Ankit Kumar

Fourth year PhD student

Khoury College of Computer Sciences, Northeastern University, Boston

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Education

Khoury College of Computer Sciences, Northeastern University *Boston, US*

PhD in Computer Science *September 2018 –*

- GPA: 3.86/4
- Courses: Special Topics: Formal Methods, Special Topics: Programming Languages, Compilers, Theory of Computation, Foundations of Distributed Systems, Principles of Scalable Data Management

Indian Institute of Technology, Kanpur *Kanpur, India*

M.Tech in Computer Science and Engineering *July 2015 – June 2017*

- CPI: 8.67/10
- Courses: Type Theoretic Foundations of Programming Languages, Programs Proofs and Types, Category Theory, Functional Programming, Mathematics for Computer Science, Finite Automata on Infinite Inputs, Principles of Programming Languages , Design and Analysis of Algorithms, Online Learning and Optimization

Indian Institute of Technology (BHU), Varanasi *Varanasi, India*

B.Tech in Electrical Engineering *July 2006 – May 2010*

- GPA: 7.94/10

Delhi Public School *Dhanbad, India*

Schooling

- 12th Board (CBSE 2006): 89.8%, awarded proficiency in Physics by CBSE board
- 10th Board (CBSE 2004): 92.2%, awarded proficiency in Maths by CBSE board

Publications

Mathematical Programming Modulo Strings *Zoom*

FMCAD 2021 *October 2021*

- Authors : Ankit Kumar and Pete Manolios
- Introduced a new branching transition system TranSeq for deciding the satisfiability of conjunctions of string equations. TranSeq is an extension of the Mathematical Programming Modulo Theories (MPMT) constraint solving framework and is designed to enable useful and computationally efficient inferences that reduce the search space, that encode certain string constraints and theory lemmas as integer linear constraints and that otherwise split problems into simpler cases, via branching. Implemented a prototype, SeqSolve, in ACL2s, which uses Z3 as a back-end solver : `https://github.com/ankitku/SeqSolve`

Automated Grading of Automata with ACL2s *Zoom*

ThEdu 2021, Workshop paper *October 2021*

- Authors : Ankit Kumar, Andrew Walter and Pete Manolios
- Introduced tools to provide automatic feedback for constructing Finite automata, Push Down automata and Turing machines. These tools are baseed on the ACL2s interactive theorem prover, which provides advanced methods for stating as well as proving and disproving conjectures: `https://github.com/ankitku/AutoGradTOC`

Research Projects

Reasoning about the Gossipsub network protocol *Boston, US*

Course Project *Fall 2020*

- Gossipsub is an extensible pubsub protocol that uses peer scoring to maintain good quality of meshes in networks. We modelled the protocol in ACL2s and fuzzed the scoring system to expose potential vulnerabilities. We are currently working on a more fine-grained model of the protocol to find more attack vectors.

Formalization of Remora in ACL2s *Boston, US*

Readings Course Project *Fall 2018*

- Implemented an interpreter for the explicitly typed version of the Remora language: `https://www.ccs.neu.edu/~pete/pub/esop14-full.pdf` in ACL2s and proved some useful properties about it: `https://gitlab.com/remora/type-systems/remora-formalization`

Polymorphic extension of a language combining proofs and types

M.Tech Dissertation

Kanpur, India

Oct 2016 - May 2017

- Worked on extending the LTheta language proposed in Casinghino et al's MSFP 2012 paper "Step-Indexed Normalization for a Language with General Recursion" with polymorphic types.
- Proved type safety of the programmatic fragment and normalisation of the logical fragment of the extended language.
  Link to thesis : `http://ankitku.github.io/thesis.pdf`

Mechanizing the Metatheory of TAL-0 Language

Course Project

Kanpur, India

Aug - Nov 2016

- Mechanized the proof of soundness of the TAL-0 type system in Coq. TAL-0 type system was introduced by Greg Morrisett in his paper Typed Assembly Language. This project was undertaken as part of Programs, Proofs and Types course taken by Prof. Piyush P. Kurur.
  Project repository : `https://github.com/ankitku/TAL0`

Teaching Experience

Khoury College of Computer Sciences

TA

Boston, US

Sept. 2018 -

- I have been a TA for Theory of Computation, Logic and Computation and Algorithms courses at Khoury. My duties in all the TA positions have included responding to doubts on Piazza.
- I was involved in setting homework and exam problems at least once in each of the courses for which I held a TA position.
- During Fall 2020, I developed and deployed an Autograder based on the ACL2s theorem prover to automatically grade and provide feedback on automata constructions to students in Theory of Computation course.

IIT Kanpur

Tutor

Kanpur, India

Aug - Nov 2016 , Jan - Apr 2017

- As a tutor for the course Esc101 titled "Fundamentals in Computing", my duties included giving course lectures, setting lab problems and clearing doubts. I was selected to continue as tutor for the next semester (Jan-Apr 2017) as well.
- In Jan - Apr 2017, under the guidance of Prof. Rajat Mittal and Prof. Sandeep Shukla of CSE Dept., we tutors teamed up to record lectures for the Esc101 course in Hindi, and upload them to the online courses link of IITK. Hence students who face trouble attending lectures in English in class can refer the same lectures in Hindi on the online courses website. Link to one of my lectures : `https://youtu.be/IReBFFx1PBE`

Professional Experience

Olacabs

SDE II

Bangalore, India

September 2012 - November 2014

- Rewrote the second version of Olacabs android consumer app.
- Performance enhancement of the Olacabs driver app which sends the location of cab to backend services.
- Worked on cashless payment and online wallet systems.
- Skills: Android, Ruby on Rails, shell, mysql, mongoDB

Morgan Stanley Advantage Services

Associate

Mumbai, India

August 2010 - September 2012

- Worked on updates and maintenance of Third Party Derivatives trading platform, and rolled it out to new markets by making the code region aware, modular and pluggable.
- Developed an app that could visualize data in large xml files, validate them against their schema files and identify cross linking between two xml files.
- Skills: Java EE, Spring, C#, Hibernate, shell, Sybase

Awards and Achievements

2016	**Pin-Bhabha Pass trek ,** Successfully completed 7 day trek organized by the Adventure Club at IIT Kanpur. My experiences : `https://ankitku.github.io/posts/2016-08-02-BhabhaPassTrek.html`	*Himachal Pradesh, India*
2013	**First Prize,** Hacknight at Droidcon India	*Bangalore, India*
2013	**Third Prize,** Tnooz THack	*Bangalore, India*
2009	**Third Prize,** AnaDigix, Sparx IIT (ISM), Dhanbad	*Dhanbad, India*
2005	**Second Place,** All India Erose Scholarship Exam	*Dhanbad, India*
2004	**Third Place,** Regional Mathematics Olympiad, Chhotanagpur Mathemematical Society	*Bokaro, India*
2000	**State Level Winner,** Amul-cheese boy and butter girl contest, Surabhi	*Anand, India*