Prashant Kumar

Programming Languages Researcher

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Education

2018–2023 **PhD in Computer Science** Oregon State University, Corvallis, USA
- Research: Explainability of Computation, Designing Domain-Specific Languages (DSLs)
- Thesis: *Automatic Explanations of Computation Results with Value Decompositions and Dominating Sets*

2014–2017 **MSc in Computer Science** University of Calgary, Calgary, Canada
- Research: Designed and implemented Message Passing Language (MPL), a type-safe concurrent programming language
- Thesis: *Implementation of Message Passing Language*

2007–2011 **B.Tech in Computer Science** Cochin University of Science & Technology, Cochin, India

Academic Experience

Aug 2023–Present **Postdoctoral Researcher** Johannes Gutenberg University Mainz, Germany
- Designed and taught *Advanced Topics in Functional Programming* (Fall 2023, 2024)
- Teaching Assistant for the Program Analysis course (Winter 2024)
- Supervised two undergraduate Bachelor's theses
- Research in programming languages & formal verification methods
- Assisted in reviewing papers for GPCE (2023), ECOOP (2024, 2025)

2018–2023 **Research & Teaching Assistant** Oregon State University, USA
- Conducted research on computational explanations under DARPA's eXplainable AI (XAI) program
- Assisted in reviewing papers for POPL (2018), GPCE (2021), and VLHCC (2020, 2021)
- Secured NSF Research Experiences for Undergraduates (REU) grant ($8,000) for undergraduate research on explanation visualization.
- Teaching Assistant for Programming Paradigms (CS 381, 1 Semester)
- Mentored 3 high school students in functional programming (Haskell, Elm) under Apprenticeships in Science and Engineering (ASE) program

2014–2018 **Research & Teaching Assistant** University of Calgary, Canada
- Teaching Assistant for the following courses:
  - Compiler Construction (CPSC 411, 4 semesters)
  - Foundations of Functional Programming (CPSC 521, 2 semesters)
  - Programming Paradigms (CPSC 449, 3 semesters)
- Developed MPL compiler with novel aspects being its type system implementation as well as an abstract machine for executing MPL programs

Professional Experience

2011–2013 **Software Engineer** Accenture, Mumbai, India
- Implemented SAP HCM Payroll systems and developed ITIL/SOX-compliant solutions
- Led system configuration, testing, and root cause analysis for enterprise projects

Technical Skills

Programming Haskell (Expert), Scala, Prolog, Coq, Python, LaTeX

Skills Compiler Construction, Abstract Machine Design, Domain-Specific Language (DSL) Design

Languages

Proficiency English (Fluent), Hindi (Native)

Teaching Expertise

Core Courses Programming Paradigms, Compiler Construction

Advanced Courses Advanced Functional Programming, Program Analysis, DSL Design

Publications

Journal Articles

2024 Erwig, M., Kumar, P. *Explanations for Combinatorial Optimization Problems* – Journal of Computer Languages, Vol. 79

2021 Erwig, M., Kumar, P. *Explainable Dynamic Programming* – Journal of Functional Programming, Vol. 31, No. e10

Conference Publications

2024 Pacak, A., Kumar, P., Xu, R., Erdweg, S. *AUTOINC: Incrementality for Free* – SPLASH Companion '24 **(Short Paper)**

2023 Kumar, P., Erwig, M. *MatchMaker: A DSL for Game-Theoretic Matching* – Symposium on Trends in Functional Programming, LNCS 13868 (**John McCarthy Best Paper Award**)

2021 Erwig, M., Kumar, P. *MADMAX: A DSL for Explanatory Decision Making* – ACM SIGPLAN Conference on Generative Programming: Concepts & Experiences

2020 Erwig, M., Kumar, P., Fern, A. *Explanations for Dynamic Programming* – International Symposium on Practical Aspects of Declarative Languages, LNCS 12007

Under Progress

2025 Kumar, P., Pacak, A., Erdweg, S. *Incremental Computing by Differential Execution* – **Submitted to ECOOP, 2025**

2024 Erwig, M., Kumar, P. *Explaining Results of Multi-Criteria Decision Making* – Journal of Multi-Criteria Decision Analysis **In Revision (Minor Revision)**

Thesis

2023 Kumar, P. *Automatic Explanations of Computation Results with Value Decompositions and Dominating Sets* – PhD Thesis

2018 Kumar, P. *Implementation of Message Passing Language* – MSc Thesis

Selected Talks

Conference Presentations

2023 *Design of a DSL for Game-Theoretic Matching* – Trends in Functional Programming, University of Massachusetts, Boston

2021 *A DSL for Explanatory Decision Making* – Generative Programming: Concepts & Experiences (GPCE), Chicago

2020 *Explanations for Dynamic Programming* – Practical Aspects of Declarative Languages (PADL), New Orleans

Invited Talks

2022 *MPL and Explainability of Computation* – Tech Talk at Galois, Portland

2018 *Message Passing Language: Design and Implementation* – Departmental Seminar, University of Calgary

Workshop Presentations

2017 *Message Passing Language: Design and Implementation* – FMCS, University of Ottawa

2016 *Abstract Machine for Message Passing Language* – FMCS, University of British Columbia

2014 *Survey of Abstract Machines for Programming Languages* – FMCS, University of Calgary