

# Ankush Das

*Applied Scientist, Amazon*

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## Research Interests

Programming Languages, Concurrency, Blockchain, Resource Analysis, Session Types, Type Systems, Formal Verification, Static Analysis

## Education

- 2015 – 2021 **Ph.D. in Computer Science**, *Carnegie Mellon University (CMU)*, Pittsburgh, PA, USA, GPA – 4.0/4.0, Advisor: *Prof. Jan Hoffmann*.
- 2010 – 2014 **B. Tech. in Computer Science and Engineering with Honors**, *Indian Institute of Technology*, Bombay, India, GPA – 8.92/10.

## Industry Experience

- 2021 – Present **Amazon**, *Santa Clara, CA*, Applied Scientist, Manager: *Dimitra Giannakopoulou*.
- Summer 2019 **Meta**, *Seattle, WA*, Research Intern, Mentor: *Shaz Qadeer*.
- Summer 2017 **Microsoft Research**, *Redmond, WA*, Research Intern, Mentor: *Patrice Godefroid*.
- 2014 – 2015 **Microsoft Research**, *Bangalore, India*, Research Fellow, Mentor: *Akash Lal*.
- Summer 2013 **Adobe Research**, *Noida, India*, Research Intern, Mentor: *Ram B. Agrawal*.
- Summer 2012 **Institute of Science and Technology**, *Austria*, Research Intern, Mentor: *Prof. Krishnendu Chatterjee*.

## Publications and Patents

### Journals

- TOPLAS 2022 **Ankush Das**, *Henry DeYoung, Andreia Mordido, Frank Pfenning*. **Nested Session Types**, ACM Transactions on Programming Languages and Systems.
- LMCS 2022 **Ankush Das**, *Frank Pfenning*. **Rast: A Language for Resource-Aware Session Types**, Logical Methods in Computer Science.

### Peer-Reviewed Conferences

- POPL 2023 **Ankush Das**, *Di Wang, Jan Hoffmann*. **Probabilistic Resource-Aware Session Types**, 50th Symposium on Principles of Programming Languages.
- ESOP 2022 *Zeeshan Lakhani, Ankush Das, Henry DeYoung, Andreia Mordido, Frank Pfenning*. **Polarized Subtyping**, 31st European Symposium on Programming.
- ESOP 2021 **Ankush Das**, *Henry DeYoung, Andreia Mordido, Frank Pfenning*. **Nested Session Types**, 30th European Symposium on Programming.
- CSF 2021 **Ankush Das**, *Stephanie Balzer, Jan Hoffmann, Frank Pfenning, Ishani Santurkar*. **Resource-Aware Session Types for Digital Contracts**, 34th IEEE Computer Security Foundations Symposium.
- SAS 2020 **Ankush Das and Shaz Qadeer**. **Exact and Linear-Time Gas-Cost Analysis**, 27th International Static Analysis Symposium.
- PPDP 2020 **Ankush Das and Frank Pfenning**. **Verified Linear Session-Typed Concurrent Programming**, 22nd International Symposium on Principles and Practice of Declarative Programming.

- CONCUR 2020 **Ankush Das and Frank Pfenning. Session Types with Arithmetic Refinements**, 31st International Conference on Concurrency Theory.
- FSCD 2020 **Ankush Das and Frank Pfenning. Rast: Resource-Aware Session Types with Arithmetic Refinements (System Description)**, 5th International Conference on Formal Structures for Computation and Deduction.
- ICFP 2018 **Ankush Das, Jan Hoffmann, Frank Pfenning. Parallel Complexity Analysis with Temporal Session Types**, 23rd ACM SIGPLAN International Conference on Functional Programming.
- LICS 2018 **Ankush Das, Jan Hoffmann, Frank Pfenning. Work Analysis with Resource Aware Session Types**, 33rd Annual Symposium on Logic in Computer Science.
- TACAS 2017 **Ankush Das, Jan Hoffmann. ML for ML: Learning Cost Semantics by Experiment**, 23rd International Conference on Tools and Algorithms for the Construction and Analysis of Systems.
- ATVA 2017 **Ankush Das, Akash Lal. Precise Null Pointer Analysis Through Global Value Numbering**, 15th International Symposium on Automated Technology for Verification and Analysis.
- POPL 2017 **Jan Hoffmann, Ankush Das, Shu-Chun Weng. Towards Automatic Resource Bound Analysis for OCaml**, 44th Symposium on Principles of Programming Languages.
- CONCUR 2017 **S. Akshay, Supratik Chakraborty, Ankush Das, Vishal Jagannath, Sai Sandeep. On Petri Nets with Hierarchical Special Arcs**, 28th International Conference on Concurrency Theory.
- CAV 2015 **Ankush Das, Shuvendu K. Lahiri, Akash Lal, Yi Li. Angelic Verification: Precise Verification Modulo Unknowns**, 27th International Conference on Computer Aided Verification.
- TAMC 2015 **Ankush Das, Shankara Narayanan Krishna, Lakshmi Manasa, Ashutosh Trivedi, Dominik Wojtczak. On Pure Nash Equilibria in Stochastic Games**, 12th Annual Conference on Theory and Applications of Models of Computation.

#### Patents

- 2015 **Ram Bhushan Agrawal, Akhilesh Godi, Ankush Das. Robust Method to Find Layout Similarity between Two Documents**, US Patent 9,235,758 B1.

#### Honors and Awards

- 2021 **Invitation to TOPLAS special issue**, ESOP 2021
- 2020 **Best Junior System Description Paper Award**, FSCD 2020
- 2019 **Meta Fellowship**, Finalist
- 2009 **All India Rank 1 in Indian National Mathematics Olympiad (INMO)**
- 2010 **All India Rank 45 in IITJEE**

#### Interns and Mentored Students

- Summer 2022 **Joomy Korkut**, *Expressing communication protocols in distributed systems as a transition system that is verified by the Rust compiler.*
- Summer 2022 **Michalis Kokologiannakis (co-mentor)**, *Optimal stateless dynamic partial-order reduction algorithm for message-passing systems.*
- Summer 2022 **Gan Shen (co-mentor)**, *Automated test generation for distributed systems.*

- Summer 2022 **Darion Cassel (co-mentor)**, *Information flow type system for design-level security analysis of AWS services.*
- 2018 – 2020 **Ishani Santurkar**, *Integration of session types with functional programming.*
- 2019 – 2020 **Stephen McIntosh**, *Design of blockchain simulation within the Nomos language.*

## Talks

### Conference Presentations

- Jun 2021 **Resource-Aware Session Types for Digital Contracts**, *CSF 2021.*
- Nov 2020 **Exact and Linear-Time Gas-Cost Analysis**, *SAS 2020.*
- Sep 2020 **Verified Linear Session-Typed Concurrent Programming**, *PPDP 2020.*
- Sep 2020 **Session Types with Arithmetic Refinements**, *CONCUR 2020.*
- Jul 2020 **Rast: Resource-Aware Session Types with Arithmetic Refinements (System Description)**, *FSCD 2020.*
- Sep 2018 **Parallel Complexity Analysis with Temporal Session Types**, *ICFP 2018.*
- Jul 2018 **Work Analysis with Resource-Aware Session Types**, *LICS 2018.*
- Apr 2017 **ML for ML: Learning Cost Semantics by Experiment**, *TACAS 2017.*
- May 2015 **On Pure Nash Equilibria in Stochastic Games**, *TAMC 2015.*

### Invited Talks

- Apr 2021 **Resource-Aware Session Types for Digital Contracts**, *Meta; Amazon, USA.*
- Jul 2017 **Work Analysis of Session-Typed Programs**, *Dagstuhl Seminar, Germany.*
- May 2014 **Termination of Initialized Integer Linear Programs**, *Microsoft Research, Bangalore, India, Invited talk for the position of research fellow.*

### Seminar Presentations

- 2019 – 2020 **Resource-Aware Session Types for Digital Contracts**, Stanford University; University of Pennsylvania; Harvard University; University of Lisbon; Imperial College, London; University of Edinburgh; University of Colorado Boulder; Massachusetts Institute of Technology; New York University; Princeton University; University of California, San Diego; University of Texas, Austin; University of Wisconsin, Madison; Cornell University; Boston University; Yale University; University of Illinois, Urbana-Champaign; Purdue University; University of Washington; Meta Seattle; IIT Delhi; IIT Bombay; Microsoft Research, Bangalore.

## Schools and Seminars

- Oct 2021 **Rigorous Methods for Smart Contracts**, *Dagstuhl Seminar, Germany.*
- Jul 2017 **Resource Bound Analysis**, *Dagstuhl Seminar, Germany.*
- Jun 2016 **Oregon Programming Languages Summer School**, *University of Oregon.*
- 2009 – 2010 **International Mathematical Olympiad Training Camp**, *HBCSE, Mumbai.*
- May 2011 **Nurture Programme**, *TIFR, Mumbai.*

## Academic Service and Organizer Work

- 2019 – 2023 **Program Committee**, *Member*, ESOP 2023, FoSSaCS 2022, DICE-FOPARA 2019.
- 2021 – 2022 **Day 1 Science Mentorship Program**, *Mentor*, Amazon.
- 2020 – 2022 **ACM SIGPLAN Long-Term Mentorship Program**, *Mentor.*

- 2020 **Programming Language Mentoring Workshop (PLMW)**, *Mentor*, SPLASH.
- 2020 **Committee on Diversity, Equity, and Inclusion**, *Member*, Computer Science Department, CMU.
- 2020 **Equity, Diversity, and Inclusion Committee**, *Member*, Graduate Student Assembly, CMU.
- 2020 **Graduate Application Support Mentor**, *Computer Science Department*, CMU.
- 2019 **Artifact Evaluation Committee**, *Member*, PLDI 2019, POPL 2019.
- 2017 – 2022 **External Reviewer**, LICS 2022, CONCUR 2021, CSL 2021, ESOP 2020, COORDINATION 2020, JLAMP 2018, FLOPS 2018, CSL 2018, ICALP 2018, FSCD 2018, FSCD 2017.
- 2017 – 2021 **Speakers Club**, *Member*, CMU.
- Fall 2018 **15-317 Constructive Logic**, *Teaching Assistant*, CMU.
- Fall 2017 **MS in Computer Science Admissions Committee**, *Member*, CMU.
- Spring 2017 **Programming Languages Group Lunch**, *Organizer*, CMU.
- Fall 2016 **15-814 Types and Programming Languages**, *Teaching Assistant*, CMU.
- 2016 **Logic in Computer Science (LICS)**, *Student Volunteer*, Columbia University.