SHIVAM HANDA

550 Memorial Drive, Apt 13C-2, Cambridge, MA, 02139 | 857-919-9124 | shivam@mit.edu | shivamhanda@gmail.com

ACADEMIC DETAILS

- Ph.D., Electrical Engineering and Computer Science, **Massachusetts Institute of Technology** (2019-Ongoing)
  Areas: Program Synthesis, Formal Methods, Formal Approaches to Machine Learning and System Design.
- M.S., Electrical Engineering and Computer Science, **Massachusetts Institute of Technology** (2016-2019)
  Thesis: Composable Inference Metaprogramming using Subproblems.
- B.Tech, Computer Science and Engineering, **Indian Institute of Technology, Delhi** (2010-2014)
  Thesis: Remote Desktop using Virtual Machine (VM) Record and Replay.

WORK EXPERIENCE

- Research Fellow, Programming Languages and Tools Group, **Microsoft Research India**, Bangalore, India   June 2014-June 2016
  Project: CScale: Distributed Stream Processing Engine.
- Research Intern, **Social Team**, **Adobe Advanced Technology Labs**, Delhi, India   May 2013-July 2013
  Project: Content Ideation.
- NIUS Researcher in **Physics**, **HBCSE, Tata Institute of Fundamental Research**, Mumbai, India   May 2012-July 2012
  Project: Influence of the Ben-Daniel Duke boundary condition on the levels of a circular Quantum Dot in a magnetic field.

RESEARCH WORK

- **Multi-Function Program Synthesis using input-output examples**
  - Synthesis of programs containing multiple functions which can call each other, given input-output examples for these functions.
  - Under submission at OOPSLA 2020.
- **Inductive Program Synthesis over Noisy Data**
  - Synthesis of programs over noisy input-output examples. These programs in general are more **interpretable than ML models**.
  - Accepted at FSE 2020.
- **Automatic Synthesis of Parallel and Distributed Unix Commands and Pipelines**
  - Synthesizes Parallel and Distributed versions of Shell Commands using **Active program synthesis** (variant of Active ML).
  - Under submission at OSDI 2021.
- **A Dataflow Model for Extracting Shell Script Parallelism**
  - Transforms shell scripts into their **parallel** and **distributed versions**, with **guarantees**, using light weight annotations.
  - Under submission at POPL 2021.
- **Compositional Inference Metaprogramming**
  - Inference Metaprogramming allows developers to dynamically decompose **general bayesian inference problems** into smaller subproblems to solve. Our work formalizes inference metaprogramming and provides **convergence guarantees**.
  - Probabilistic programming with programmable inference, PLDI 2018.
  - Compositional Inference Metaprogramming with Convergence Guarantees, arxiv 2019.
- **CScale: Distributed Stream Processing Engine**
  - Designed stream processing engine which allows computations with **large state** with **unbounded histories**.
  - It improves performance of **replicated pipelines** and uses **re-computation**, while providing no-data-loss grantees.
- **Remote Desktop using VM Record and Replay**
  - Optimization of Remote Desktop tools to **consume less Bandwidth** and **Virtual Remote Server's CPU**.
  - Utilized **VM record replay** to record snapshots of Server's Hypervisor and replays it on Client's Hypervisor.
- **Content Ideation**
  - Constructed a ML based model which helps companies create engaging content for their social media followers, allowing them to predict performance of their posts and provides suggestions on mode of content delivery and optimum time to post.
  - **Patent** on a part of this work: **Hierarchy Similarity Measure**, Shukla et.al.
- **Influence of the Ben-Daniel Duke boundary condition on the levels of a circular Quantum Dot in a magnetic field**
  - Derived a theoretical model of effects of Ben Daniel Duke condition in case of circular Quantum Dots in magnetic fields.
  - Under submission to **Superlattices and Microstructures**.

SCHOLASTIC ACHIEVEMENTS

- Awarded **Aditya Birla Scholarship** for **4 consecutive years; 1 among 11** scholars from all over India.
- Won **Silver Medal** for Indian at **International Physics Olympiad (IPhO)** 2010, help at Zagreb, Croatia.
  Honored by **Ministry of Science and Technology** and Tata Institute of Fundamental Research for the same.
- Secured **All India Rank 37** in **IIT-JEE** entrance examination, among more than 500,000 students.
- Awarded **AIEEE Merit Scholarship** for securing **All India Rank 9 in AIEEE** qualifying exams.

OTHER RELEVANT RESEARCH PROJECTS

- **Secure Userspace DMA**: Allows userspace processes to directly share DMA devices securely.
- **Learning Discrete Structures using Gumbel-Ellipsoid**: Learning ML models which output complicated Discrete structures.
- **Automated Requirement Document Analysis**: NLP to check completeness and consistency of requirement specifications.

RELEVANT COURSES

Entrepreneurship: New Enterprises (MIT-Sloan).
Machine Learning: Machine Learning (MIT), Statistical Learning Theory (MIT), Topics in Deployable Machine Learning (MIT).
Physics: Quantum Mechanics (IITD), Relativistic Quantum Mechanics (IITD) ,Optics (IITD), Special Topics in Optics (IITD), etc.