Ramyaa

New Mexico Institute of Mining and Technology
Department of Computer Science and Engineering
Socorro, NM 87801

Email: ramyaa@cs.nmt.edu

Research Interests

Emerging models of Computation, Theory and Logic (Implicit Computational Complexity, Complexity Theory), Artificial Intelligence/Machine Learning (use of abstraction and biologically inpired algorithms in ML and applications of ML.

Education

Academic Background

Aug 2015 - Present	Assistant Professor, New Mexico Tech.
Oct 2013 - Present	Visiting Research Scientist, Science Gateways Group, Indiana University, Bloomington
Aug 2016 - Dec 2016	Research Fellow, University of California, Berkeley. Advisor: Prof. Andreas Blass
Sept 2013 - Aug 2015	Visiting Assistant Professor, Mathematics and Computer Science Department, Wesleyan University.
Jun 2011 - Aug 2013	Post Doctoral Researcher, Ludwig-Maximilians-Universitat (LMU), Munich, Germany Advisor: Prof. Martin Hofmann
Aug 2005 - Jul 2011	PhD in Computer Science and minor in Logic, Indiana University (IU), Bloomington. Advisor: Prof. Daniel Leivant
Aug 2004 - Jul 2005	M.S. in Logic and Computation, Carnegie Mellon University (CMU) Advisor: Wilfried Sieg
Aug 2001 - Jul 2004	M.S. in Artificial Intelligence, University of Georgia (UGA) Advisor: Prof. Ronald W. McClendon
Aug 2001 - Jul 2004	M.S. in Computer Science, University of Georgia (UGA) Advisor: Prof. Robert W. Robinson
Jun 1997 - Apr 2001	B.E. in Computer Science, Madurai Kamaraj University (MKU), India

Instructor for Criminal Justice Data Analysis, certificate course at IIT Kanpur (targeted at senior police officers).

List of Publications

*: Supervised graduate students; +: Supervised undergraduate students

Journal papers

B Dennis+ and **R Ramyaa**. "Comparative analysis of object visualization tools with respect to their use in education". IEEE Computer Society Technical Committee on Learning Technology, 2022

R Kuo, M Banawan, J Domingo, E Popescu, and **R Ramyaa**, "Report from women in engineering panel at IEEE ICALT 2021". Bulletin of the Technical Committee on Learning Technology (ISSN: 2306-0212), 21(3):46, 2021 (Invited paper)

S. Krishnan, **R. Ramyaa**, "When two heads are better than one: nutritional epidemiology meets machine learning", The American Journal of Clinical Nutrition, Volume 111, Issue 6, June 2020,, https://doi.org/10.1093/ajcn/nqaa113

R Ramyaa, O Hosseini *, GP Krishnan and S Krishnan. "Phenotyping Women Based on Dietary Macronutrients, Physical Activity and Body Weight Using Machine-Learning Tools.". 2019. Nutrients 11 (7).

S Bus, and **R Ramyaa** "Short refutations for the equivalence-chain principle for constant-depth formulas." Mathematical Logic Quarterly, 2017

A Verma, **R Ramyaa**, R Singh, S Marru, "Validating distance decay through agent based modeling", Special Issue of Security Informatics (SI) on Computational Criminology 2012.

Conference papers

E Binnendyk+, M Carmosino, A Kolokolova, **R Ramyaa**, and Manuel Sabin. "Learning with distributional inverters." Proceedings of Machine Learning Research (PMLR), 2022.

E Binnendyk+, M Carmosino, A Kolokolova, **R Ramyaa**, and M Sabin. "Learning with distributional inverters." CoRR, abs/2112.12340, 2021

S Norouzi, J. J. D. Luis, **R Ramyaa**, J. S. Young, E. B Seneta, M Darvish, M Hosseini, and E. R Ligon."CNN to mitigate atmospheric turbulence effect on Shack-Hartmann wavefront sensing: A case study on the Magdalena ridge observatory interferometer. In Machine Learning for Scientific Imaging 2022, IST EI Conference Proceedings, 2022.

G Krishnan, F Maier, and **R Ramyaa**. "Learning rules with stratified negation in differentiable ILP." In Advances in Programming Languages and Neurosymbolic Systems Workshop in Neurips, 2021

D Aranda+, A Towler+, **R Ramyaa**, and Rita Kuo. "The usability of using educational game for teaching foundational concept in propositional logic". At International Conference on Advanced Learning Technologies (ICALT), 2021.

M. Smith, N. Johnson, J. Ingram, A. Carbajal, B. Haus, E. Domschot * ,**R. Ramyaa**, C. Lamb, S. Verzi, and W. Kegelmeyer. "Mind the Gap: On Bridging the Semantic Gap between Machine Learning and Malware Analysis". In Proceedings of the 13th ACM Workshop on Artificial Intelligence and Security (AISec 2020). Association for Computing Machinery, New York, NY, USA, 4960.

T Tadros, GP Krishnan, **R Ramyaa**, M Bazhenov. "Biologically inspired sleep algorithm for increased generalization and adversarial robustness in deep neural networks." ICLR 2020. Link

A. Towler^{+}, D. Aranda^{+}, **R. Ramyaa** and R. Kuo,"Using Educational Game for Engaging Students in Learning Foundational Concepts of Propositional Logic." 2020 IEEE 20th International Conference on Advanced Learning Technologies (ICALT), Tartu, Estonia, 2020, pp. 208-209,

D Aranda^{+}, A Towler^{+}, **R Ramyaa**, and R Kuo. "Designing an Educational Game for Teaching Foundational Concepts in Propositional Logic" 2019, E-learn.

R Ramyaa, K Das*, S Marru, "Aggregating Ensemble Weather Predictions for Rainfall Predictions", 17th IEEE International Conference on Machine Learning and Applications, 2018, IEEE.

D Leivant, and **R Ramyaa** "The Computational Contents of Ramified Corecurrence." FoSSaCS 2015: 422-435

N Danner, D R Licata and **R Ramyaa** "Denotational cost semantics for functional languages with inductive types." ICFP 2015: 140-151

N Danner, D R Licata,**R Ramyaa**. "Denotational cost semantics for functional languages with inductive types." arXiv:1506.01949.

R Ramyaa, and D Leivant, "Ramified Lazy Corecursion and Logspace" Logic and Computational Complexity. Vienna, 2014.

M Hofmann, **R Ramyaa**, and U, Schöpp, "Pure pointer programs and tree isomorphism." Foundations of Software Science and Computation Structures. Foundations of Software Science and Computation Structures (FOSSCS), 2013. Springer Berlin Heidelberg.

M Hofmann, **R Ramyaa** "Computing With a Fixed Number of Pointers (Invited Talk)". FSTTCS 2013: 3-18

R Ramyaa, D Leivant, "Ramified Corecurrence and Logspace", Electr. Notes Th. CS. 276(2011).

D Leivant, **R Ramyaa**, "Implicit complexity for coinductive data: a characterization of corecurrence", DICE 2011: 1-14.

Ramyaa R., Leivant D., "Feasible Functions over Co-inductive Data", WoLLIC 2010: 191-203.

A Verma, **R Ramyaa**, R Singh, and S Marru, "Rationalizing police patrol beats using Voronoi Tessellations", ACM SIGKDD Workshop on Intelligence and Security Informatics, 2010.

R.W. McClendon, G. Hoogenboom, A. Jain, **R Ramyaa**, B. Smith, "Temperature prediction for Frost Prediction", Proc. of the 2005 Southeast Regional Vegetable Conference. GA, 2005. P. 97.

R Ramyaa, C. He, K. Rasheed, "Using Machine Learning Techniques for Stylometry", IC-AI 2004.

W.D. Potter, **R Ramyaa**, Li J., Ghent J., Twardus D., Thistle H., "STP: An Aerial Spray Treatment Planning System", Proc. of the IEEE SoutheastCon 2002, pp. 300-305, Columbia, SC.

Posters

T Tadros, G Krishnan, **R Ramyaa** and M Bazhenov. "Biologically inspired sleep algorithm for increased generalization and adversarial robustness in deep neural networks." Will be presented as poster at International Conference on Learning Representations, 2020.

GP Krishnan , OC Gonzalez , **R Ramyaa**, M Bazhenov. "Neural mechanisms of reactivation during slow-wave sleep." Program No. 082.14. 2019 Neuroscience Meeting Planner. Chicago, IL: Society for Neuroscience, 2019.

GP Krishnan, **R Ramyaa**, M Bazhenov. "Reactivation in network motifs during NREM and REM sleep in thalamocortical model" Program No. 511.09. 2018 Neuroscience Meeting Planner. San Diego, CA: Society for Neuroscience, 2018. Online.

Selected Invited Talks

G Krishnan, F Maier, and **R Ramyaa**. "Learning rules with stratified negation in differentiable ILP." In Spotlight talk at Advances in Programming Languages and Neurosymbolic Systems Workshop, Neurips, 2021.

"Machine Learning in Nutrition", at NMSU, "The art of AI and grant writing" workshop supported by New Mexico EPSCoR, Feb 2020.

"Abstraction based learning". at NMSU, "The art of AI and grant writing" workshop supported by New Mexico EPSCoR, Deb 2020.

"First order logic with least fixed point operator." Invited talk at Logic and Computational Complexity (LCC) 2019 workshop at Patras, Greece, on July 8, 2019, as part of ICALP.

"Designing an Educational Game for Teaching Foundational Concepts in Propositional Logic. Designing an Educational Game for Teaching Foundational Concepts in Propositional Logic." ID: 55695. Presented at E-Learn 2019.

"Abstraction in ML." In UNM 2019 Computer Science Colloquium Series.

"Hybrid supervised-unsupervised algorithms." In 2019 New Mexico Research Spotlight Forum on AI and ML.

"Machine learning improvements in computer science". At NMT GSA applications in machine learning symposium, 2018.

"Neural mechanisms of reactivating in thalamocortical networks during NREM sleep". At MURI meeting Dec 2018, San Diego.

"Power of first order logic with least fixed points". Simons institute logical structures in computation reunion. Dec 11-15.

"Artificial Intelligence to predict body weight using dietary data in population based datasets". Obesity Week 2017, Washington DC Oct 29-Nov 2nd

"Lyapanov function of sleeping brain and what it can tell us about memory consolidation". UCSD, Sep 2017.

"Class of feasible functions over streams", CS colloqium, UT Dallas, 2014.

"Relativized separation of Logspace and Ptime", Logic Seminar Talk, IU Bloomington, 2013.

"Programming language for neural oscillations", Universität Potsdam, 2013.

"Power of Non-Determinism without counting on Cayley graphs", Oberseminar, LMU, 2012.

"Implicit complexity for higher order functionals", Oberseminar, LMU, 2011

"Arrow's theorem and extensions", Talk at Logic Seminar at Indiana University.

"Streaming Algorithms", Theory seminar, Indiana University, 2011.

"Implicit Complexity for coinductive data", Graduate student conference in Logic, UIUC, 2010.

"Complexity of higher order functions" Talk at (CS) Theory seminar Indiana university, 2010.

"Comparing Machine learning techniques for stylometry", Graduate student conference in AI, UGA, 2002.

"'Smart and 'brute-force' agents in Mummy Maze", AI Seminar, UGA, 2002.

Grants Support

"Advances in Machine Learning Methods : Methodologies for a Data Science Approach to Applications of Genetics" Co-PI , grant from Lanl.

"MALGEN : MALware GENeration with specific behaviours to improve ML-based detection", PI for sub award (PI for the main grant: Michael Reed Smith), grant from Sandia Labs (Acorn grant i.e., a subaward), 2020-2023, $150,000. (NMT $103614 for graduate student)

"Funding for CyfHer Workshop", Workshop leader (PI: Amy Knowles), grant from Goole Explore CSR, 03/2020, $18,000.

"Intel Neuromorphic chip community - research on PL for neuromorphic chips", PI, grant from Intel Corp., 2020-2021, access to Intel's neuromorphic Loihi chip server.

"AI applicaitons to criminology", Co-PI (PI: Arvind Verma, Indiana University), grant from Indian Police Deptartment, $3,000 08/2018-05/2019 ($2500 for undergraduate research)

REU Site: Research Experiences for Undergraduates - Emerging Issues in Cybersecurity, Senior Person (PI: Jun Zheng, Co-PI: Dongwan Shin), grant from NSF , $287,984, 2/1/2018-1/31/2021

Lifelong Learning Machines (L2M) , grant from DARPA, Role: Primary personnel for developing neuro-inspired machine learning component. (PI: Bruce McNaughton, UC Irvine, Co-PI: Maxim Bazhenov, UCSD), 2018-2022, $2,500,000.

Collaborative Research: SI2-SSI: Open Gateway Computing Environments Science Gateways Platform as a Service (OGCE SciGaP) to build reusable, Co-Investigator. (PI: Marlon Pierce, Indiana University; Co-PI: Suresh Marru, Indiana University), 10/01/2013-09/30/2018. Total amount $2,519,986.00 . (NMT $30,000 for graduate student support)

Google Summer of Code, Mentor, 2013, 2016 ($5,000 for undergraduate research)

Student Advisees

2020	Siavash Norouzi(MS), Charles Brock(PhD), Brian Kirk(PhD) , Eva DomSchot(MS), Brandon Bicknell(MS), Wesley Pick-Roth(MS), Eric Binnendyk(BS), Brandon Dennis(BS)
2019	Siavash Norouzi(MS), Charles Brock(MS), Brian Kirk(PhD)
2018	Siavash Norouzi(MS), Kallol Das(MS), Omid Hosseini(MS)
2017	Kallol Das(MS), Omid Hosseini(MS)
2016	Omid Hosseini(MS)

Invited Program Commttee / Reviewer / Subreviewer etc.

Textbook Proposal Review for Springer Books.

Review for editorial in The American Journal of Clinical Nutrition.

PC member of CiE 2022

PC member of CSR 2022

PC member of ICALT 2022,2021, 2020

PC member GCCCE 2020

PC member of LICS 2018

PC member of LCC 2017

PC member of DICE 2016

Reviewer for ITCS 2022

Reviewer for Agronomy

Reviewer for ACM SAC 2018, 2020,2021

Reviewer for PLOS one 2015.

Subreviewer for LICS 2020, 2013, 2015

Subreviewer for STACS for 2014, 2015.

Research projects

Theory/Logic

Power for first order logic, extended with fixed points, with A. Blass, University of Michigan.

Neuromorphic chip and biological inspired computing, with M. Bazhenov, UCSD (current)

Implicit complexity for corecursive data (2007-present) leading to PhD thesis with Dr.D. Leivant Characterizing complexity classes of corecursive functions via restricting corecursion and coinduction.

PURPLE (June 2011 - Sept 2013) as postdoctoral researcher, with Dr.M.Hofmann. Study the power of abstract pointer programs on graphs; relativized separation of Logspace and Ptime; funded by German National Research grant (DFG).

AProS (2004-2005) with Dr.W.Sieg: AProS is a theorem prover that searches for normal proofs using Intercalation Calculus. My contribution was formulating and implementing inference rules for modal logic (S4, S5, GL (provability logic for Peano Arithmetic)); supported by several grants, including NSF.

Artificial Intelligence

ML application for genetics - interpretable ML, transfer learning, with Lanl.

ML applications to Malware detection - ML over programs, with Michael Reed, Sandia Labs

Machine learning applications to help construction to dampen earthquake effects, with Claudia Wilson (NMT) (planned)

Machine learning applications to atmospheric science, with Surresh marru (Indiana Univerity) Keith Brewster (University of Oklahoma)

Machine learning applications to nutrition and health, with Sridevi Krishnan, UC Davis (current)

Automating Image cleanup and artifact removal, with NRAO (current)

Agent based modeling and data mining in criminology with Dr. A. Verma; Google summer of code project, Summer 2013 (Mentor); preparing for NIJ grant.

Risk Management of Fruit Crops through Prediction of Frost Conditions in Georgia (2003-2004) with Dr. R.W. McClendon as graduate research assistant. Using artificial neural network to predict temperature and frost; funded by USDA.

Spray Treatment Planning (2002-2003) with Dr. W.D.Potter as graduate research assistant. Develop heuristic searches and genetic algorithm for planning/ routing areal pesticide spraying; funded by USDA.

Automated Resume Reader (2000-2001) with Dr.Aravindan leading to B.E. thesis. Data collection from resumes using datamining and natural language processing techniques.

Theses and Technical Reports

"Implicit complexity for coinductive data", PhD Thesis (Computer Science, IU). PDF

"Proof Search in Modal Logic (S4, S5 and GL)", MS thesis (Logic and Computation, CMU).PDF

"Hamiltonian Cycles in Regular Digraphs", MS thesis (Computer Science, UGA). PDF

"Weather Forecasting and Frost Prediction", MS thesis (Artificial Intelligence, UGA).PDF

Ramyaa R., "Alternating paths in coloured graphs", Technical report, Indiana University, 2006.

Naci L., Ramyaa., "Artificial Agents", Georgia Grad. Student Interdisciplinary Conference, UGA, 2003.

"Automated resume reader", BE thesis (Computer Science, MKU, India).

Teaching Experience

Graph Algorithms, NMT, spring 2020.

Machine learning, NMT, fall 2019, fall 2020.

Advanced Algorithms, NMT, spring 2018, spring 2019.

Theory of Computation, NMT, fall 2017, fall 2018,

Automata and Formal Languages, NMT, spring 2016, spring 2018, spring 2019, spring 2020

Foundations of computation (discrete mathematics), NMT, fall 2015, fall 2017, fall 2018, fall 2019, fall 2020.

Introduction to Artificial Intelligence, Wesleyan University, spring 2015.

Introduction to programming for non-majors (with python), Wesleyan University, fall 2014.

Introduction to programming for non-majors (with python), Wesleyan University, fall and spring 2013.

Associate Instructor for graduate courses on

- Theory of Computing, IU 2008 (fall), 2009 (fall).
- Computational Complexity, IU 2006 (spring), 2008 (spring), 2009 (spring).
- Introduction to Applied logic, IU, 2009 (spring), 2008 (fall).

Associate Instructor/Teaching Assistant for undergraduate graduate courses

- Introduction to algorithm design and analysis, IU 2007 (spring).
- A survey of Computers and Computing, IU 2007 (fall).
- Programming Concepts, IU 2007 (fall).
- Introduction to computers and computing, IU 2006 (fall) 2005 (fall)
- Logic and proofs, CMU 2005 (spring)
- Philosophy of mind, CMU 2004 (fall)

Individual Tutoring/Mentoring

- Independent study : segmentation, triangualtion and mesh construction, NMT, 2018 (spring)
- Independent study: Convolution networks on 3D structures , NMT, 2018 (fall)
- Independent study : 3D machine vision and graphics, NMT, 2016 (summer)
- Mentored a Google Summer Project Student (senior from IIT), 2013 (summer) and (junior from NMT), 2016 (summer).
- Supervisor for seminar on distributed and parallel algorithms at LMU, 2012-13 (winter).
- Tutored an undergraduate student for CS theory courses at IU September 2009 to May 2010
- Tutored an undergraduate student with learning disability for introduction to CS at IU 2007 (spring)

References

Available upon request