ontario, May 8, 2008.

**Adaptive Polynomial Multiplication.**

Ontario Research Centre for Computer Algebra (ORCCA) Joint Lab Meeting,  
U. of Western Ontario, March 14, 2008.

**Complexity of Shifted-Lacunary Polynomial Interpolation.**

SCG Seminar, U. of Waterloo, December 13, 2007.

**Matrix Input and Toeplitz Determinant:  
Undergraduate Research Projects with LinBox.**

SCG Lab Meeting, U. of Waterloo, December 8, 2006.

SERVICE AND  
OTHER ACTIVITIES

**ECCAD 2012**, organizer.

**ISSAC 2011**, poster committee member.

**ECCAD 2011**, organizer.

**Referee for:**

- ACM SIGSAM Bulletin
- Algorithmic Number Theory Symposium (ANTS)
- Computer Algebra in Scientific Computing (CASC)
- International Symposium on Algorithms and Computation (ISAAC)
- International Symposium on Symbolic and Algebraic Computation (ISSAC)
- Journal of Symbolic Computation (JSC)
- Milestones in Computer Algebra (MICA)
- Parallel Symbolic Computation (PASCO)
- Symbolic Numeric Computation (SNC)
- Symposium on Theoretical Aspects of Computer Science (STACS)
- Theoretical Computer Science (TCS)

**ACM SIGSAM**, web site design and maintenance.

**Math Faculty Players**, 2007-present.

Put on skits for new graduate students.

**Departmental Graduate Committee**, 2010–present.

**Faculty Committee on Student Appeals**, 2008-2010.

**Graduate Recruitment Committee**, 2008–2009.

Helped create grad brochure and organize grad open house.

**Computer Science Mentoring Program**, 2010-2011.

**Ontario Universities Fair**, Toronto, September 29, 2007.

**International Symposium on Symbolic and Algebraic Computation (ISSAC)**,

Waterloo, ON, July 29–August 1, 2007.

**Imperial Oil Seminar in CS for Young Women**, UW, May 20–25, 2007.

**CS4U Day**, UW, November 18, 2006.

**UW Day (Fall Open House)**, UW, November 4, 2006.

**Musician** (trombone/tuba). Currently playing with:

- Guelph Symphony Orchestra
- Wellington Winds Concert Band
- Brass Essentials Quintet
- orchestra@uwaterloo
- Ebytown Brass Band

AWARDS

**Outstanding Achievement in Graduate Studies Designation (Doctoral)**.

Faculty of Mathematics, University of Waterloo, June 2011.

Awarded to one Ph.D. student each year in each faculty.

**NSERC Vanier Canada Graduate Scholarship**, Spring 2009.

“The Vanier CGS program aims to attract and retain world-class doctoral students by supporting students who demonstrate a high standard of scholarly achievement in graduate studies in the social sciences and humanities, natural sciences and engineering, and health; as well as leadership skills.”

**TA Award**, UW, Winter 2009.

**David R. Cheriton Graduate Scholarship**,

U. of Waterloo School of Computer Science, Winter 2008.

“... on the basis of scholastic excellence and a demonstrated interest in research that addresses problems associated with designing and implementing efficient and reliable computing systems, along with their effective integration.”

**Entrance Scholarship**, UW, Fall 2006.

**International Doctoral Student Award**, UW, Fall 2006.

**Panel of Distinguished Seniors**, U. of Delaware, Spring 2006.

“In recognition of outstanding scholarship, presented to a panel comprised of one senior in each college.”

**Quantum Leap Innovations Outstanding Senior Award**, UD, Spring 2006.

“Awarded to a senior computer science major in recognition of superior academic performance in computer science.”

**William D. Clark Prize**, UD, Spring 2006.

“Presented only when a senior majoring in mathematics has, in the opinion of the department, unusual ability in the area.”

**National Science Foundation Graduate Research Fellowship**,

Honorable Mention, 2006 and 2007.

**Department of Computer Science Outstanding Student Award**, Spring 2005.

**Delaware State Music Teachers Association Award**, Spring 2006.

**Pi Kappa Lambda Award**, Spring 2006.

**Theodore Presser Scholarship**, Spring 2005.

CONFERENCE  
PARTICIPATION

**Fields Workshop on Hybrid Methodologies for Symbolic-Numeric Computation**, Waterloo, Ontario, Canada, November 16–19, 2011.

**International Symposium on Symbolic and Algebraic Computation (ACM ISSAC)**

- San Jose, California, U.S.A., June 8–11, 2011
- Munich, Germany, July 25–28, 2010
- Seoul, Republic of Korea, July 28–31, 2009
- Linz, Austria, July 20–23, 2008
- Waterloo, Ontario, Canada, July 29–August 1, 2007

**Jo60: A Modern Computer Algebraist**, Bonn, Germany, May 27–29, 2010.

**East Coast Computer Algebra Day (ECCAD)**

- Waterloo, Ontario, Canada, April 9, 2011
- Atlanta, Georgia, USA, May 15, 2010
- Kingston, Rhode Island, USA, May 2, 2009
- Shepherdstown, West Virginia, USA, May 10, 2008
- Chestertown, Maryland, USA, April 21, 2007
- Philadelphia, Pennsylvania, USA, May 6, 2006

**Canadian Mathematical Society (CMS) Meetings**

- Windsor, Ontario, Canada, December 5–7, 2009
- Montréal, Québec, Canada, June 1–5, 2008
- London, ON, Canada, December 8–10, 2007
- Winnipeg, Manitoba, Canada, May 31–June 3, 2007

**Symbolic Numeric Computation (SNC)**

- Kyoto, Japan, August 3–5, 2009
- London, Ontario, Canada, July 25–27, 2007

**Applications of Computer Algebra (ACA)**

- Montréal, Québec, Canada, June 24–28, 2009
- Linz, Austria, July 27–30, 2008

**AMS/MAA Joint Mathematics Meetings**, Washington, D.C., January 5–8, 2009.

**Milestones in Computer Algebra (MICA)**, Stonehaven Bay, Trinidad and Tobago, May 1–3, 2008.

**Mathematical Aspects of Computer and Information Sciences (MACIS)**, Paris, France, December 5–7, 2007.

POSTERS

**Faster Sparse Interpolation over Finite Fields and Complex Numbers.**  
East Coast Computer Algebra Day (ECCAD) 2011.

**Complexity of Sparsest Multiple Computation.**  
East Coast Computer Algebra Day (ECCAD) 2010.

**Fast Multiplication with Low Space Complexity.**  
Cheriton Research Symposium, September 2008.  
East Coast Computer Algebra Day (ECCAD) 2009.

**Automatic Variable Order Selection for Polynomial System Solving**  
(with Mark Giesbrecht, John May, Marc Moreno Maza, and Yuzhen Xie).  
Milestones in Computer Algebra (MICA) 2008.

**Detecting Polynomial Perfect Powers** (with Mark Giesbrecht).  
East Coast Computer Algebra Day (ECCAD) 2008.  
Second Canada-France Congress (CMS/MITACS), 2008.

**New Algorithms for Lacunary Polynomials** (with Mark Giesbrecht).  
CMS/MITACS Joint Meeting, 2007.  
International Symposium on Symbolic and Algebraic Computation (ACM ISSAC) 2007.