

## Name

Michael Soltys-Kulinicz

## Address

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## Educational Background

- Ph.D.** University of Toronto, Computer Science/Mathematics, 2001  
Thesis title: *Complexity of Derivations of Matrix Identities*  
Adviser: Professor Stephen A. Cook  
Area: Computational Complexity and Logic
- M.Sc.** University of Toronto, Mathematics, 1996  
Adviser: Professor Luis Seco
- Hon. B.Sc.** University of Toronto, Mathematics, 1995

## Current Status

Since 2014, Professor & Chair of Computer Science at CSU Channel Islands.

## Areas of Interest

**Algorithms:** I am especially interested in proofs of correctness of algorithms, as well as issues related to complexity and logic (my PhD thesis was on the algorithmic and logical foundations of linear algebra). I have just finished writing the 3rd editions of my book on the analysis of algorithms, and I have written a book on complexity. I am interested in algorithmic applications to combinatorial matrix theory, strings, ranking and proof complexity. **Cybersecurity:** My work includes consulting and development in information security and digital forensics. I work for the SoCal High Technology Task Force (HTTF) and I am the directory of security for Executek International.

## Academic Employment History

August 2014	<b>Professor and Chair</b> California State University at Channel Islands Chair of Computer Science
August 2014	<b>Adjunct Professor</b> McMaster University, Computing and Software
July 2013	<b>Professor</b> McMaster University, Computing and Software
July 2006	<b>Associate Professor</b> McMaster University, Computing and Software
July 2012–December 2012	<b>Visiting Professor</b> Department of Mathematics, University of California at San Diego
August 2007–June 2008	<b>Visiting Ulam Professor</b> Department of Mathematics, University of Colorado at Boulder
February 2008	<b>Visiting Scholar</b> <i>XV Escuela de Verano de Ciencias Informáticas</i> Departamento de Computación, Universidad Nacional de Río Cuarto
May and June 2007	<b>Visiting Scholar</b> Algorithmics Research Group, Jagiellonian University
July 2001–July 2006	<b>Assistant Tenure-track Professor</b> McMaster University, Computing and Software
1999–2001	<b>Lecturer</b> , University of Toronto, Computer Science

## Teaching

See: <http://prof.msoltys.com/teaching>

## Supervision of Graduate Students

1. **M.Sc.** Eric Gentry, completed May 2019.  
Thesis title: *SEAKER: A Mobile Digital Forensic Triage Device*.
2. **M.Sc.** Geetanjali Agarwal, completed December 2018.

Thesis title: *Aneka: Detecting various forms of the same wavelet image hashing algorithm.*

3. **M.Sc.** Ryan McIntyre, completed May 2018.  
Thesis title: *Bounding the size of minimal clique covers.*
4. **M.Sc.** Deepa Suryawanshi, to be completed May 2018.  
Thesis title: *Image Recognition.*
5. **M.Sc.** Chris Kuske, completed May 2018.  
Thesis title: *Derivation of consistent pairwise matrices.*
6. **M.Sc.** Dhruv Pandya, completed December 2017.  
Thesis title: *Voyager: Identifying IPs from Online Clicks.*
7. **M.Sc.** Hita Gambheer, completed December 2016.  
Thesis title: *Design Safety Verification of Medical Device Models using Automata Theory.*
8. **M.Sc.** Joel Helling, completed May 2017.  
Thesis title: *Constructing an Indeterminate String from its Associated Graph.*
9. **Ph.D.** Neerja Pophli, completed August 2016.  
Thesis title: *A Generalization of Square-Free Strings.*
10. **Ph.D.** Mohamed Sabry, in progress, expected to finish 2018.  
Subject: *Complexity/Cryptography.*
11. **Ph.D.** Ariel Fernández, completed August 2013.  
Thesis title: *Formalizing combinatorial matrix theory.*
12. **M.Eng.** Filip Jeremic, completed May 2013. Project title: *Parallel Lattice Basis Reduction.*
13. **M.Sc.** Dragan Rakas, completed May 2013.  
Thesis title: *A Proof of Concept for Homomorphically Evaluating an Encrypted Assembly Language.*
14. **M.Eng.** Mohamed Sabry, completed May 2011.  
Thesis title: *An implementation of the GGH cryptosystem.*
15. **Ph.D.** Greg Herman, completed March 2009.  
Thesis title: *Unambiguous functions in logarithmic space.*

16. **M.Sc.** Craig Wilson, completed May 2008.  
Thesis title: *Computing winning strategies for poset games.*
17. **M.Sc.** Tim Paterson, completed April 2006.  
Thesis title: *A propositional proof system with permutation quantifiers.*
18. **M.Sc.** Yu-Tong HE, co-supervised with Dr. Janicki, completed June 2003.  
Thesis title: *Verification of the WAP Transaction Layer using Model Checker SPIN.*

## Publications

### Books

1. Michael Soltys, *An introduction to the analysis of algorithms*, World Scientific Publishing, 3rd edition, 328 pages, 2018.
2. Michael Soltys, *An introduction to computational complexity*, Jagiellonian University Press, 143 pages (ISBN: 978-83-233-2864-3), 2009.

### Peer reviewed journal papers

3. Konrad Kułakowski, Jiří Mazurek, Jaroslav Ramík and Michael Soltys, *When is the condition of order preservation met?*, European Journal of Operational Research, 277:248–254, 2019
4. Eric Gentry, Frank Lyu, Ryan McIntyre and Michael Soltys, *SEAKER: A tool for fast digital forensic triage*, Advances in Information and Communication, Springer 2019. (Journal version of paper [45](#).)
5. Ryan McIntyre and Michael Soltys *An improved upper bound and algorithm for clique covers*, Journal of Discrete Algorithms, 48:42–56, 2018.
6. Joel Helling, P.J. Ryan, W.F. Smyth, Michael Soltys, *Constructing an Indeterminate String from its Associated Graph*, Journal of Theoretical Computer Science, 710:88–96, February 2018.
7. Neerja Mhaskar and Michael Soltys *A formal framework for stringology*, Journal of Discrete Applied Mathematics, 2018. (Long journal version of [31](#).)
8. Ariel Fernández, Ryszard Janicki and Michael Soltys, *Computing covers from matchings with permutations*, accepted for publication in the International Journal of Computer Applications, 2017. (Long journal version of [29](#).)

9. Waldemar W. Koczkodaj and Dominik Strzalka and Jean-Pierr Magnot and Jiri Mazurek and James Peters and Michael Soltys and Jacek Szybowski and Arturo Tozzi and Hojjat Rakhshani, *On normalization of inconsistency indicators in pairwise comparisons*, International Journal of Approximate Reasoning, 86:73–79, July 2017.
10. Waldemar W. Koczkodaj, Ludmil Mikhailov, Grzegorz Redlarski, Jacek Szybowski, Gaik Tamazian, Michael Soltys, Elisa Wajch and Kevin Kam Fung Yuen, *Important Facts and Observations about Pairwise Comparisons*, Special Issue on Pairwise Comparisons in Fundamenta Informaticae, 144(3-4):291–307, 2016.
11. Barbara Sandrasagra and Michael Soltys, *Complex Ranking Procedures*, Special Issue on Pairwise Comparisons in Fundamenta Informaticae, 144(3-4):223–240, 2016.
12. Michael Soltys, *A formal approach to ranking procedures*, International Journal of Knowledge-based and Intelligent Engineering Systems, 19(4): 225-234, 2015.
13. Neerja Mhaskar and Michael Soltys, *String Shuffle: Circuits and Graphs*, Journal of Discrete Algorithms, 31:120-128, March 2015.
14. Sam Buss and Michael Soltys, *Unshuffling a Square is NP-Hard*, Journal of Computer and System Sciences, 80(4):766-776, 2013.
15. Michael Soltys, *Proving properties of matrices over  $\mathbb{Z}_2$* , Archive for Mathematical Logic, 51(5):535–551, 2012.
16. Grzegorz Herman and Michael Soltys, *Unambiguous functions in logarithmic space*, Fundamenta Informaticae, 114(2):129–147, 2012.
17. Michael Soltys, *Feasible proofs of Szpilrajn’s theorem: A proof-complexity framework for concurrent automata*, Journal of Automata, Languages and Combinatorics, 16(1):27–38, 2011.
18. Michael Soltys and Craig Wilson, *On the complexity of computing winning strategies for finite poset games*, Theory of Computing Systems, 48(3):680–692, 2011.
19. Grzegorz Herman and Michael Soltys, *On the Ehrenfeucht-Mycielski sequence*, Journal of Discrete Algorithms, 7(4):500–508, 2009.
20. Grzegorz Herman, Tim Paterson and Michael Soltys, *A propositional proof system with quantification over permutations of variables*, Fundamenta Informaticae, 79(1–2):71–83, 2007.

21. Michael Soltys, *The proof theoretic strength of the Steinitz Exchange Theorem*, Discrete Applied Mathematics, 155(1):53–60, 2007.
22. Michael Soltys, *LA, Permutations, and the Hajos Calculus*, Theoretical Computer Science, 348(2–3):321–333, December 2005.
23. Neil Thapen and Michael Soltys, *Weak Theories of Linear Algebra*, Archive for Mathematical Logic, 44(2):195–208, 2005.
24. Michael Soltys and Stephen Cook, *The complexity of derivations of matrix identities*, Annals of Pure and Applied Logic, 130(1–3):207–275, December 2004.
25. Michael Soltys and Alasdair Urquhart, *Matrix Identities and the Pigeonhole Principle*, Archive for Mathematical Logic, 43(3):351–358, April 2004.
26. Michael Soltys, *Extended Frege and Gaussian Elimination*, Bulletin of the Section of Logic, 31(4):1–17, 2002.
27. Michael Soltys, *Berkowitz’s Algorithm and Clow Sequences*, Electronic Journal of Linear Algebra, 9:42–54, 2002.
28. Stephen Cook and Michael Soltys, *Boolean Programs and Quantified Propositional Proof Systems*, Bulletin of the Section of Logic, 28(3):119–129, 1999.

### Peer reviewed conference proceedings

29. Ariel Fernández, Ryszard Janicki and Michael Soltys, *A permutation-based algorithm for computing covers from matchings*, in 32nd International Conference on Computers and Their Applications (CATA2017), March 2017.
30. Waldemar Koczkodaj and Michael Soltys, *Consistency-driven Pairwise Comparisons Approach to Abandoned Mines Hazard Rating*, in the 7th International Conference on Computational Methods (ICCM2016), August 2016.
31. Neerja Mhaskar and Michael Soltys, *A formal framework for Stringology*, in the Proceedings of the 21st Prague Stringology Conference, 2016.
32. Neerja Mhaskar and Michael Soltys, *A formal framework for Stringology*, Proceedings of the 20th Prague Stringology Conference, 2015.
33. Neerja Mhaskar and Michael Soltys, *Non-repetitive strings over alphabet lists*, WALCOM: Algorithms and Computation, volume 8973 of Lecture Notes in Computer Science, pages 270–281, February 2015.

34. Michael Soltys, *Fair ranking in competitive bidding procurement: A case analysis*, 18th International Conference in Knowledge Based and Intelligent Information and Engineering Systems (KES), volume 35 of Procedia Computer Science, pages 1138–1144, Pomorski Park Naukowo-Techniczny (PPNT), Gdynia, September 2014. **Best Paper Award.**
35. Ariel Fernández and Michael Soltys, *Feasible combinatorial matrix theory*, 38th International Symposium on Mathematical Foundations of Computer Science (MFCS), volume 8087 of Lecture Notes in Computer Science, pages 777–788, IST, Klosterneuburg, Austria, August 2013.
36. Michael Soltys, *Circuit complexity of shuffle*, the International Workshop on Combinatorial Algorithms (IWOCA), volume 8288 of the Lecture Notes in Computer Science, pages 402–411, Rouen, France, July 2013.
37. Katharine Blanchard and Michael Soltys, *Perceptions of foundational knowledge by computer science students*, 17th Western Canadian Conference on Computing Education (WCCCE), pages 19–23, University of British Columbia, Vancouver, May 2012.
38. Michael Soltys, *The proof theoretic strength of the Steinitz exchange theorem*, 10th Meeting on Computer Algebra and Applications (EACA), pages 174–177, Seville, September 2006.
39. David L. Parnas and Michael Soltys, *Basic Science for Software Developers*, in: eds. R. T. Boute and J. N. Oliveira, *Formal Methods in the Teaching Lab Workshop (Workshop at 14th International Symposium on Formal Methods)*, pp. 15–20, 2006.
40. Michael Soltys, *Feasible Proofs of Matrix Properties with Csanky’s Algorithm*, 19th International Workshop Computer Science Logic (CSL), volume 3634 of Lecture Notes in Computer Science, pages 493–508, Oxford, August 2005.
41. Michael Soltys, *LA, Permutations, and the Hajos Calculus*, 31st International Colloquium on Automata, Languages and Programming (ICALP), volume 3142 of Lecture Notes in Computer Science, pages 1176–1187, Turku, July 2004.
42. Michael Soltys, *Matrix algebra with quantification over permutations*, 9th Meeting on Computer Algebra and Applications (EACA), pages 301–305, Santander, July 2004.
43. Michael Soltys, *Finite Fields and Propositional Proof Systems*, The 7th World Multiconference on Systemics, Cybernetics and Informatics, pages 141–146, Orlando, Florida, July 2003.

44. Michael Soltys and Stephen Cook, *The Proof Complexity of Linear Algebra*, 17th Annual IEEE Symposium on Logic in Computer Science (LICS), pages 335–344, Copenhagen, July 2002.

### Peer reviewed presentations at meetings

45. Eric Gentry, Frank Lyu, Ryan McIntyre and Michael Soltys, *SEAKER: A tool for fast digital forensic triage*, Future of Information and Communications Conference (FICC), 2019, San Francisco.
46. Carlos Adrián Gomez, Michael Soltys and Adam Sędziwy, *iSprinkle: when education, innovation and application meet*, 5th International Conference on Educational Innovation in Technical Careers, INDOTEC 2017, Granada, Spain.
47. Ariel Fernández and Michael Soltys, *Feasible combinatorial matrix theory: polytime proofs for König’s Min-Max and related theorems*, short presentation at LICS 2013, New Orleans, Tulane University (same paper as [35](#)).
48. Michael Soltys and Greg Herman, *Unambiguous functions in logarithmic space*, 5th Conference on Computability in Europe (CiE), (pages 162–175 in booklet of presented papers), Heidelberg, August 2009.
49. Michael Soltys and Craig Wilson, *On the complexity of computing winning strategies for finite poset games*, 4th Conference on Computability in Europe (CiE), (pages 415–424 in booklet of presented papers), Athens, June 2008.
50. Michael Soltys, *Feasible proofs of matrix identities with Csanky’s algorithm*, The 7th International Workshop on Logic and Computational Complexity, LCC, affiliated with the 20th Annual IEEE Symposium on Logic in Computer Science (LICS), Chicago, June 2005.

### Technical reports

51. Michael Soltys, *Gaussian lattice reduction algorithm terminates in polynomial time*, McMaster Computing and Software Technical Report (CAS-11-10-MS), 2011.
52. Michael Soltys, *A note on finding a rational symmetric matrix for a given separable polynomial*, McMaster Computing and Software Technical Report (CAS-08-12-MS), 2008.
53. Greg Herman and Michael Soltys, *A polytime proof of correctness of the Rabin-Miller algorithm from Fermat’s little theorem*, arXiv (CoRR abs/0811.3959), 2008.



54. David L. Parnas and Michael Soltys, *Basic Science for Software Developers*, McMaster SQRL Technical Report (7), 2002.
55. Michael Soltys, *A Model-Theoretic Proof of the Completeness of LK Proofs*, McMaster Computing and Software Technical Report (CAS-06-05-MS), 1999.

### Editorial Board

56. David Bremner, Antoine Deza and Michael Soltys, *Foreword: selected papers from the Franco-Canadian workshop on combinatorial algorithms*, Journal of Combinatorial Optimization, 16(4):323, 2008.

For a list of selected talks see my web page.

### Honors and Awards

1. The Kościuszko Foundation Collegium of Eminent Scientists of Polish Origin and Ancestry, 2018.
2. CSU Channel Islands, 2016 Business & Technology Partnership Leadership Award.
3. Best Paper award at KES'2014 conference (see *Peer reviewed conference proceedings* paper number [34](#)).
4. The Best Prof Award on April 10, 2013, from the Software Engineering Club.
5. McMaster Student Union teaching award for the faculty of Engineering, 2010/2011.
6. Ulam Visiting Professor Fellowship, University of Colorado at Boulder, 2007/2008
7. University of Toronto, Computer Science Student Union, award for teaching excellence 1999/2000.