

Paul Tarau

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Education:

- Ph.D. - Computer Science 1990 - Université de Montreal
- M.Sc. - Computer Science 1986 - Université Laval (Quebec)
- B.Sc. - Mathematics 1975 - University of Bucharest

Citizenship

USA+Canada

Positions held:

- Tenured Full Professor at Univ. of North Texas, from Sept 2013
- Tenured Associate Professor at Univ. of North Texas, from Sept 2000
- Tenure Track Associate Professor at Univ. of North Texas, Sept 1998-Aug 2000
- Tenure Track Associate Professor at Louisiana Tech University, from Dec 1997- to Aug 1998
- Tenured Associate Professor 1994-1997 at Univ. of Moncton
- Tenured Assistant Professor 1989-1994 at Univ. of Moncton
- Tenure track teaching position at University of Moncton since 1986-1989

Research

Research Philosophy

I have explored of a fairly wide spectrum of Computer Science research fields. Synergies between them are found and exploited when solving problems in a new field and they have turned out to be useful also when revisiting a familiar one. The following are some of the research fields where my work has resulted in an overall h-index of **24** and a number of high impact publications (with citation counts of most influential papers in parenthesis):

- natural language processing (627, 133, 111)
- program transformations and implementation of logic programming languages (86, 75)

- agent infrastructures, mobile code, distributed programming models, NLP-enabled knowledge-based chat agents (54)
- compiler writing, runtime systems, memory management (51, 37)
- logic programming and logic grammars (62,29)

While aware of the status of being a “visitor”, a large majority of my research papers are attempts to “paradigm shifting” rather than “paradigm consolidation” - i.e. they are typically high-risk/high reward exploratory research work. For instance, the highest ranked paper that I have co-authored is [1], currently (Jan. 2014) at more than **800** citations. It has started a fast growing new research field - Graph based Methods for Natural Language Processing with a few thousand papers and a series of 8 “TextGraphs” workshops on the subject.

On the other hand, my newest research interest is a sharp departure from everything I have worked previously. **21** out of my **24** papers published between 2009 and 2013 are focussed on modeling foundational aspects of finite mathematics driven by an effort to provide a unified theory of fundamental data types through executable shared axiomatizations and bijective data transformations. While sometime my research focus is theoretical in nature, I am a strong believer in fully replicable research. Literate programming – a complete executable specification of the concepts discussed – is a distinctive feature of these 17 papers allowing readers to easily test their technical correctness and reuse their content. Two recent NSF grants and the acceptance of the 20+ papers at competitive international conferences seem to validate this entirely new research direction.

Currently Active Research Threads

- Declarative Modeling of Finite Mathematics (Computations with Trees, Hereditarily Finite Sets and Functions, Bijective Data Type Transformations, Efficient Gödel numberings, Ranking/Unranking functions, Self-delimiting codes)
- Design and Implementation of Declarative Programming Languages
- Natural Language Processing, Logic Programming and Logic Grammars
- Scala, Java and Prolog based Agent Infrastructures
- Compilers, Run-time Systems and Automatic Memory Management
- Exact Circuit Synthesis Algorithms

Publications

- **Refereed Journal papers:** [2] [3] [4] [5, 6] [7, 8] [9] [10, 11, 12] [13, 14] [15, 16, 17, 18]
- **Refereed International Conferences and Workshops:**
2017 [19, 20, 21, 22] **2016** [23, 24, 25, 26, 27, 28]
2015: [29, 30, 31, 32, 33, 34]
2014: [35, 36, 37, 38, 39, 40, 41, 42] **2013:** [43, 44, 45] **2012:** [46, 47, 48, 49, 50] **2011:** [51, 52, 53, 54, 55, 56, 57, 58] **2010:** [59, 60, 61, 62, 63, 64] **2009:** [65, 65, 66, 67, 68, 69], **2008:** [70, 71, 72, 73, 74, 75] **2007 and before:** [76, 77], [78, 79, 80, 81, 82] [83, 84, 85, 86, 87, 88, 1, 89, 90, 91] [92, 93, 94, 95, 96] [97] [98], [99, 100, 101, 102, 103, 104] [105, 106, 107, 108, 109] [110, 111, 112, 113, 114] [115, 116, 117, 118, 119, 120, 121, 122, 123] [124, 125, 126, 127, 128] [129, 130, 131, 132, 133, 134, 135, 136, 137, 138] [139, 140, 141, 142, 143, 144, 145] [146] [147, 148, 149, 150, 151, 152] [153] [154, 155, 156] [157] [158]

- Refereed National Conferences and Workshops: [159, 160, 161]
- Other refereed publications: [112, 162, 163, 164, 165, 166, 167]
- PhD Thesis: [168]
- Invited talks: SYNASC'2012 invited talk [169], INAP'96 Keynote Speech: [170] ILPS'97 Advanced Tutorial: [171], WWW6 LP'97 [172], JICSLP'98 Implementation of (C)LP Languages Workshop T[173] JELIA'98 Invited Talk [174] AGP'99 Invited Talk
- Other publications: [175, 176, 177, 178][179, 180, 181, 182, 183, 184, 185, 186] [187, 188, 189, 190, 191, 192, 193] [194, 172, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210]
- Proceedings Edited [211, 212, 213, 214, 215, 216]

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- [2] Maciej Bendkowski, Katarzyna Grygiel, and Paul Tarau. Random generation of closed simply typed λ -terms: A synergy between logic programming and Boltzmann samplers. *Theory and Practice of Logic Programming*, pages 1–23, 2017. to appear.
- [3] P. Tarau. Arithmetic and boolean operations on recursively run-length compressed natural numbers. *Scientific Annals of Computer Science*, 24(2):287–323, 2014.
- [4] Paul Tarau. Towards a generic view of primality through multiset decompositions of natural numbers. *Theoretical Computer Science*, 537(0):105 – 124, 2014. Theoretical Aspects of Computing (ICTAC 2011).
- [5] Paul Tarau. Compact Serialization of Prolog Terms (with Catalan Skeletons, Cantor Tupling and Gödel Numberings) . *Theory and Practice of Logic Programming*, 13(4-5):847–861, 2013.
- [6] David Haraburda and Paul Tarau. Binary trees as a computational framework. *Computer Languages, Systems & Structures*, 39(4):163 – 181, 2013.
- [7] Paul Tarau. The BinProlog Experience: Architecture and Implementation Choices for Continuation Passing Prolog and First-Class Logic Engines. *Theory and Practice of Logic Programming*, 12(1-2):97–126, 2012.
- [8] Paul Tarau. “Everything Is Everything” Revisited: Shapeshifting Data Types with Isomorphisms and Hylomorphisms. *Complex Systems*, (18):475–493, 2010.
- [9] Paul Tarau and Veronica Dahl. High-Level Networking with Mobile Code and First Order AND-Continuations. *Theory and Practice of Logic Programming*, 1(3):359–380, May 2001. Cambridge University Press.
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- [16] Paul Tarau, Koen De Bosschere, and Bart Demoen. Partial Translation: Towards a Portable and Efficient Prolog Implementation Technology. *Journal of Logic Programming*, 29(1–3):65–83, November 1996.
- [17] K. De Bosschere and P. Tarau. Blackboard-based Extensions in Prolog. *Software — Practice and Experience*, 26(1):49–69, January 1996.
- [18] Paul Tarau. Une machine abstraite optimisée à passage de continuations: l’expérience BinProlog. *Technique et Science Informatique*, 14(6):713–731, 1995.
- [19] Paul Tarau. A Hiking Trip Through the Orders of Magnitude: Deriving Efficient Generators for Closed Simply-Typed Lambda Terms and Normal Forms. In Manuel V Hermenegildo and Pedro Lopez-Garcia, editors, *Logic-Based Program Synthesis and Transformation: 26th International Symposium, LOPSTR 2016, Edinburgh, UK, Revised Selected Papers*, pages 240–255. Springer LNCS, volume 10184, September 2017. , Best paper award.
- [20] Maciej Bendkowski, Katarzyna Grygiel, and Paul Tarau. Boltzmann samplers for closed simply-typed lambda terms. In Yuliya Lierler and Walid Taha, editors, *Practical Aspects of Declarative Languages - 19th International Symposium, PADL 2017, Paris, France, January 16-17, 2017, Proceedings*, volume 10137 of *Lecture Notes in Computer Science*, pages 120–135. Springer, 2017. , Best student paper award.
- [21] O. Bodini and P. Tarau. On Uniquely Closable and Uniquely Typable Skeletons of Lambda Terms. *CoRR*, abs/1709.04302, September 2017.
- [22] Paul Tarau. A Hitchhikers Guide to Reinventing a Prolog Machine. In Tran Cao Son Ricardo Rocha, editor, *33rd International Conference on Logic Programming (ICLP 2017), Technical Communications*, Melbourne, Australia, September 2017.
- [23] Paul Tarau. Computing with Catalan Families, Generically. In M. Gavanelli and J. Reppy, editors, *Proceedings of the Eighteenth International Symposium on Practical Aspects of Declarative Languages PADL’16*, pages 117–134, St. Petersburg, Florida, USA, January 2016. Springer, LNCS.
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- [31] Paul Tarau. Ranking/Unranking of Lambda Terms with Compressed de Bruijn Indices. In M. Kerber, J. Carette, C. Kaliszyk, F. Rabe, and V. Sorge, editors, *Proceedings of the 8th Conference on Intelligent Computer Mathematics*, pages 118–133, Washington, D.C., USA, July 2015. Springer, LNAI 9150.
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Patents

- **US Patent No. 7,809,548** *Graph-based Ranking Algorithm for Text Processing* (with Dr. Rada Mihalcea and University of North Texas)

Research Publication Impact

Here are, as shown on January 15, 2018, **4208** total citations from the Google Scholar database) the impact indicators of my past research papers (a total of **153** peer-reviewed publications).

- **h-index 24**
- **g-index 67**

Research Grants

- **SHF:Small:Arithmetic Algorithms and Applications of Hereditarily Binary Numbers, NSF Research Grant 1423324 2014-2017**
(<http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1423324>) \$253,161 , **PI**

- **A Framework for Bijective Data Transformations, NSF Research Grant 1018172 2010-2013**
(<http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1018172>) \$97,500 , PI
- **Graph Algorithms for Text Disambiguation, Summarization and Entailment, with Dr. Rada Mihalcea, 2006-2007 Texas ARP Grant, \$99,000 co-PI**
- Prolog based Internet Data-mining: NovuWeb Inc. Research Grant, 2000, \$7,500/1 year
- UNT Research Grant (with Dr. A. Mikler) 2000 - \$3,500/1 year
- Radiance Group Research Grant 1998 (at Louisiana Tech, US), \$7000/1 year
- NSERC RESEARCH GRANT 1998-2002 (Canada) CA\$72,000/4 years - discontinued due to move to US -
- NSERC RESEARCH GRANT 1994-1998 (Canada) CA\$50,000/4 years
- NSERC EQUIPMENT GRANT 1992-1993 (Canada)
- NSERC OPERATING GRANT 1991-1994 (Canada)
- BC Innovative Funds Proposal "Computing Science Teaching and Training Using WWW" with Dr. Veronica Dahl and Dr. Jiawei Han from SFU: 1995-1996
- CLTI Moncton: 1996-1997 - CA\$30,000 with Dr. Veronica Dahl from Simon Fraser University, CLTI + APECA with industrial partner E-COM
- Univ. Moncton FESR GRANT GRANT 1991-1994,1994-1997,1998-2000 (Canada) - discontinued due to move to US -
- KU Leuven visiting researcher grant: 1994 (Canada)
- IRISA+Univ. de Rennes visiting researcher grant: 1994

Invited talks:

- Invited Talk at PADL'2018,SYNASC'2012, <http://synasc12.info.uvt.ro/invited-speakers/paul-tarau-1>
- Invited Talk at IICS'2001, Germany (Innovative Internet Computing Systems)
- Invited Talk at 2000 International Summer School in Computational Logic Acquafredda di Maratea (Basilicata, Italy) September 3-8, 2000
- Invited Talk at AGP'99, Italy (international conference in the field of Logic Programming)
- Invited Tutorial at Logic Programming Summer School'99, Univ. of New Mexico
- Keynote Speech at INAP'96, Japan
- Invited Tutorial at ILPS'97, USA
- Invited Talk at JICLSP'98, Implementation of LP Workshop, UK
- Invited Talk at JELIA'98, Germany
- Invited conferences at MITRE Corporation (1999), Oregon Graduate Institute (1999), Simon Fraser University (1998)

Recent Conference Presentations

In the last 5 years I was *the presenter* of the following **26 papers**:

- **2012:** [46]
- **2011:** [55, 53, 52, 51, 56, 57, 58]
- **2010:** [59],[60],[61],[62],[63],[64]
- **in 2009:** [65], [66], [68], [67], [69]
- **in 2008:** [71] [70], [72], [73, 74, 75]
- **in 2007:** [76]

Teaching

Teaching philosophy

I value independent, creative thinking, and the ability to apply learnings to new situations. My teaching emphasizes *operational knowledge*: the ability to *do* things, to solve problems, by combining rigorous logic with induction and experiment. I tend to evaluate students in a way that strongly discourages recitation of passively memorized or superficially understood concepts.

While making sure that all students understand fundamental concepts and learn the most important practical skills, I put special emphasis on letting exceptional students fly as high as they can.

One of the main dangers in rapidly evolving domains, like computer science, is fast depreciation of knowledge. I tend to fight this by adapting my courses to cover key technological changes.

Finally, I think about teaching and research as activities which interoperate and stimulate each other.

Graduate Supervision:

Recent Graduate Supervision:

- **2 PhD** students (in progress) : David Haraburda (co-authored one joint paper he will present at SAC'12, NSF supported) and Fahmida Hamid (supported by the department, working as a TA)
- **3 MSc** thesis students (graduated)
 - 1 Msc thesis student graduated (2011): David Haraburda
 - 1 MSc thesis student graduated (2010): Bharat Dandala
 - 1 MSc thesis student graduated (2009): Chris Gacomet
- member of **17 PhD** thesis committees: Kino Coursey graduated 2009, Samer Hassan (graduated 2011), Hakan Ceylan (graduated 2011), Cameron Palmer, Dhanyu Amarasinghe, Ravi Sinha, Michael Mohler (graduated 2012), Geng Zheng, Jorge Reyes-Silveyra, Carmen Banea, Chee Wee Leong, Tomislav Janjusic, Oleg Garitselov (graduated 2012), Oleg Kolgushev, Thiraphat Meesumrarn, Abdullah Saudagar, Himanshu Dutta)
- member of **2 MSc** thesis committees (Brett Thompson, 2009 and Christian Loza, 2009)
- individual work with several PhD and MSc students (directed study, projects)

Other Graduate Supervision Since Joining UNT:

I have supervised the following students graduating with MSc. thesis with whom I co-authored papers in peer-reviewed conferences and workshops:

- David Haraburda
- Devender Gollapally
- Anima Gupta
- David Hurt
- Satyam Tyagi
- Qinan Zhou

as well as the following MSc. thesis students: V.G. Balamuru, P. Gupta, S. Kandaswamy, K. Valveti, G. Sun.

A *post-doctoral visitor* of mine at UNT, A. J. Garcia, is now professor at Universidad Nacional del Sur, Argentina.

Courses taught recently

Codes higher than 5000 indicate graduate courses.

- Fall 2017: CSCE 5430 Software Engineering
- Spring 2017: CSCE 5450 Programming Languages
- Fall 2016: CSCE 4430 Programming Languages CSCE 5400 Automata Theory
- Spring 2015: CSCE 3030 Parallel Programming CSCE 4430 Programming Languages
- Fall 2014. CSCE 5160 Parallel Processing and Algorithms CSCE 5450 Programming Languages
- Spring 2014: CSCE 2100 Computing Foundations I CSCE 5450 Programming Languages
- Fall 2013: CSCE 5290/4930 Natural Language Processing, CSCE 5150-2 Analysis of Algorithms, CSCE 6933 Logic and Knowledge Processing in Computer Science
- Spring 2013 CSCE 4430 Programming Languages CSCE 4444 Software Engineering
- Maymester 2012: CSCE 4930/CSCE 5933 Advanced Object Oriented and Functional Programming in Scala
- Spring 2012: CSCE 4430 Programming Languages, CSCE 5430 Topics in Software Engineering
- Fall 2011 CSCE 5420: Software Development CSCE 6933 Topics in Computational Mathematics
- Spring 2011 CSCE 5170: Graph Theory CSCE 4430: Programming Languages
- Fall 2010 CSCE 6933: Topics in Computational Mathematics CSCE CSCE 5450: Programming Languages
- Spring 2010 CSCE 3600: Principles of System Programming CSCE 5430: Topics in Software Engineering
- Fall 2009 CSCE 4430/5450: Programming Languages CSCE 5420: Software Development

- Spring 2009 CSCE 4430/5450: Programming Languages CSCE 5430: Topics in Software Engineering
- Fall 2008 CSCE 4430/5450: Programming Languages CSCE 5420: Software Development
- Spring 2008 CSCE 4430/5450: Programming Languages CSCE 5430: Topics in Software Engineering
- Fall 2007: CSCE 4430/5450: Programming Languages CSCE 5420: Software Development
- Spring 2006: CSCE 5210: Artificial Intelligence CSCE 5450: Programming Languages
- Fall 2005: CSCE 5450: Programming Languages CSCE 4430: Programming Languages
- Spring 2005: CSCI 5410: Artificial Intelligence CSCI 4300: Survey of Computer Languages
- Fall 2004: CSCI 4410: Introduction to Artificial Intelligence CSCI 4250: Survey of Computer Languages
- Spring 2004: CSCI 5410: - Artificial Intelligence CSCI 3400: - Data Structures
- Fall 2003: CSCI 6330: Advanced Topics in Software Agents CSCI 4250: Survey of Computer Languages
- Spring 2003: CSCI 5250: - Programming Languages CSCI 5540: - Operating Systems
- Fall 2002: CSCI 4250 Survey of Computer Languages, CSCI 5250 Programming Languages,
- Spring 2002: CSCI 5530 Topics in Software Engineering CSCI 5550 Compiler Design
- Fall 2001: CSCI 4250 Survey of Computer Languages, CSCI 5250 Programming Languages,
- Spring 2001: CSCI 5530 Topics in Software Engineering CSCI 5550 Compiler Design
- Fall 2000: CSCI 4250 Survey of Computer Languages, CSCI 5250 Programming Languages,
- Spring 2000: CSCI 5530 Topics in Software Engineering CSCI 6330 Advanced Internet Programming
- Fall 1999: CSCI 4250 Survey of Computer Languages, CSCI 5250 Programming Languages
- Spring 1999: CSCI 5530 Topics in Software Engineering, CSCI 6330 Intelligent Mobile Agents
- Fall 1998: CSCI 4250 Survey of Computer Languages, CSCI 5250 Programming Languages.

Partly due to my diverse research interests accumulated over the years, I am able to cover the topics of about 80-90 percent of undergraduate and graduate courses and ready to teach any of them on a few days notice.

Service

Recent Program Committees and Grant Panels:

- ICLP'2018 program co-chair
- ICLP'2017, PADL'2018, PADL'2017, PADL'2016, LATA'15, ICLP'2014, TextGraphs'13, LOP-STR'13, ACM SAC'13
- CICLOPS'12, GPCE12, TextGraphs-7, FLOPS2012, ACM SAC12/CM, PDP11, DSL11, CICLOPS11
- CICLOPS'09, SAC'08, ICLP'07, CICLOPS'07, SAC'06, ICLP'04, PADL'04, CICLOPS'04, INAP'04, SONA'04, PADL'03, ICLP'07
- PADL'02, PDP'2000, CL2000, PADL'2000, JFPLC'2000, ESAW'2000

- COCL'99, MAS'99, IDL'99, DIPLCLP'99, PADL'2000, JFPLC'2000
- JICSLP'98, JFPL'98, ICLP'1997, IWLPTIA'1997
- JICSLP'1996, ICLP'1995, LOPSTR'1995, JFPL'96
- 2003 NSF Panelist
- 1998-2001: serving a 3-year term on the Canadian NSERC Computer Science grant committee

Journal Refereeing

- Theory and Practice of Logic Programming,
- Journal of Logic Programming,
- Journal of LISP and Symbolic Computation,
- Journal of Computer Languages,
- TOPLAS
- Journal of Computer Mathematics
- Journal of Experimental and Theoretical Artificial Intelligence

Workshops (co)-organized

- CICLOPS'09 (Pasadena, CA)
- IDL'99 (Paris)
- DIPLCPL'99 (Las Cruces, NM)
- ICLP'97 Leuven: Second International Workshop on Logic Programming Tools for Internet Applications,
- CP'97 Workshop on Constraint Reasoning on the Internet
- JICSLP'96 Bonn: First Workshop on Logic Programming Tools for Internet Applications
- ILPS'95 Ithaca: Implementation of Logic Programming Languages Workshop
- ICLP'94 Budapest: Blackboard Based Logic Programming Workshop

University of North Texas Committee Service

- CENG Faculty Council chair 2009-2011
- CSE Personnel Affairs Committee - co-chair in 2008-2009
- CS Undergraduate Committee
- CS Graduate Committee
- CS Library Contact
- CS Chair Search Committee
- CS Search Committee

Other Professional Service

As an example of professional service to a neighboring University, I am currently serving on the Computer Science Advisory Board at UT Dallas.

Professional Organizations

ACM, Association of Logic Programming

Other experience and skills

Software development

Please follow links from <http://www.cs.unt.edu/~tarau> for current versions.

- Styla – an open source Prolog interpreter supporting Actor programming in Scala and Akka, available from <http://code.google.com/p/styla/>
- Jinni – a high performance Java based Prolog compiler 1997-2004
- BinProlog – a Multi-Threaded Prolog Compiler 1990-2006 (about 50 000 lines of Prolog and C-code)
- WordNet Prolog based Voice-Enabled Conversational Agent
- PocketJinni Prolog system for Java-enabled PDAs and Wireless Phones
- Kernel Prolog: Lightweight Prolog Interpreter and Compiler developed in an Object Oriented Style, available from <http://code.google.com/p/kernel-prolog/>
- The jProlog experimental Prolog-to-Java translator (joint work with Bart Demoen from K.U. of Leuven, Belgium)

Programming Languages

- Procedural and Object Oriented: Java, Scala, C, C#, C++, Ruby, Python, Objective-C
- Logic and Relational: Prolog, Mercury, OWL, RDF, SQL
- Functional: Haskell, Coq, ML, Scheme, Lisp, Miranda
- Scripting: OS X, Linux and Windows shell programming, Tcl/Tk
- Legacy: Pascal, Fortran, Cobol, Basic, APL
- Low Level: x86 and Sparc Assembler
- Internet: XML, HTML, VRML, JavaScript

Operating environments:

- Expert knowledge of UNIX (OS X and Linux) and Windows administration, networking, LANs, WANs
- Extensive knowledge of Unix and Windows software and hardware, communications, networking, socket programming etc.
- Practical knowledge of Android development with Eclipse and iPhone/iPad apps with Xcode
- Various Java and .NET Projects for Pocket PC and Windows Mobile PDAs and cell phones

Natural Languages:

- fluently speaking: English, French, Hungarian, Romanian
- reading ability in: German, Italian, Spanish