

Komondoor V Raghavan

raghavan@iisc.ac.in • <https://www.csa.iisc.ac.in/~raghavan>

Research Interests

My research interests are broadly in the areas of programming languages, program analysis, and software engineering. I am particularly interested in developing automated, semantics-based tools that help programmers understand, verify, and evolve programs, in an agile and reliable manner. Most of my research is centered around static and dynamic analysis of programs, program transformations, as well as analysis and verification of formally specified requirements and designs.

Education

PhD in Computer Sciences

Univ. of Wisconsin-Madison.

Thesis: Identifying and eliminating duplication in source code.

Adviser: Prof. Susan Horwitz.

GPA: 3.85 / 4

Date: Aug. '03

Master of Technology in Computer Sciences

Indian Institute of Technology, Bombay, India.

Thesis: System for automatically generating code optimizers.

Adviser: Prof. D. M. Dhamdhere.

Avg. Grade: 9.76 / 10

Date: Jan '96

Bachelor of Engineering in Computer Sciences

Government College of Tech., Coimbatore, India.

Thesis: Implementation of a run-time debugger.

Avg. Marks: 85%

Date: May '94

Work and Research Experience

- Associate Professor at *Indian Institute of Science, Bangalore* (Jul. '15 to present).
- Visiting Faculty at *IIT Bombay* (May '19 to June '19).
- Visiting Faculty at *National University of Singapore* (Aug. '16 to Jan. '17).
- Assistant Professor at *Indian Institute of Science, Bangalore* (Aug. '08 - Jun. '15).
- Research Staff Member at *IBM India Research Lab, New Delhi* (Oct. '05 - Jul. '08).
- Postdoc Researcher at *IBM T. J. Watson Research Center*, with Advanced Programming Tools group (Dr. John Field) (Sep. '03 - Sep. '05).
- Summer Intern at *IBM T. J. Watson Research Center*, with Advanced Programming Tools group (June - Aug. '02).
- Summer student at *IBM Toronto Lab* (Sep. - Dec. '00, June - Aug. '01).
- Summer Intern at *Lucent Bell Labs*, with Databases group (Dr. Rajeev Rastogi) (June - Aug. '98).
- Project Engineer at *Indian Institute of Technology, Bombay*, with Prof. S. Sudarshan (Jan '96 - July '97).

Last updated 2022/01/03

Activities and Awards

- Program committee memberships
 - Int. Conf. on Software Engg. (ICSE): 2018, 2021, 2023.
 - Int. Symp. on Software Testing and Analysis (ISSTA): 2022
 - India Software Engineering Conference (ISEC): 2010-2013, 2015, 2020, 2022.
 - Chair of PhD Symposium committee of India Software Engineering Conference (ISEC): 2020
 - IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS): 2020
 - IEEE/ACM International Conf. on Automated Software Engineering (ASE): 2019, 2020.
 - IEEE Int. Conf. on Software Analysis, Evaluation, and Reengineering (SANER): 2019.
 - Int. Conf. on Software Engg. (ICSE) – Workshops Track: 2019.
 - IEEE International Conference on Software Maintenance and Evolution (ICSME): 2011, 2012, 2018, 2019.
 - IEEE Int. Working. Conf. on Source Code Analysis and Manipulation (SCAM): 2014, 2015, 2016, 2018.
 - 33rd IEEE/ACM International Conf. on Automated Software Engineering (ASE) – Tool Demo Track: 2018.
 - Int. Symp. on Automated Technology for Verification and Analysis (ATVA): 2017.
 - Inter-Research-Institute Student Seminar in Computer Science (IRISS): 2015, 2016, 2017.
 - Int. Conf. on Software Engg. (ICSE) – Software Engineering in Practice (SEIP) Track: 2014, 2016.
 - IEEE Int. Conf. on Software Analysis, Evaluation, and Reengineering (SANER) – Industry Track: 2016.
 - ACM India Compute: 2015.
 - Asia-Pacific Software Engineering Conference (APSEC): 2015.
 - ACM Symposium on Principles of Programming Languages (POPL) – External Review Committee: 2015.
 - ACM Symp. on Applied Computing (SAC): 2009-2011, 2015.
 - Int. Conf. on Program Comprehension (ICPC) – Industry Track: 2014.
 - Working Conference on Reverse Engineering (WCRE): 2013, 2014.
 - Asian Symp. on Programming Langs. and Systems (APLAS): 2008, 2014.
- Sponsored projects
 - Siemens India (2019-)
 - Tata Consultancy Ltd. (2017-)
 - Nucleus Software Exports Ltd. (2015-2018)
 - Indo-German Max Planck Center for Computer Science (2011-2016)
 - ISRO-IISc Space Technology Cell (2012-2013)
 - Infosys Ltd. (2010-2012)
- Research grants

- IBM Research India (2021)
- Microsoft Research India grant (2009, 2013)
- IBM Faculty Award (2008)
- Consultancy
 - Expert opinion report to High Court of Karnataka (2020)
 - Flytxt Ltd. (2018)
 - Tarang Ltd. (2013)
- Awards
 - Distinguished reviewer award by Program Committee of IEEE/ACM Int. Conf. on Automated Software Engineering (ASE), 2019.
 - Distinguished reviewer award by Program Committee of Working Conf. on Reverse Engineering (WCRE), 2013.
- Events co-organized
 - Workshop on Research Highlights in Programming Languages (co-located with FSTTCS 2020).
 - 1st Software Engineering Research in India (SERI) Update Meeting, July 2019.
 - Joint workshop by IISc, Microsoft Research, and U. Pennsylvania on Programming Languages, Formal Methods, and Cyber-Physical Systems, January 2019.
 - Winter School in Software Engineering, organized by ACM iSoft, December 2017.
 - IMPECS-POPL Workshop on Emerging Research & Development Trends in Programming Languages, January 2015.
 - Future of Debugging, as part of the *Mysore Park Series*, 2012.
- Member of Boards of Studies of colleges
 - CSE Department, PSG College of Technology, 2020-22.
 - CSE Department, KPR Institute of Engineering and Technology, 2019-21.
 - CSE Department, Bannari Amman Institute of Technology, Anna University Nominee, 2015-17.
- Fellowships (during PhD study)
 - IBM PhD Fellowship (2002)
 - IBM CAS Fellowship (2000-2001)
- Helped write Instructors Manual for “Database System Concepts”, 3rd Edition, McGraw-Hill, by Silberschatz, Korth, and Sudarshan.

Publications

Refereed conference and workshop publications

1. Geetam Chawla, Navneet Aman, Raghavan Komondoor, Ashish Bokil, and Nilesh Kharat. Verification of ORM-based Controllers by Summary Inference. To appear in *Proc. 44th International Conference on Software Engineering (ICSE)*, May 2022.

2. Stanly Samuel, Deepak D'Souza, and Raghavan Komondoor. GenSys: A Scalable Fixed-point Engine for Maximal Controller Synthesis over Infinite State Spaces. In *Demonstrations Track, Proc. the ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE)*, August 2021.
3. Snigdha Athaiya, Raghavan Komondoor, and K. Narayan Kumar. Data Flow Analysis of Asynchronous Systems using Infinite Abstract Domains. In *Proc. 30th European Symposium on Programming (ESOP)*, Apr. 2021.
4. Raveendra Kumar Medicherla, Raghavan Komondoor, and Abhik Roychoudhury. Fitness Guided Vulnerability Detection with Greybox Fuzzing. In *Proc. 13th Intl. Workshop on Search-Based Software Testing (SBST)*, Oct. 2020.
5. Himanshu Arora, Raghavan Komondoor, and G. Ramalingam. Checking Observational Purity of Procedures. In *Proc. Fundamental Approaches to Software Engineering (FASE)*, Apr. 2019.
6. Girish M. Rama, Raghavan Komondoor, and Himanshu Sharma. Refinement in object-sensitivity points-to analysis via slicing. In *Proc. ACM SIGPLAN Splash Conference (OOPSLA)*, Nov. 2018.
7. Girish M. Rama and Raghavan Komondoor. Detecting Full Initialization Points of Objects to Support Code Refactorings. In *Proc. 24th Asia-Pacific Software Engineering Conference (APSEC)*, Dec. 2017.
8. Snigdha Athaiya and Raghavan Komondoor. Testing and Analysis of Web Applications using Page Models. In *Proc. Int. Symp. on Software Testing and Analysis (ISSTA)*, July 2017.
9. Tejas Patil, Raghavan Komondoor, Deepak D'Souza, and Indrajit Bhattacharya. An Optimization Approach for Matching Textual Domain Models with Existing Code. In *Proc. 32nd Int. Conf. on Software Maintenance and Evolution (ICSME)*, October 2016.
10. R. K. Medicherla, R. Komondoor, and S. Narendran. Program Specialization and Verification using File Format Specifications. In *Proc. 31st IEEE Int. Conf. on Software Maintenance and Evolution (ICSME)*, September 2015.
11. R. K. Medicherla and R. Komondoor. Precision vs. Scalability: Context Sensitive Analysis with Prefix Approximation. In *Proc. 22nd IEEE Int. Conference on Software Analysis, Evolution, and Reengineering (SANER)*, March 2015.
12. G. M. Rama and R. Komondoor. A dynamic analysis to support object-sharing code refactorings. In *Proc. 29th IEEE/ACM Int. Conf. on Automated Software Engineering (ASE)*, September 2014.
13. K. Vasanta Lakshmi, A. Acharya, and R. Komondoor. Checking liveness properties of Presburger counter systems using reachability analysis. In *Proc. 19th Int. Symp. on Formal Methods (FM)*, May 2014.
14. R. Komondoor, I. Bhattacharya, D. D'Souza, and S. Kale. Using Relationships for Matching Textual Domain Models with Existing Code. In *Proc. Working Conf. on Reverse Engineering (WCRE)*, October 2013.
15. R. Komondoor. Precise slicing in imperative programs via term-rewriting and abstract interpretation. In *Proc. Static Analysis Symp. (SAS)*, June 2013.
16. R. Komondoor, V. K. Nandivada, S. Sinha, and J. Field. Identifying services from legacy batch applications. In *Proc. India Software Engg. Conf. (ISEC)*, 2012.

17. R. Komondoor, K. V. Lakshmi, D. P. Seetharam, and S. Balodia. Packet flow analysis in IP networks using data-flow analysis. In *Proc. India Software Engg. Conf. (ISEC)*, 2012.
18. R. Madhavan and R. Komondoor. Null dereference verification via over-approximated weakest pre-conditions analysis. In *Proc. ACM Symposium on Object Oriented Programming Systems, Languages, and Applications (OOPLSA)*, October 2011. *Acceptance rate: 36%*.
19. H. S. Gupta, D. D'Souza, R. Komondoor, and G. M. Rama. A case study in matching service descriptions to implementations in an existing system. In *Proc. 26th IEEE Intl. Conf. on Softw. Maintenance (ICSM)*, September 2010. *Acceptance rate: 27%*.
20. R. Komondoor, and G. Ramalingam. Recovering Data Models via Guarded Dependences. In *Proc. 14th Working Conf. on Reverse Engg. (WCRE)*, October 2007, pages 110–119. *Acceptance rate: 31%*.
21. S. Sinha, G. Ramalingam, and R. Komondoor. Parametric Process Model Inference. In *Proc. 14th Working Conf. on Reverse Engg. (WCRE)*, October 2007, pages 21–30. *Acceptance rate: 31%*.
22. G. Ramalingam, R. Komondoor, J. Field, and S. Sinha. Semantics-based Reverse Engineering of Object-Oriented Data Models. In *Proc. 28th International Conference on Software Engineering (ICSE)*, May 2006, pages 192–201. *Acceptance rate: 9%*.
23. R. Komondoor, G. Ramalingam, S. Chandra, and J. Field. Dependent Types for Program Understanding. To appear in *Proc. 11th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS)*, Apr. 2005, pages 157–173. *Acceptance rate: 24%*.
24. R. Komondoor and S. Horwitz. Effective, Automatic Procedure Extraction. In *Proc. 11th International Workshop on Program Comprehension (IWPC)*, pages 33-43, May 2003.
25. R. Komondoor and S. Horwitz. Using Slicing to Identify Duplication in Source Code. In *Proc. Int. Symposium on Static Analysis (SAS)*, pages 40-56, July 2001. *Acceptance rate: 34%*.
26. R. Komondoor and S. Horwitz. Tool Demonstration: Finding duplicated code using program dependences. In *Proc. European Symp. on Programming (ESOP)*, April 2001.
27. R. Komondoor and S. Horwitz. Semantics-Preserving Procedure Extraction. In *Proc. ACM Symposium on Principles of Programming Languages (POPL)*, pages 155-169, Jan. 2000. *Acceptance rate: 20%*.
28. Y. Breitbart, R. Komondoor, R. Rastogi, S. Seshadri, and A. Silberschatz. Update Propagation Protocols for Replicated Databases. In *Proc. ACM SIGMOD International Conference on Management of Data*, pages 97-108, June 1999. *Acceptance rate: 20%*.

Refereed journal publications

1. A. Margoer, and R. Komondoor. Two techniques to improve the precision of a demand-driven null-dereference verification approach. In *Science of Computer Programming (SCP)*, 98:645-679, 2015.
2. S. Chandra, J. de Vries, J. Field, H. Hess, M. Kalidasan, K. V. Raghavan, F. Nieuwerth, G. Ramalingam, and J. Xue. Technical Forum Article: Using logical data models for understanding and transforming legacy business applications. *IBM Systems Journal*, 45(3):647–655, 2006.

Invited Talks and Tutorials

1. *Technology sourcing support available from R&D Institutions.* Faculty Development Program on Entrepreneurship, Sponsored by Dept. of Science and Technology, Govt. of India, organized by Mannar Thirumalai Naicker College, Madurai, March 2021.
2. *Analysis and synthesis of software systems for uncertain environments.* Second Workshop on Software Engineering for an Uncertain World, co-located with Innovations in Software Engineering Conference (ISEC), February 2020.
3. *Refinement in object-sensitivity points-to analysis via slicing.* Celebration of Automated Software Engineering (ASE), co-located with IEEE/ACM Int. Conf. on Automated Software Engineering (ASE), San Diego, USA, November 2019.
4. Keynote talk on abstract interpretation. 5th IEEE International Conference on Advances in Computing and Communication Engineering, at Bannari Amman Institute of Technology, April 2019.
5. *Abstract interpretation – a framework for program analysis and verification.* 6th Undergraduate Summer School, organized by Dept. of CSA, IISc, July 2018.
6. *Abstract interpretation – a framework for program analysis and verification.* Summer School on Theoretical Foundations of Computer Science, organized by IIIT Bangalore, June 2018.
7. *Static analysis to enable verification and transformation of data-intensive business applications.* Workshop on Formal Methods for Analysis of Business Systems (Formabs), Singapore, Sep. 2016.
8. *Null-dereference analysis using weakest pre-conditions.* Int. Conference on Computational Methods and Software Engineering, organized by College of Engineering, Guindy, Chennai, 2015.
9. *Null-dereference analysis using weakest pre-conditions.* Workshop on Research Issues in Computer Science and Engineering, organized by Ballari Institute of Technology and Management, Ballari, 2015.
10. *Introduction to abstract interpretation.* Continuing Education Programme, Defense Research and Development Organization (DRDO) – Center for Artificial Intelligence and Robotics (CAIR), Bangalore, 2014.
11. *Null-dereference analysis using weakest pre-conditions.* 7th National Workshop on Recent Trends in Software Testing (RTST 2014), organized by NIT Rourkela, 2014.
12. *Precise slicing using term-rewriting and abstract interpretation.* 32nd CREST Open Workshop, organized by University College London (UCL), 2014.
13. *Null-dereference analysis using weakest pre-conditions, and Precise slicing using term-rewriting and abstract interpretation.* Software Engineering Workshop, organized by NITK Surathkal, 2014.
14. *Introduction to conceptual modeling using Alloy.* Workshop on Industry Oriented Software Engineering, organized by Siddaganga Institute of Technology, Tumkur, sponsored by TEQIP – AICTE, 2013.
15. *A survey on program slicing techniques.* Formal Methods Update Meeting, organized by Formal Methods in India group at IIT Delhi, 2013.
16. *Introduction to program verification using SpecSharp.* Staff Development Program (SDP), sponsored by AICTE, organized by PSG College of Technology Coimbatore, in 2013.
17. *Null-dereference analysis using weakest pre-conditions.* Workshop on “Making Formal Verification Scalable and Usable”, organized by Chennai Mathematical Institute, 2013.

18. *Introduction to program verification using SpecSharp*. PG Lecture Series, sponsored by Karnataka Science and Technology Academy (KSTA), held in SJCE College Mysore, 2012.
19. *Introduction to conceptual modeling using Alloy*. School on Software Engineering, co-located with 9th Int. Colloquium on Theoretical Aspects of Computing (ICTAC), Bangalore, 2012.
20. *Introduction to program verification using SpecSharp*. ISRO's Structured Training Program on Software Engineering, Trivandrum, 2012.
21. *Recovering logical data models from legacy systems*. TCS Ltd.'s internal conference TacTics, 2012.
22. *Introduction to program verification using SpecSharp*, and *Introduction to conceptual modeling using Alloy*. Vellore Institute of Technology (VIT)'s faculty development program, 2011.
23. *Recovering logical data models from legacy systems*. India Workshop on Reverse Engg. (IWRE), 2011.
24. *Bug detection using FindBugs*. International Symp. on Software Reliability and Engg. (ISSRE), Mysore, 2009.
25. *A survey of techniques for formal analysis of loops in programs*. IBM India Research Lab's annual technical event (I-CARE), 2009.
26. *Introduction to abstract interpretation*. The "Ramanajun Rediscovered" conf. on Mathematics and Information Technology, organized by IIIT Bangalore and Indian Mathematical Society, 2009.

Courses taught

- Formal methods in software engineering, in IISc: Most recent offering in Jan.-Apr. 2022.
- Principles of Distributed Software, in IISc: Most recent offering in Jan.-Apr. 2022.
- Program Analysis and Verification, in IISc. Most recent offering in Aug.-Dec. 2021.
- Topics in Program Analysis, in IISc: Most recent offering in Jan.-Apr. 2019.
- Advanced Programming Tools (1 credit), in IIT Delhi: Aug.-Dec. 2007.

Students graduated from thesis-based courses

1. Geetam Chawla, MTech (Research), 2021
2. Snigdha Athaiya, PhD, 2020
3. K. Vasanta Lakshmi, PhD, 2018
4. Girish M. Rama, PhD, 2018
5. M. Raveendra Kumar, PhD, 2018
6. Himanshu Arora, MSc Engg., 2018
7. Pallavi Chugh, MSc Engg., 2016
8. Tejas Patil, MSc Engg., 2015
9. Aravind Acharya, MSc Engg., 2014
10. Amogh Margoor, MSc Engg., 2013

Patents

1. S. Chandra, J. Field, R. Komondoor, G. Ramalingam, and S. Sinha. System and Method for a Logical-Model based Application Understanding and Transformation. *Applied for US Patent 2006.*
2. Y. Breitbart, R. Komondoor, R. Rastogi, S. Seshadri, and A. Silberschatz. Timestamp-based System and Method for Serializing Updates in a Distributed Database. *Granted US Patent #6,381,609, 2002.*