Dhruv Nevatia

COMPUTER SCIENCE · STUDENT

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Education

Chennai Mathematical Institute, India   *2020—-*

M.SC. IN COMPUTER SCIENCE   *CGPA 10.00*

Chennai Mathematical Institute, India   *2017-2020*

B.SC. (HON.) IN COMPUTER SCIENCE AND MATH   *CGPA 8.11*

Courses

Advanced courses   *CMI-IITB*

Mathematical Logic, Automated Reasoning, Model Checking and Software Verification, Logic Automata and Games, Advanced Timed automata, Timed Automata, Concurrency theory, Weighted Automata, Theory of Computation, Proofs and Types, Complexity Theory, Algebraic automata theory, Linear optimization, Formal Security Analysis

Other relevant courses   *CMI*

Data mining and machine learning, Probability theory, Extremal combinatorics, Implementation of Functional Programming Languages, Functional Programming (Haskell), Advanced Programming (Python), Discrete Mathematics, Design and Analysis of Algorithms, Programming Language Concepts, Linear and Abstract Algebra

Past and ongoing research

MSc Thesis   *IIT, Bombay*

S AKSHAY   *Currently ongoing*

It focuses on developing a graph semantics and appropriate logical characterization to capture the behaviour of register automata in a unified approach to reduce the emptiness problem of register automata to satisfiability of a logical formulae. We further look at restrictions of these structures to deduce decidability.

An algebraic approach to universal automaton   *IRIF, Paris*

THOMAS COLCOMBET, DANIELA PETRISAN   *Currently ongoing*

We introduce a coarsest congruence on a new kind of bimachine to construct a quotient isomorphic to the universal automaton. We further investigate the same in a categorical lens for languages over monad algebras.

A Characterisation of First-Order Logic with Neighbour   *IIT Goa*

AMALDEV MANUEL   *June 2019 - Feb 2020*

We propose a notion of variety for regular languages that are closed under the reverse operation. We first observe that there is an Eilenberg-type correspondence between our proposed notion of varieties and pseudovarieties of hermitian semigroups. As an application it is shown that the class *Weak Locally Threshold Testable*, those languages that are definable in first-order logic with adjacency predicate, corresponds to the locally-hermitian block product of the pseudovarieties $\mathbf{Acom}^\star$ and $\mathbb{L}\mathbf{1}^h$.

Publications

An algebraic characterisation of First-Order Logic with Neighbour

WITH AMALDEV MANUEL, Accepted in **LICS 2021**

Projects and focused reading

On Weakening Strategies for PB solvers   *IIT, Bombay*

ASHUTOSH GUPTA

Involved investigation of weakening, division and resolution strategies and their interplay to minimize constraint blow-up and optimize strength for PB specifications. It further provides an implementation in SAT4j with a case-by-case analysis of observed improvement in runtime.

Perturbed Timed Automata *CMI*

B SRIVATHSAN

Determinizability of one clock perturbed timed automata unlike non - perturbed. Gives a construction for the same extending to timed language inclusion decidability hence answering the problem of universality.

Invariant Model Checking by K-Induction *CMI*

MANDAYAM SRIVAS

Involved implementation of invariant model checking algorithm by k-induction in z3, given a transition system and a property.

Learning regular sets from Queries and counterexamples *CMI*

C. AISWARYA

Gives an Oracle-guided learning algorithm of regular languages. The algorithm relies on the Myhill-Nerode equivalence for termination.

Honors & Awards

2017	**Finalist for National Math camp**, Madhava math competition	*CMI*
2015	**Ranked** 3rd**,** Regional Maths Olympiad	*Maharashtra-Goa*

Teaching

2020	**Teaching Assistant**, Theory of Computation	*CMI*
2020	**Teaching Assistant**, Mathematical Logic	*CMI*
2019	**Teaching Assistant**, Introduction to Programming in Haskell	*CMI*
2018	**Lecturer**, Abstract Algebra course for JEST applicants	*CMI - IMSc*

Technical Skills

Programming languages	Haskell, Python, C++, JAVA, Rust, F*
Tools	NuSMV, Z3, CBMC, Cadical, Proverif, Cryptoverif