EKANSHDEEP GUPTA

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EDUCATION

New York University (NYU), USA — Fall 2020 - Ongoing
Doctorate of Philosophy (PhD) — GPA: 3.92/4
Computer Science

Chennai Mathematical Institute (CMI), India — Fall 2017 - Spring 2020
Bachelor of Science (Honours) — GPA: 9.67/10
Mathematics and Computer Science

RESEARCH INTERESTS

Formal methods, automated reasoning, separation logic, programming languages, symbolic execution, verification, logic.

RESEARCH EXPERIENCE

Courant Institute of Mathematical Sciences — Ongoing
Mentor: Thomas Wies — *New York University*

Creating a symbolic execution based automated verifier for separation logic. Seek to extend existing verifiers like Viper and Iris with better support for extensions of separation logic with custom resource algebras and better automation.

Laboratoire Spécification et Vérification — Summer 2019
Mentor: Alain Finkel — *École Normale Supérieure, Paris-Saclay*

Studied well-structured transition systems. Introduced and solved the Well Structured Problem and showed undecidability results for several classes of Presburger counter machines. Proved decidability for a subclass by finding a new algorithm; also showed a shorter proof of reachability for 1-affine nets.

R.C. Bose Summer Internship in Cryptology — Summer 2018
Mentor: Goutam Paul — *Indian Statistical Institute, Kolkata*

Studied Coding Theory, read about the algebraic construction and implementation of Low Density Parity Check (LDPC) codes followed by a technique to improve upon the standard LDPC Codes using belief propagation and list-erasure decoding.

INTERNSHIPS

Amazon Web Services — Summer 2022
S3 Automated Reasoning Group — *New York*

Built a light-weight executable specification for the S3 API. Tested the S3 service against our model and discovered bugs and edge-cases in the Multipart Upload API. Communicated findings to engineers to implement fixes.

PUBLICATIONS

A. Finkel and E. Gupta. The Well Structured Problem for Presburger Counter Machines. *In Proceedings of the 39th Conference on Foundations of Software Technology and Theoretical Computer Science* (FSTTCS'19)

RELEVANT COURSEWORK

Computer Science: Honours Programming Languages, Abstract Interpretation, Theoretical Machine Learning, Functional Programming in Haskell, Imperative Programming in Python, Theory of Computation, Logic Automata and Games, Data Mining and Machine Learning, Proofs and Types, Mathematical Logic.

Mathematics: Real & Complex Analysis, Multivariable Analysis, Metric Space Topology, Calculus, Differential Equations, Linear Algebra, Group Theory, Ring and Field Theory, and Probability Theory.

TALKS AND PRESENTATIONS

Gödel's Incompleteness Theorems November 2020

Presented as part of weekly Formal Methods Seminar at NYU. Introduced the historical context for Gödel's Theorems. Defined Gödel Numbering and showed in detail how it can be used to prove incompleteness of any sufficiently powerful logical system.

The Well Structured Problem for Presburger Counter Machines December 2019

Presented at FSTTCS'19. Introduced the well structured problem and the strong well structured problem for transtition systems; demonstrated its solutions for several classes of Presburger Counter machines.

Dependent Types and the λP system November 2019

Introduced the λP extension of lambda calculus with dependent types; discussed strong normalisation property and compared logical expressiveness with intuitionistic first order logic.

WORKSHOPS AND CONFERENCES

SPLASH 2021 October 2021

ACM SIGPLAN, Chicago, Illinois

FSTTCS 2019 December 2019

Indian Institute of Technology, Bombay, India

ForMaL—DigiCosme School on Formal Methods and Machine Learning June 2019

ENS Paris-Saclay, Cachan, France

TEACHING EXPERIENCE

Theory of Computation—Instructor: Prof. Aiswarya Fall 2019

Teaching assistant: made weekly problem sets, held tutorials.

Discrete Mathematics—Instructor: Prof. Srivathsan Fall 2019

Teaching assistant: made weekly problem sets, held weekly tutorials and clarified doubts.

Programming and Algorithms using Python—Instructor: Prof Madhavan Fall 2019-21

Teaching assistant: answered questions on the online forum and reviewed problem sets.

AWARDS AND FELLOWSHIPS

· MacCracken Fellowship: 2020-2026
· Chennai Mathematical Institute Fellowship: 2017-20
· Kishore Vaigyanik Protsahan Yojna Fellowship for undergraduate students: 2017-20
· Madhava Mathematics Competition 2019 — 2nd position across India

TECHNICAL STRENGTHS

Languages: English, Hindi.
Programming Skills: C++, Java, OCaml, Haskell, Python, Coq, Dafny, JavaScript, LaTeX.