

Ph.D. @CSE, IITH



CSE IITH-PHD ADMISSIONS OPEN JAN 2026



భారతీయ సాంకేతిక విజ్ఞాన సంస్థ హైదరాబాద్
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad



CSE DEPARTMENT HIGHLIGHTS

Broad Research Areas

01 Theory

Algorithms
Computational Complexity
Graph Theory
Combinatorics
Formal Methods
Quantum Computing
Post-quantum cryptography

02 Systems

Computer Networks
Compilers
Architecture
Distributed Systems
Blockchains
Cyber Security

03 AI/ML & Data Science

Computer Vision
NLP (Natural Language Processing)
Social Media Analytics
Theoretical AI/ML
Applications

PhD Fellowships

- Google Ph.D. Fellowship
- TCS Ph.D. Fellowship
- Intel Ph.D. Fellowship
- Reliance Foundation Fellowship
- PMRF Fellowship
- Microsoft Research India PhD Award
- Qualcomm Innovation Fellowship

Alumni in PostDoc Positions

Publication Venues

Student Recognitions

- IDRBT Doctoral Colloquium
- Indo-Canadian Shastri Student Research Fellowship
- S N Bose Fellowship
- Honda YES Fellowship
- Viterbi Fellowship
- Google AI Residency
- Facebook AI Residency
- Fulbright-Nehru doctoral research fellowship

Eligibility

BE (or equivalent) with a valid GATE score, or students from a CFTI with a CGPA of 8.0 and above, or MTech degree holders can apply.

PhD Programme

MTech

B.Tech (or equivalent)
with a valid GATE score

B.Tech(or equivalent) from CFTI
with CGPA 8.00 and above

How to Apply

How to Apply and Prepare?

- Applications must be submitted online at: <https://iith.ac.in/phdadmissions/>
- CSE PhD information at: <https://cse.iith.ac.in/admissions/phd.html>
- For PhD admission related queries: [Click here](#)
- How to Prepare for Ph.D. Interviews? [Click here](#)
- Syllabus and Sample questions: [Click here](#)
- Current PhD Students: [Click here](#)

Selection process: November 2025

CSE department brochure:
<https://cse.iith.ac.in/aboutUs/Brochure.html>

Application start date : 10-Oct-2025 12:00 IST
Application end date : 24-Oct-2025 23:59 IST

Table of Contents

Theoretical Computer Science @IITH

Computer Systems Research @IITH

Artificial Intelligence/Machine Learning Research @IITH

Collaborations

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Life @CSE, IITH

CSE PhD Alumni

How to Apply?

Theoretical Computer Science @IITH

Cryptography

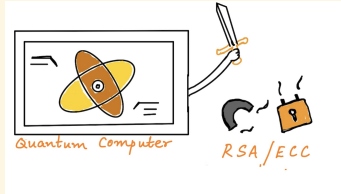
- ▶ How to **efficiently authenticate** a vehicle **without revealing private information** in fast moving traffic? Lightweight cryptography!



Cryptography

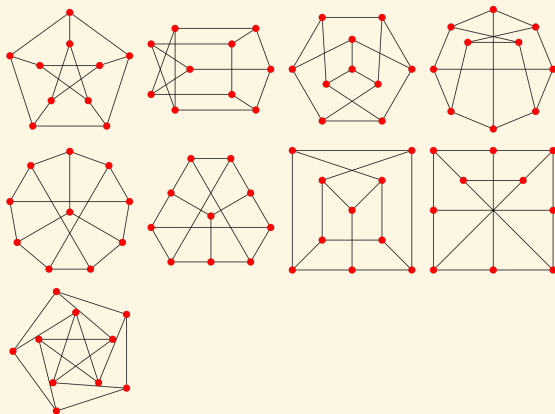
- ▶ A quantum computer can break most of the encryption schemes of today. What are the options for crypto, post-quantum?

Quantum crypto, Lattice crypto, etc.



- ▶ Hardware/Software aspects of quantum cryptography.
- ▶ Privacy preserving mechanisms over blockchains.

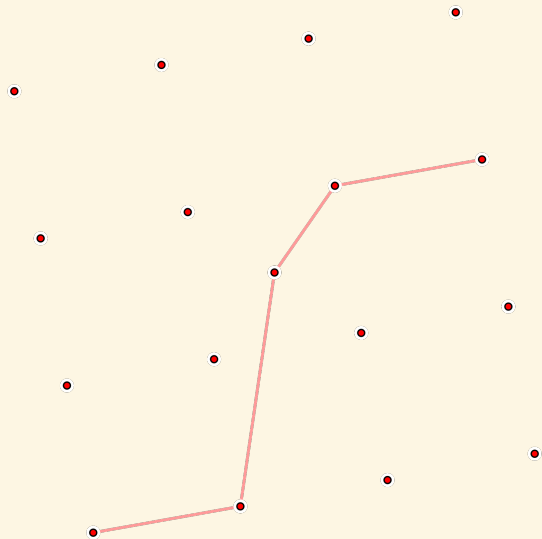
Combinatorics



Are they the same graph?

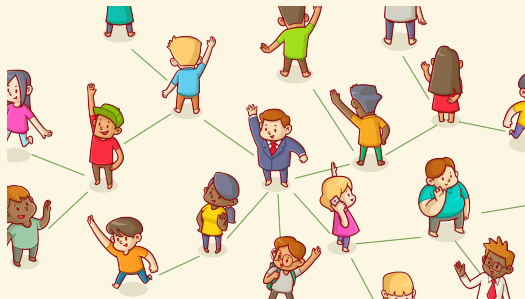
Graph Isomorphism Problem

Combinatorics



Erdős Szekeres Problem:
What is the longest
increasing/decreasing sequence
here?

Combinatorics

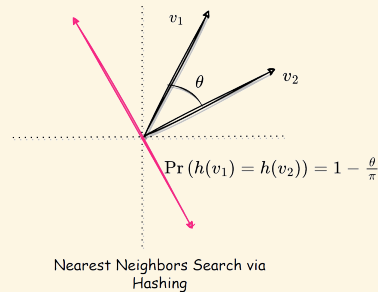
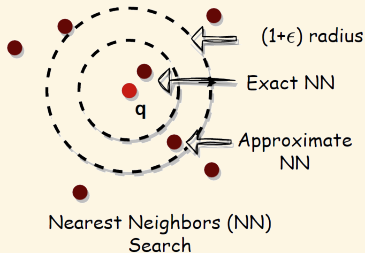


Second Neighborhood Problem:

Posed by Paul Seymour (1990):

In a **social network** described by such a graph, is there always someone who has at least as many friends-of-friends as friends?

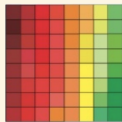
Algorithms



Vector



Matrix

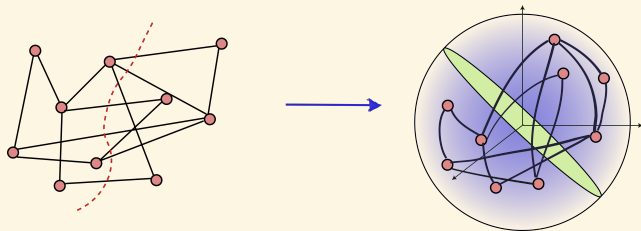


Tensor



- ▶ Locality Sensitive Hashing (LSH) [Indyk, Motwani '98] suggest approximate nearest neighbour search algorithm for vectors.
- ▶ Major open problem is to propose (approximate) nearest neighbour search algorithms for tensors!

Algorithms



Max-Cut problem:

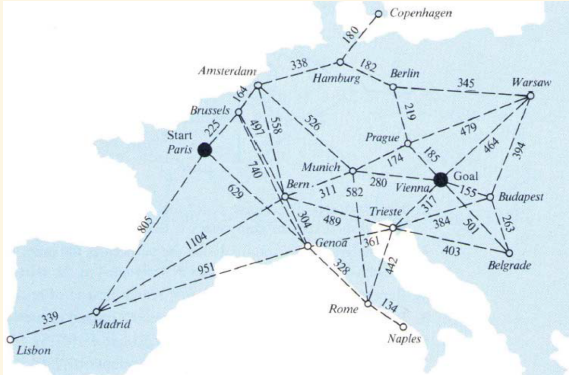
Partition a set of people into two parts such that interaction across parts is maximized.

[Goemans-Williamson '95]:

Embedding the graph into a sphere, and cutting the sphere into two halves to find the partition gives a good approximation.

Major open problem to find a better solution!

Complexity Theory

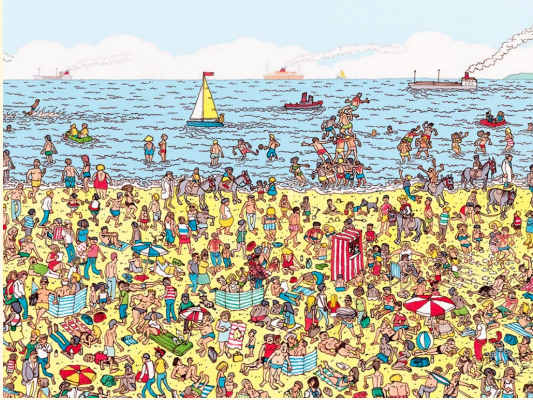


Travelling Salesman Problem:

Given: cost of travelling between every pair of cities, and a cost c .

Is there a **tour with cost $\leq c$** that visits every vertex exactly once and ends in the starting vertex?

Complexity Theory



Zero Knowledge Proofs:
Can you **prove** that you have found Waldo
without revealing where he is?

Theoretical Computer Science Faculty



Maria Francis

Cryptography, Computational Algebra



Rogers Mathew

Combinatorics



M. V. Panduranga Rao

Quantum Computing



Nitin Saurabh

Computational Complexity, Quantum Computing



Subrahmanyam Kalyanasundaram

Computational Complexity



Aravind N.R

Graph Theory, Algorithms, Combinatorics



Rameshwar Pratap

Algorithms, Machine Learning



Rakesh Venkat

Algorithms, Complexity Theory

Networks and Systems Group
Dept. of Computer Science and Engineering



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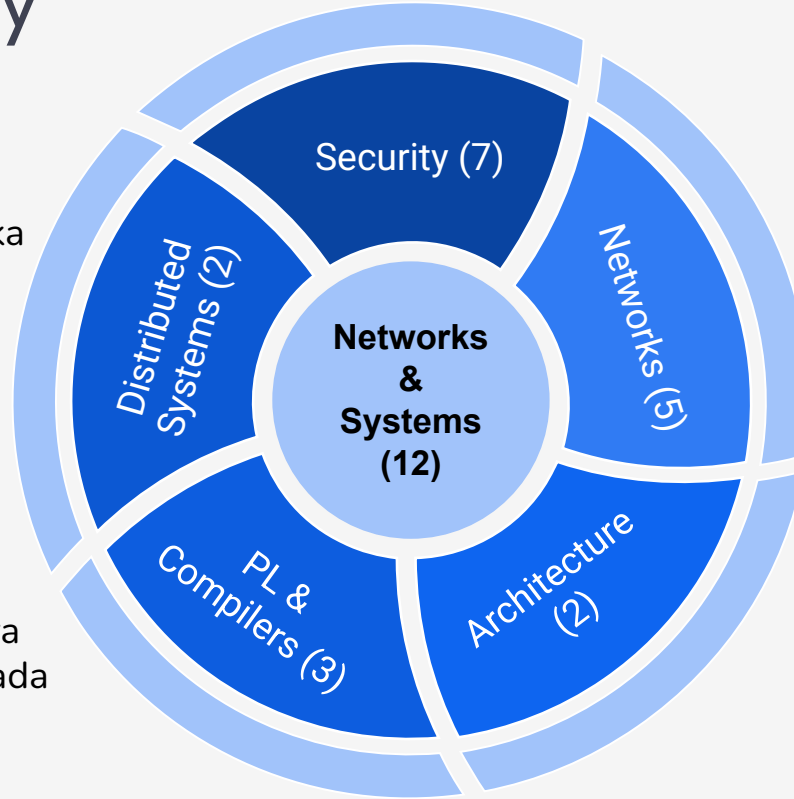
Faculty

- Saurabh Kumar



- Kotaro Kataoka
- Sathya Peri

- Ashish Mishra
- Jyothi Vedurada
- Ramakrishna Upadrasta



- Antony Franklin
- Bheemarjuna Reddy Tamma
- C. Siva Ram Murthy
- Kotaro Kataoka
- Praveen Tammana

- Rajesh Kedia
- Shirshendu Das

Research Expertise: Networks & Security

01

Mobile Wireless Networks
(5G and Beyond Networks)

02

Software-defined Networking &
Network Functions Virtualization

03

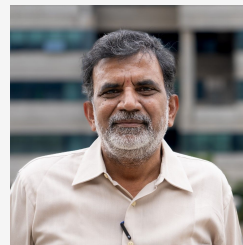
Networked systems for AI/ML:
Programmable Data Planes,
Data Center Networking

04

V2X & Mobile Edge for
Autonomous Navigation

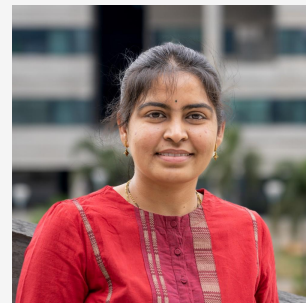
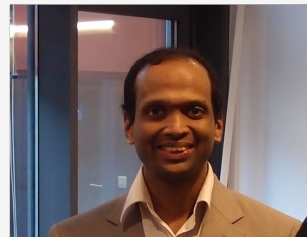
05

Cyber Security, Wireless Security
& AI



Research Expertise: PL/Compilers

01	Program Analysis and Compilers using Machine Learning
02	Polyhedral Compilation
03	Compiler Optimization Techniques for CPUs & GPUs
04	High-performance GPU Algorithms for Scalable Graph Analysis
05	Data Race Checking & Parallel Code Compliance Standards
06	Tree Automata for Synthesis and Verification over Refinement Typed Space
07	ML Modulo Repair for scalable synthesis.



Research Expertise: Computer Architecture

01

Thermal Management for 3D Architectures

02

Memory Security

03

Cache, Interconnects & Memory Access Policies

04

Resource Sharing in Heterogeneous Architectures

05

Non-volatile Memories



Research Expertise: Distributed Systems and Databases

01	Blockchains & its applications to Security and Smart Contracts
02	Large-Scale Graph Analytics
03	Efficient Consensus Protocols
04	Distributed and Federated Learning
05	AI for Databases, Database Testing



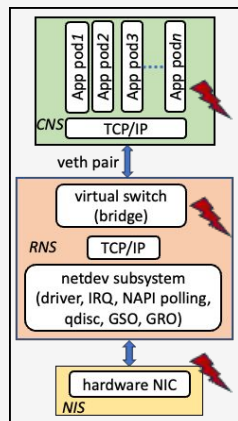
Courses Offered: Electives



1. Networked Wireless Systems
2. Internet of Things
3. Topics in Networks (/w Industry)
4. Topics in Wireless Networks
5. Software Defined Networks
6. Network Engineering (hands-on)
7. **Cyber Security and AI (/w Industry and AI dept.)**
8. Concurrency Control in Transactional Systems
9. Parallel and Concurrent Programming
10. Distributed Computing
11. Parallel Programming for Practitioners
12. Compiler Optimizations
13. Advanced Compiler Design
14. Advanced Compiler Optimizations
15. Topics in Compiler Optimizations 🤝
16. Introduction to Compiler Engineering (/w Industry)
17. Advanced Compiler Engineering
18. Compilers for Machine Learning
19. Introduction to Program Analysis and Compiler Optimization
20. **Program Synthesis**
21. Advanced Computer Architecture 🤝
22. **Hardware Architecture for Deep Learning** 🤝

Research Highlights

Networked systems research



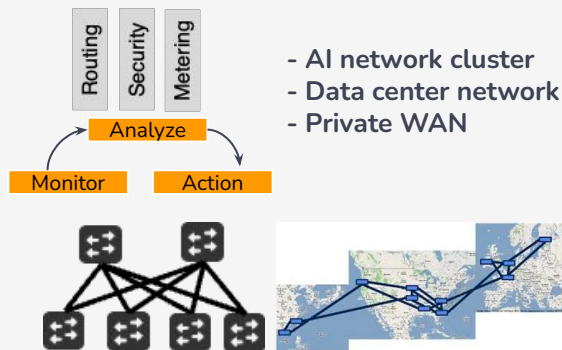
Host network stack
(eBPF, smartNICs)



1. Monitoring and detecting performance anomalies
Challenge: Minimizing per-packet overheads at high-speed (> 100Gbps)

2. Static analysis of eBPF bytecodes for debugging
Challenge: Extracting network context to bytecode

Collaborators: IITH Compilers team, IBM Res, CMU

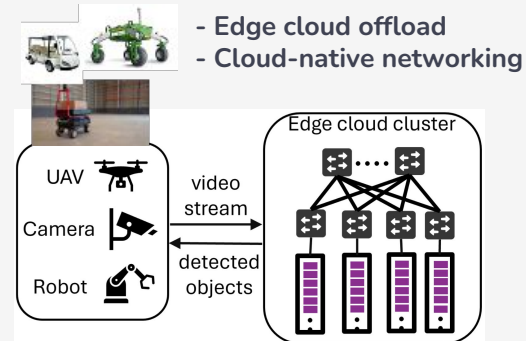


- AI network cluster
- Data center network
- Private WAN

1. Traffic Engineering (P4, SDN):
- Congestion control, multipath traffic split, In-network telemetry
Challenge: Restrictions on per-packet operations, state, latency

2. Securing in-network systems (P4, SDN):
- DoS, DDoS, Evasion, Poisoning, Bad QoS
Challenge: Tradeoff between performance and security operations

Collaborators: IIIT Delhi, Princeton, Univ. of Waterloo, Marvell



1. Load-aware in-network LB (service mesh)
Challenge: Visibility into servers' load and nw path status

2. GPU-centric packet processing for IoT-ML inference
- GPUNetIO, GPUDirectRDMA
Challenge: Reliable transport over lossy networks

Collaborators: NYU, IITH, DigiQuanta



Edge Cloud for Autonomous Navigation Applications

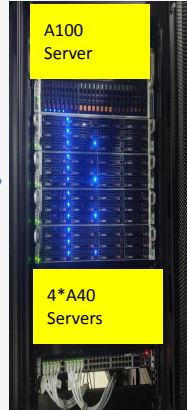
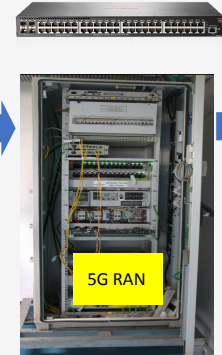
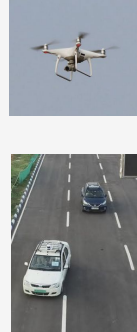
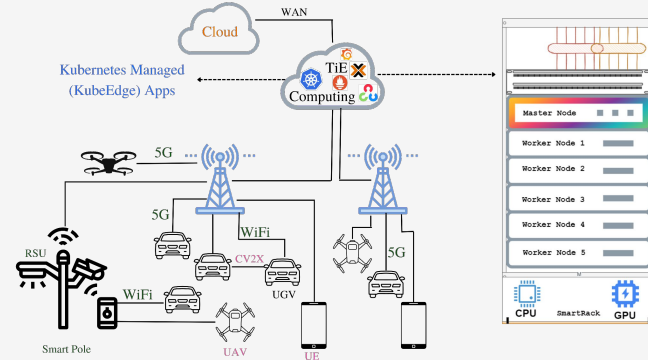
Goal: Bring compute and storage closer to the data source



**TiHAN testbed for
Research & Technology
development of
Autonomous Navigation
and Data Acquisition
Systems**



TiE Architecture



OAI based 4G/5G Virtualized Base Station Testbed



- Joint allocation of radio and system resources
- Traffic-aware compute resource tuning for energy efficiency
- A flexible split based 5G RAN to Minimize energy consumption and handovers

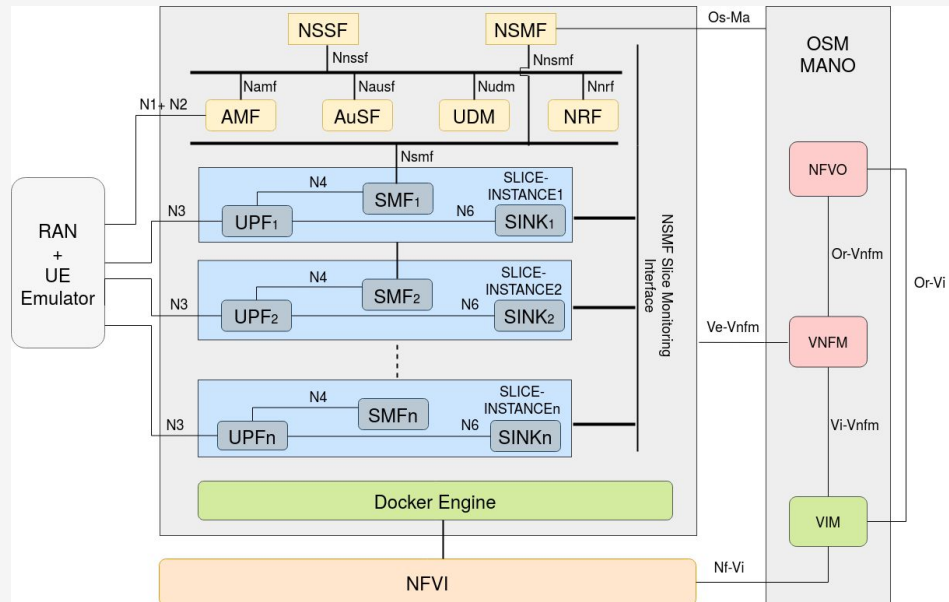
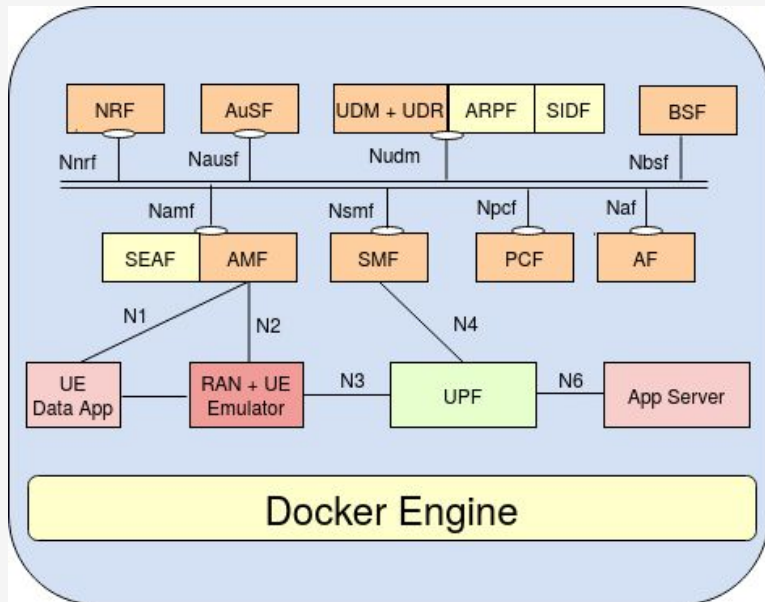


[IEEE Netsoft] [IEEE TNSM] [IEEE NOMS]

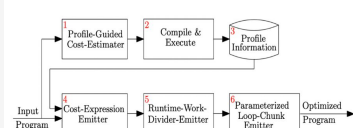


Building IITH 5G Core

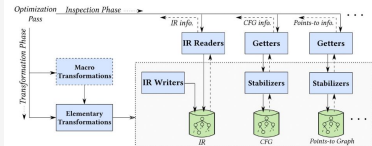
- Funded by “Indigenous 5G Testbed” Project, DoT, GoI
- Supports Network Slicing and Orchestration (OSM)
- Integration with OAI RAN & MEC platforms
- Contributing to open source platforms like OpenAirInterface (OAI)



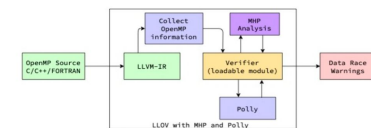
Zoom-in on some of the Developed Frameworks



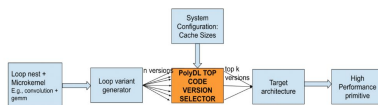
Deep Chunking: Chunking Loops with non-Uniform Workloads



Homeostasis: Self-Stabilizing Compiler Infrastructure



LLOV: Static Data-Race Checker for OpenMP Programs



PolyDL: Polyhedral Optimizations for Creation of High-performance DL Primitives.

Papers Published

- DisGCo : A Compiler for Distributed Graph Analytics. R S Anchu and V K Nandivada, *in the ACM Transactions on Architecture and Code Optimization (TACO)*, 2020. Presented at HiPEAC 2021.
- Chunking Loops with non-Uniform Workloads. I K Prabhu and V K Nandivada, *in the Proceedings of the International conference on Supercomputing (ICS)*, 2020.
- PolyDL: Polyhedral Optimizations for Creation of High-performance DL Primitives. Sanket Tavarageri, Alexander Heinecke, Sasikanth Avancha, Bharat Kaul, Gagandeep Goyal, and Ramakrishna Upadrasta. 2021. *ACM Trans. Archit. Code Optim.* (TACO), 2021. Presented at HiPEAC 2021.
- LLOV: A Fast Static Data-Race Checker for OpenMP Programs. Utpal Bora, Santanu Das, Pankaj Kukreja, Saurabh Joshi, Ramakrishna Upadrasta, and Sanjay Rajopadhye. 2020. *ACM Trans. Archit. Code Optim.* (TACO), 2020. Presented at HiPEAC 2021.
- OpenMP aware MHP Analysis for Improved Static Data-Race Detection Utpal Bora, Shrayish Vaishay, Saurabh Joshi, Ramakrishna Upadrasta. The Seventh Annual Workshop on the LLVM Compiler Infrastructure in HPC Workshop held in conjunction with SC21 - November 14, 2021 - St. Louis, USA

Software Produced (or planned to be Released)

- IMOP**: IIT Madras OpenMP Compiler Framework (<http://www.cse.iitm.ac.in/~amannoug/imop/>)
- DiscGo**: A compiler to compile Green-Marl programs to efficient MPI Programs (<https://github.com/anchur/DisGCo>)
- LLOV (2.0)**: LLVM OpenMP Verifier <https://compilers.cse.iith.ac.in/projects/llov/>
- PolyDL/PolyAI**: Polyhedral Optimizations for Creation of High Performance DL primitives <https://compilers.cse.iith.ac.in/projects/polydl/>
- BullsEye**: Scalable and Accurate Approximation Framework for Cache Miss Calculation <https://compilers.cse.iith.ac.in/projects/bullseye/>



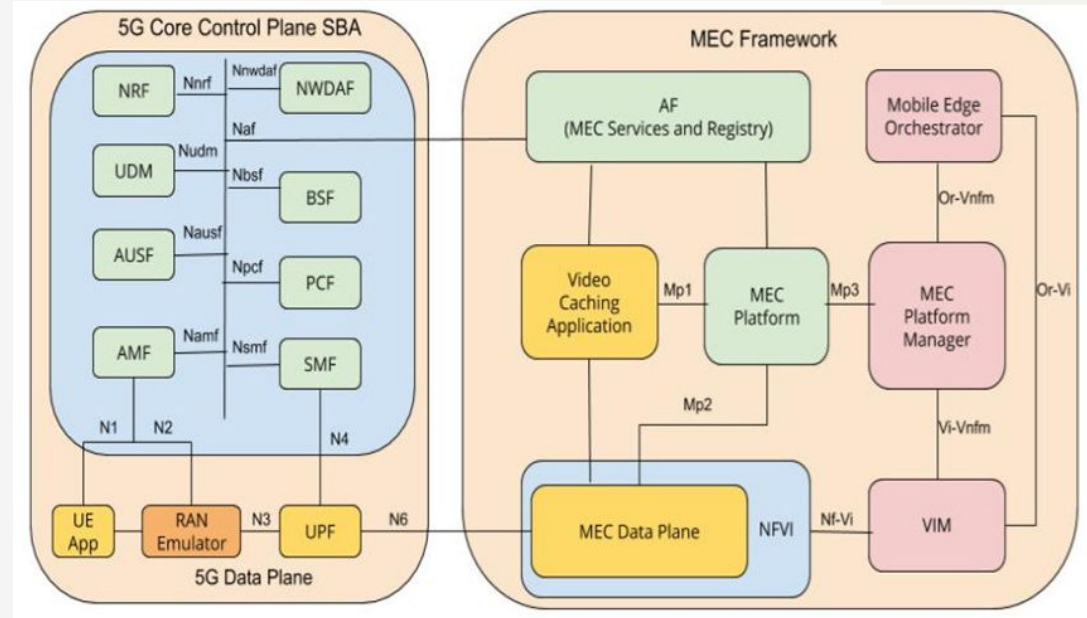
Tutorials of Softwares

- IMOP**
 - CGO 2020
 - CGO 2021, CGO 2022 (online)
 - (upcoming) CGO 2023
- LLOV**: Fourth LLVM performance workshop (Co-located with CGO-2020)
- PolyDL/PolyAI**: Compilers for Machine Learning (C4ML) workshop 2021 (co-located with CGO-2021)
- POSET-RL**: Sixth LLVM performance workshop (Co-located with CGO-2022) (online)



MEC Platform for Deploying 5G Applications

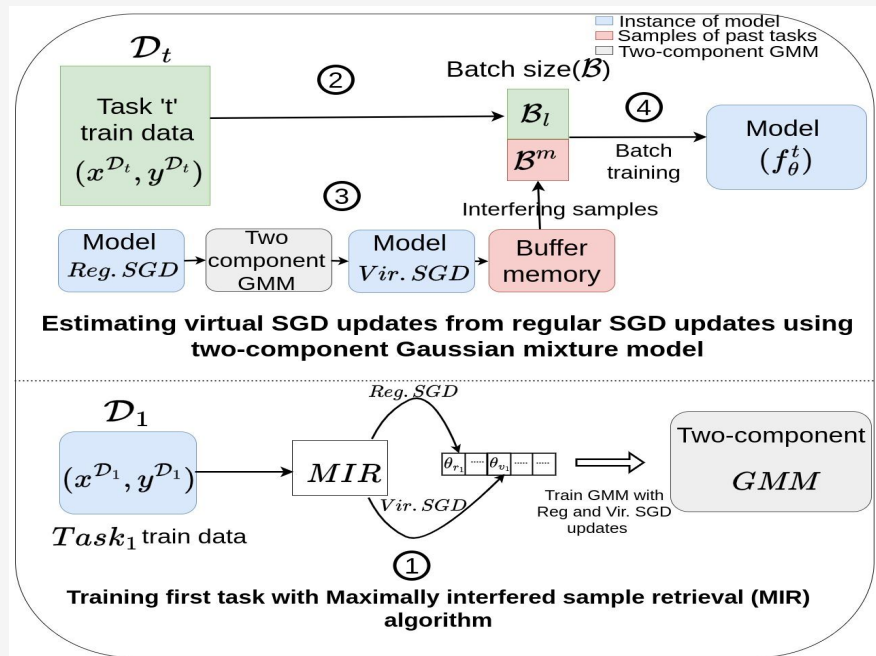
- Integrated /w IITH 5GC
- Support for Radio Network & Location Information Services
- Edge video caching for DASH-based video streaming



[IEEE Netsoft] [IEEE/ACM COMSNETS]

Continual Learning for Network Intrusion Detection

- Severe class imbalance (CI) in datasets like CICIDS-18, CTU-13 and ANOSHIFT
- Scalability issues in using CL for realtime NIDS
- Extended Class based Reservoir Sampling (CBRS) for tackling severe CI
- Perturbation assistance for parameter approximation (PAPA) for scalability

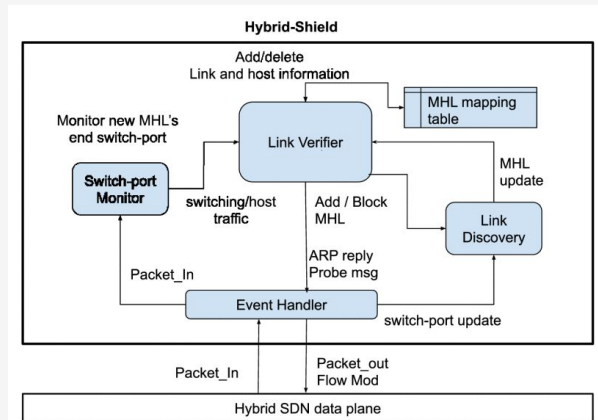


[NeurIPS 2023]

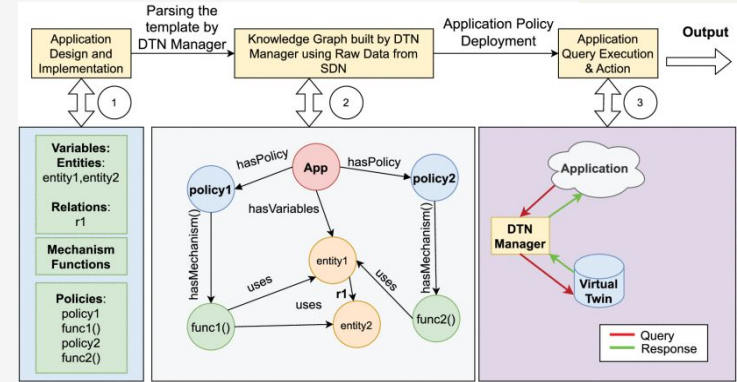


Internet Architecture

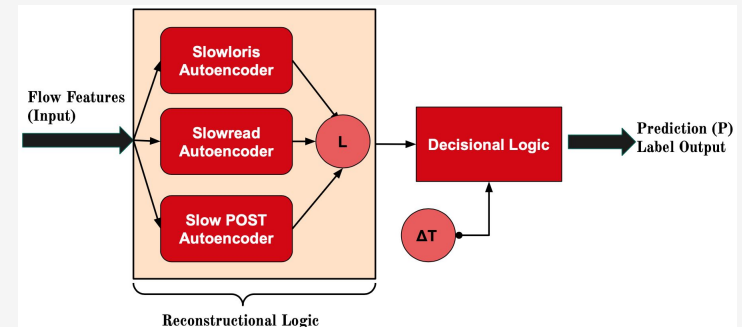
- Digital Twin of SDN based Networks by Data Representation
- Topology Poisoning Attacks and Prevention in Hybrid SDN (IEEE TNSM 2022)
- Slow HTTP DoS Attack Detection using Autoencoders through Unsupervised Learning (ACM AINTEC 2021)



Workflow of Prevention Mechanism of Topology Poisoning Attacks



Workflow of Constructing a Digital Twin Network

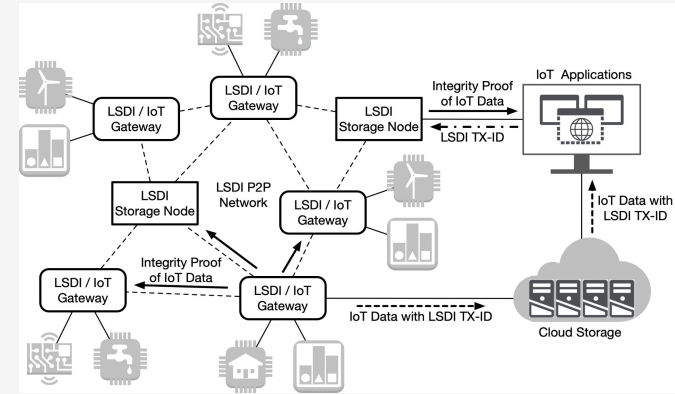


Reconstruction Logic

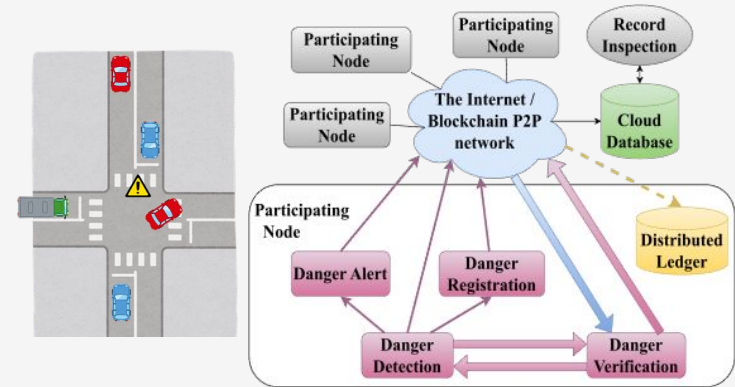
Slow HTTP DoS Attack Detection

Blockchain

- DAG based Distributed Ledger for IoT Data Integrity (IEEE ICOIN 2021)
- Collective Intelligence by AI-Blockchain Interplay (IEEE IV 2023)
- Credential Management (IEEE Access 2022)
- Inter Blockchain Communication (ongoing)
- Exploration of Blockchain Use Cases in Mental Health Care
- Industry Collaborators: DENSO, I'mbesideyou, Chaintope, etc.



Working of DAG based Distributed Ledger



Parallel & Distributed Systems

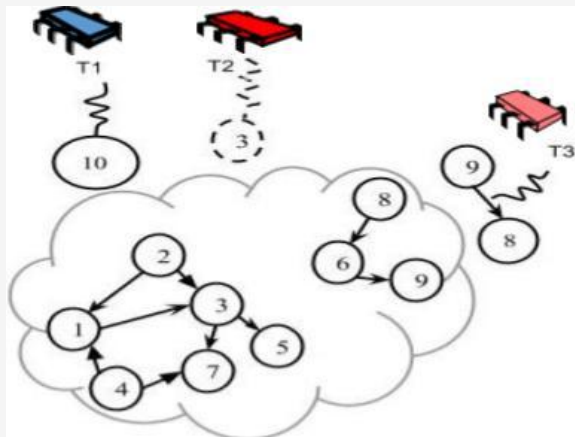
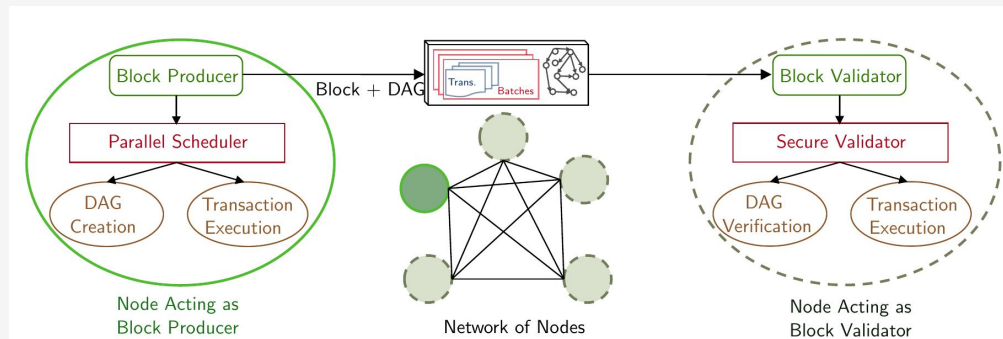


Illustration of a Dynamic Time-Changing Graph



Efficient Smart Contract Execution in Blockchains

Dynamic Distributed Graph Analytics

- Working on developing tools for Dynamic time-changing distributed graphs
- Worked the analytics operations: Betweenness Centrality, Pagerank, BFS, Shortest Paths

Efficient Smart Contract Execution in Blockchains

Developed an Efficient Distributed and Secure framework for the Execution of Smart Contracts in Blockchains.
Demonstrated it Hyperledger Sawtooth

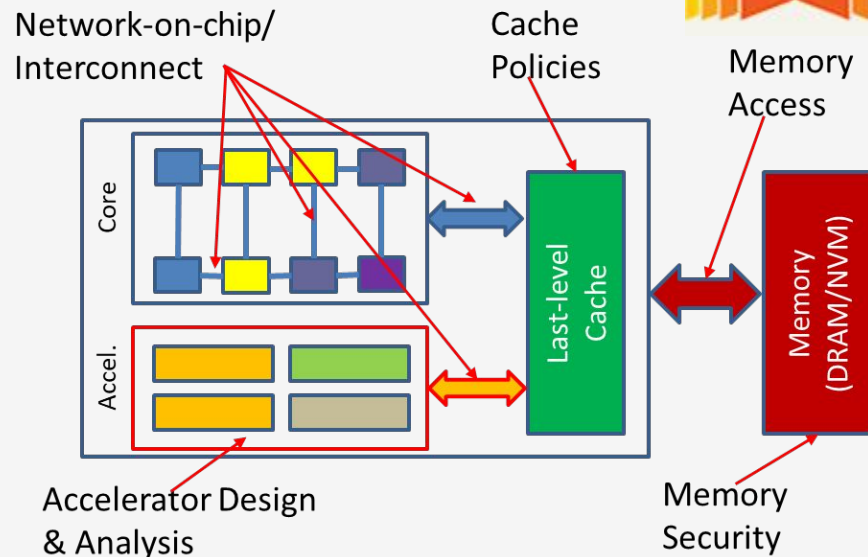
Computer Architecture

Problem: Standard interconnect and memory management policies are not efficient for accelerator-rich systems

Research: Identify resource sharing policies considering accelerator access patterns

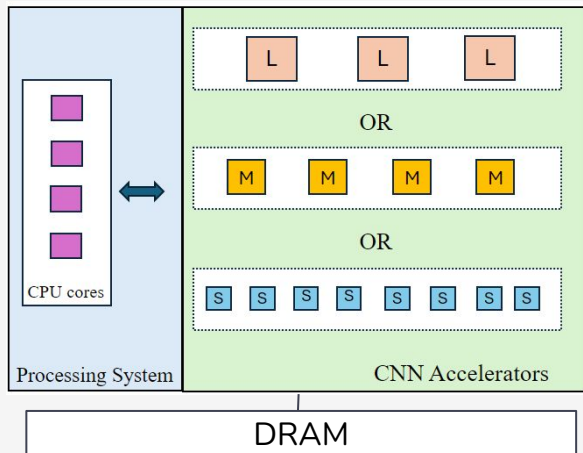
Problem: 3D architectures for processor and memory suffer from thermal issues

Research: Propose thermal management policies with low overheads



Computer Architecture

Concurrent CNN Accelerators



- Characterizing workloads for various hardware configurations [IEEE ESL 2024]
- CNN execution time estimation as per hardware configuration [ACM TECS 2024]

RISC-V Specific Optimizations

- Custom/co-processor instructions as per application requirements
- Register access optimizations - hardware and software

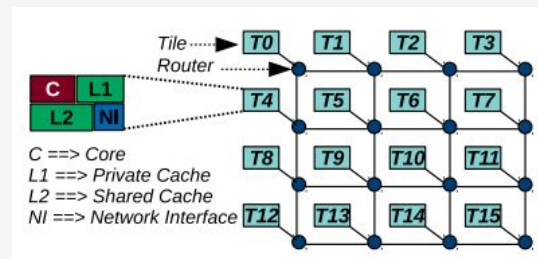
CNN/LLM Optimizations for NVM

- NVM have high latency and energy cost for writes
- Analyze the bit changes and optimize the total number of writes

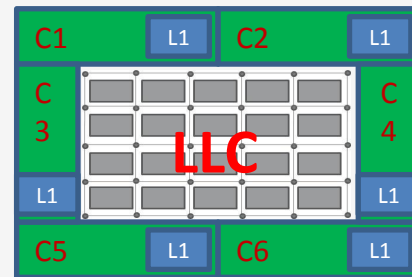
Chipmultiprocessor and Hardware Security

In modern Chipmultiprocessors (CMP) multiple cores share a common Last Level Cache (LLC)

- Performance enhancement of CMP LLCs: *Replacement Policies, Prefetching, Cache Utilisation, and Coherence Issues.*
- Preventing CMP LLCs from Side-Channel and Covert-Channel attacks without compromising on performance.
- Exploring the possibilities of different Hardware Trojan (HT) present in the Network-on-Chip (NoC) of the modern CMPs.
- Resolving the challenges of using emerging memory technologies to design CMP LLC: *Performance, Endurance and Security.*
- Reducing the refresh overhead and preventing the security attacks on DRAM-based main memories.



A Chipmultiprocessor (CMP) with tiled architecture.

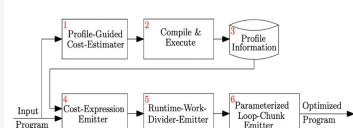


A Chipmultiprocessor (CMP) with non-tiled architecture.

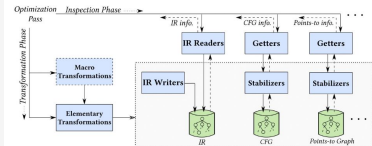
Programming Model/Language, Compiler and Runtime System for Emerging HPC Systems



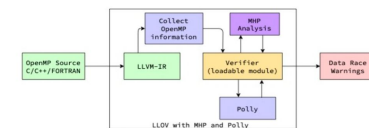
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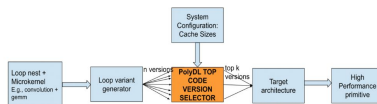
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PolyDL: Polyhedral Optimizations for Creation of High-performance DL Primitives.

Papers Published

- DisGCo : A Compiler for Distributed Graph Analytics. R S Anchu and V K Nandivada, *in the ACM Transactions on Architecture and Code Optimization (TACO)*, 2020. Presented at HiPEAC 2021.
- Chunking Loops with non-Uniform Workloads. I K Prabhu and V K Nandivada, *in the Proceedings of the International conference on Supercomputing (ICS)*, 2020.
- PolyDL: Polyhedral Optimizations for Creation of High-performance DL Primitives. Sanket Tavarageri, Alexander Heinecke, Sasikanth Avancha, Bharat Kaul, Gagandeep Goyal, and Ramakrishna Upadrasta. 2021. *ACM Trans. Archit. Code Optim.* (TACO), 2021. Presented at HiPEAC 2021.
- LLOV: A Fast Static Data-Race Checker for OpenMP Programs. Utpal Bora, Santanu Das, Pankaj Kukreja, Saurabh Joshi, Ramakrishna Upadrasta, and Sanjay Rajopadhye. 2020. *ACM Trans. Archit. Code Optim.* (TACO), 2020. Presented at HiPEAC 2021.
- OpenMP aware MHP Analysis for Improved Static Data-Race Detection Utpal Bora, Shrayish Vaishay, Saurabh Joshi, Ramakrishna Upadrasta. The Seventh Annual Workshop on the LLVM Compiler Infrastructure in HPC Workshop held in conjunction with SC21 - November 14, 2021 - St. Louis, USA

Software Produced (or planned to be Released)

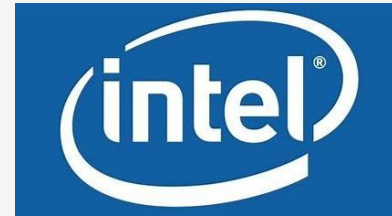
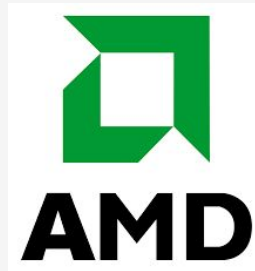
- IMOP**: IIT Madras OpenMP Compiler Framework (<http://www.cse.iitm.ac.in/~amannoug/imop/>)
- DiscGo**: A compiler to compile Green-Marl programs to efficient MPI Programs (<https://github.com/anchur/DisGCo>)
- LLOV (2.0)**: LLVM OpenMP Verifier <https://compilers.cse.iith.ac.in/projects/llov/>
- PolyDL/PolyAI**: Polyhedral Optimizations for Creation of High Performance DL primitives <https://compilers.cse.iith.ac.in/projects/polydl/>
- BullsEye**: Scalable and Accurate Approximation Framework for Cache Miss Calculation <https://compilers.cse.iith.ac.in/projects/bullseye/>



Tutorials of Softwares

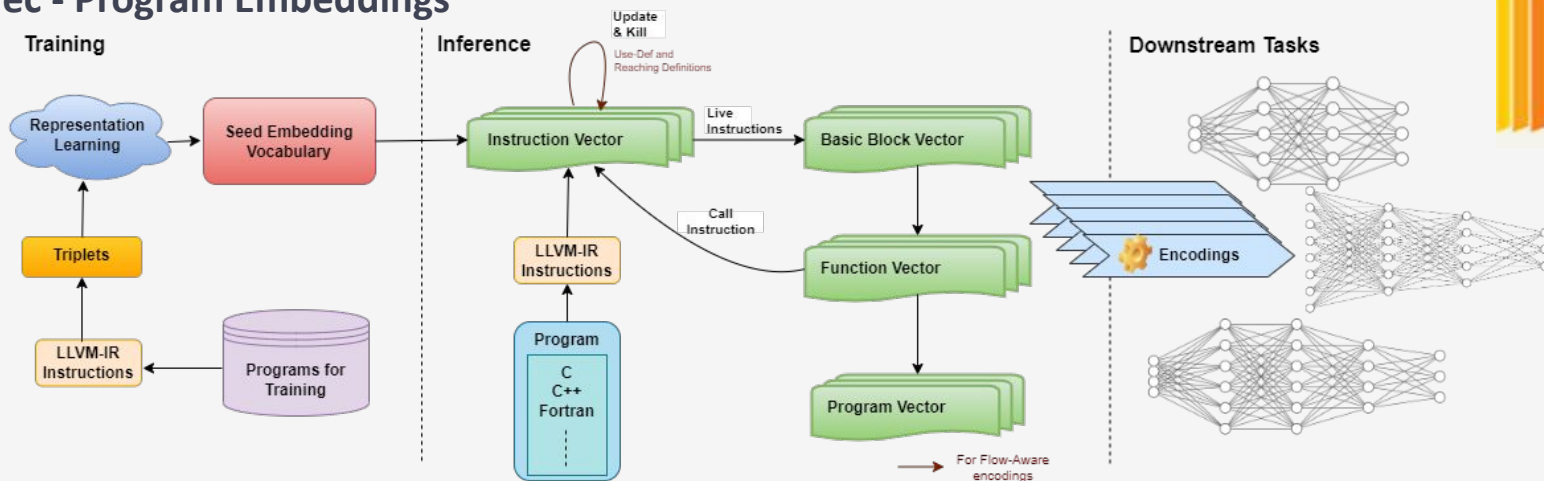
- IMOP**
 - CGO 2020
 - CGO 2021, CGO 2022 (online)
 - (upcoming) CGO 2023
- LLOV**: Fourth LLVM performance workshop (Co-located with CGO-2020)
- PolyDL/PolyAI**: Compilers for Machine Learning (C4ML) workshop 2021 (co-located with CGO-2021)
- POSET-RL**: Sixth LLVM performance workshop (Co-located with CGO-2022) (online)

ML4Code: Machine Learning for Compiler Optimizations and Program Analysis



Machine Learning for Code: Embeddings and Applications

IR2Vec - Program Embeddings



Applications

Heterogeneous Device Mapping
[TACO' 20, APNET' 22]



Register Allocation
[CC' 23]



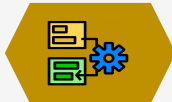
Power and Energy Optimizations
[Ongoing]



Thread Coarsening
[TACO' 20]



Compiler Phase Ordering
[ISPASS' 21]

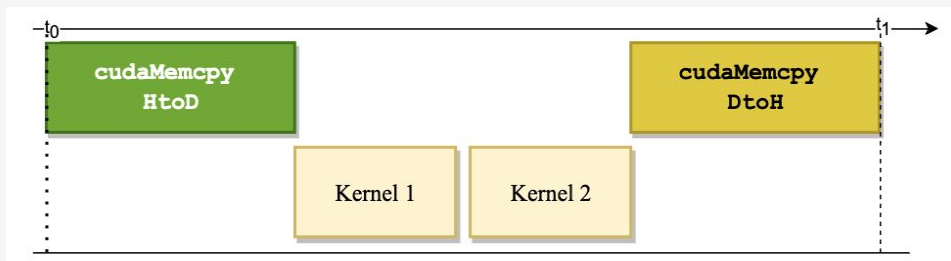


Binary and Source code Similarity
[Ongoing, Under Submission]

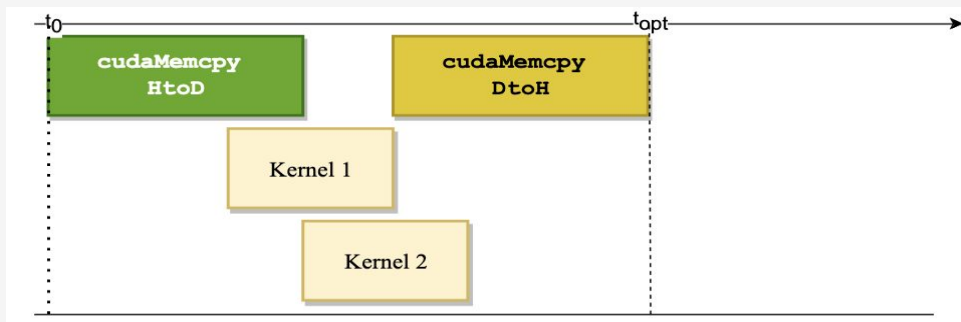


Compiler Optimizations in CPU-GPU Heterogeneous Systems

Before Optimization



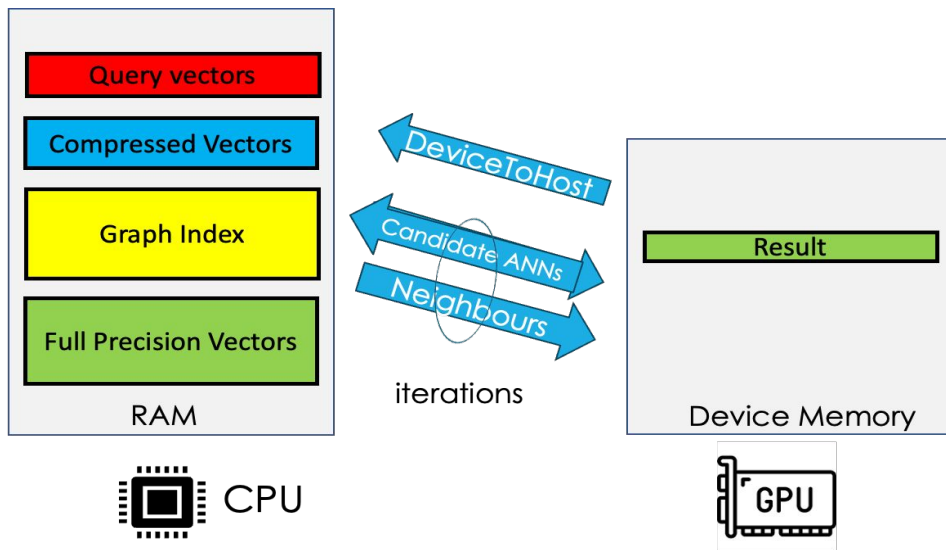
After *StreamAlloc* Optimization



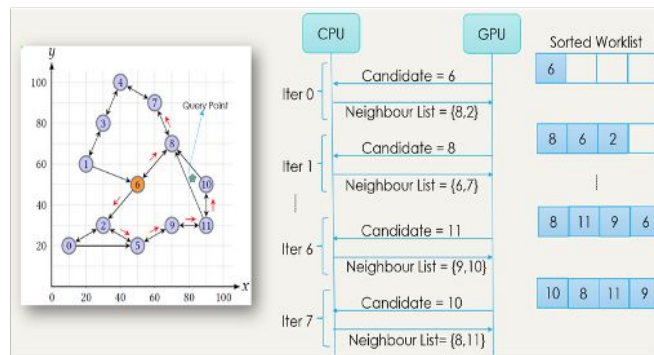
- **Hetero-sync Motion Optimization**
- Compiler Optimizations to percolate blocking/Sync statements to a later program point to enable overlapping computations between CPU and GPU increasing parallelism.
- **Automatic CUDA Stream Allocation**
- Compiler Optimization to convert Sync to Async calls in CPU-GPU Heterogeneous programs
- Determines the stream identifiers for each corresponding asynchronous call

Billion-Scale ANN on GPU

- A high-throughput billion-point scale Approximate Nearest Neighbour search on CPU-GPU Heterogeneous system
- On a single A100 GPU
- Graph index remains on host memory but optimized at



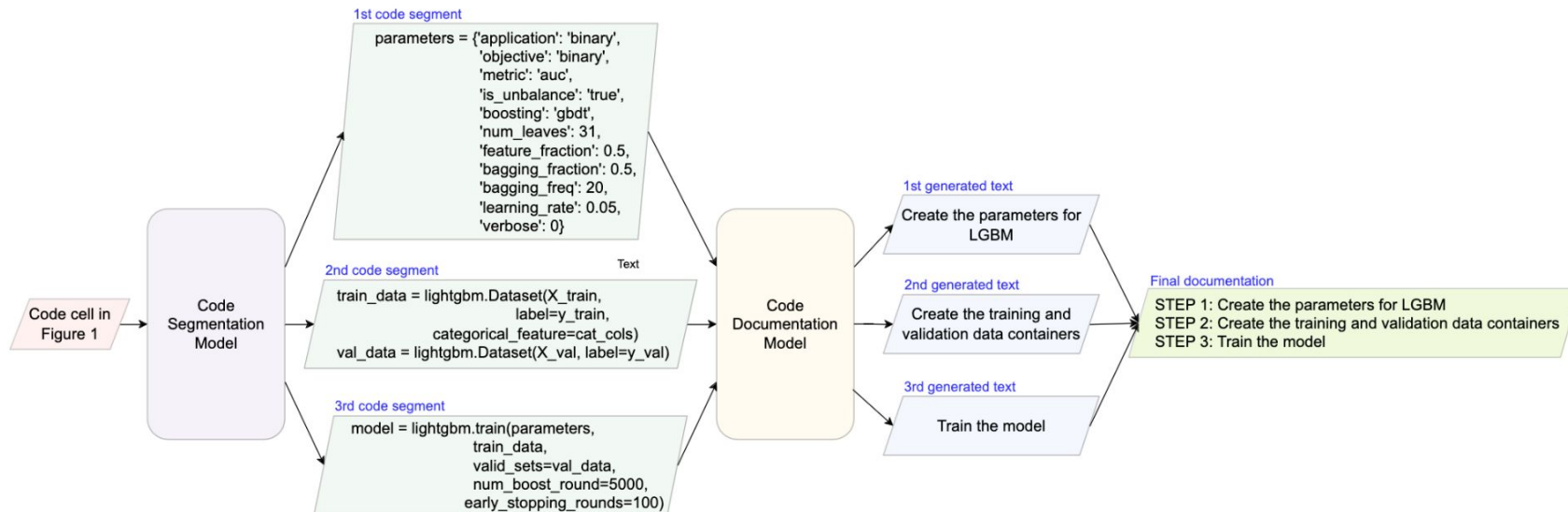
Greedy Search





Program Analysis using LLMs

- Does CodeT5, PLBART, CodeBERT, UniXcoder, etc., perform semantic tasks well (e.g., bug prediction, bug fixing, etc.)?
- Cell2Doc: ML Pipeline for Generating Documentation in Computational Notebooks [ASE'23]



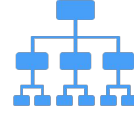
Programming Languages & Synthesis: Broad Classification of our Research Efforts :



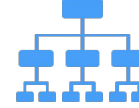
Analysis and Refactoring



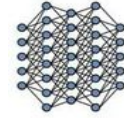
**Automated Verification,
Rich Type Systems**



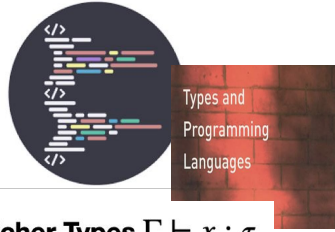
**Symbolic
Program Synthesis**



**Neurosymbolic
Synthesis**



Analysis



Richer Types $\Gamma \vdash x : \tau$

Types and
Programming
Languages

Spec:

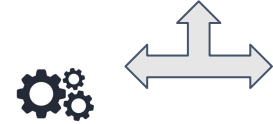
$$\Psi = x : \tau \rightarrow \{P\} \nu : t\{Q\}$$



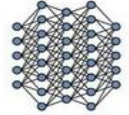
FM4Synthesis

Spec: i/o examples, A NL Query

$$\Psi = x : \tau \rightarrow \{P\} \nu : t\{Q\}$$



FM4Repair



ESME 22, ICSE 23

ECOOP' 23, PLDI 23

OOPSLA 22

OOPSLA 25

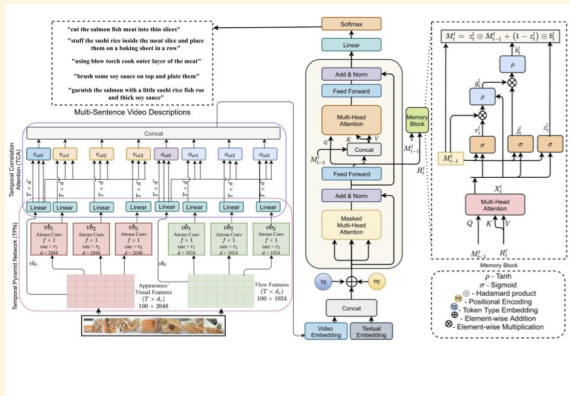


Artificial Intelligence/Machine Learning Research @IITH

Deep Learning Architecture and Training

► Explore

- New architectures and models
- New training methods and loss functions
- Newer inputs



Generative AI

- ▶ AI to create a wide variety of data, such as images, videos, audio, text and 3D models
- ▶ GenAI learns patterns from existing data and uses that knowledge to generate new and unique data.
 - ▶ GenAI applications: ChatGPT, DeepBrain, Synthesia,...

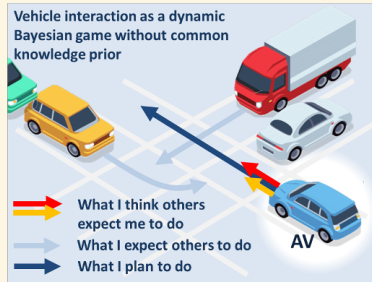
“ A cat and a female character in a spaceship exploring a hidden galaxy. With detailed backgrounds, expressive characters, including magical elements, illustration made by hand. ”



Image Generation

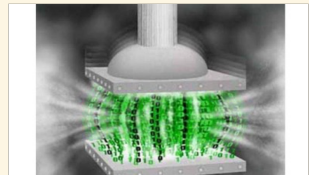
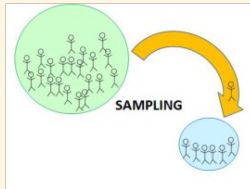
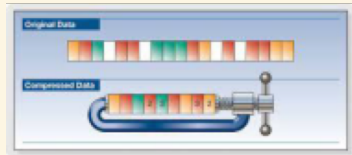
Bayesian Learning

- ▶ Use Bayesian Learning for building Safe AI applications
- ▶ High risk real-world applications, such as autonomous vehicles and healthcare
- ▶ Bayesian Deep Learning provides better decision making by handling uncertainty, robustness and considering domain knowledge



Algorithms for Massive Datasets

- ▶ Developing algorithms for handling large dimensionality and large volume of datasets
 - ▶ **High-dimensional**: text vocabulary, pixels in image
 - ▶ **Large volume**: millions of documents and images
- ▶ Develop efficient distributed algorithms – Hadoop/MapReduce
- ▶ Use Sketching/Sampling to turn “Big Data into tiny data”



Computer Vision

- ▶ Action recognition, emotion recognition and video analytics
- ▶ Autonomous vehicle technology
- ▶ Aerial imagery analysis and image captioning
- ▶ Medical imaging



Vision for Drones

- ▶ **Challenge:** Handling objects of different sizes
- ▶ **Applications:** Surveillance, Search and Rescue, Infrastructure Inspection, Crop Health Monitoring, Land Cover Mapping, Traffic Management
- ▶ Detecting drones from drones



NLP: Dialog Systems

- ▶ Computer system intended to converse with a human.
- ▶ Uses one or more of text, speech, graphics, gestures, etc., to communicate between human and system
- ▶ Build scalable and explainable dialog systems

U_0 : Can you help me find some attractions in the east part of town?

B_0 : { (attraction, area, east) }

S_1 : Definitely! My favorite place in the east is the Funky Fun House. It's funky and fun!

U_1 : Can I have the number please?

B_1 : { (attraction, area, east), (attraction, name, Funky Fun House) }

S_2 : It's 01223304705. Do you need anything else?

U_2 : Yeah, I need a restaurant. They need to serve Indian food and be in the same area as Funky Fun House.

B_2 : { (attraction, area, east), (attraction, name, Funky Fun House), (restaurant, area, east), (restaurant, food, Indian) }

S_3 : There are 4 Indian restaurants in the area. Two are moderately priced and two are expensive. Can I ask what price range you would like?

U_3 : I would prefer one in the moderate price range.

B_3 : { (attraction, area, east), (attraction, name, Funky Fun House), (restaurant, area, east), (restaurant, food, Indian), (restaurant, price, moderate) }

NLP: Personalized Autosuggest

- Personalized query autocompletion for short and unseen prefixes.



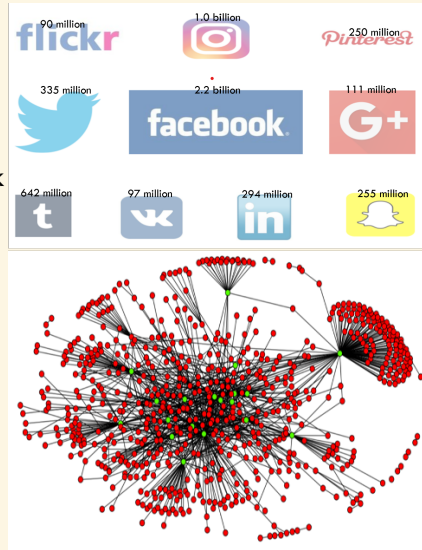
Let previous n queries (earliest to latest order) in the current session s be $\{q_1, q_2, \dots, q_n\}$. Current query is q , and p is the query prefix typed so far.



Generate top- N query completions conditioned on current query prefix p , additional trie context e , and session information s i.e., $P_{\theta}(q \mid p; e; s)$

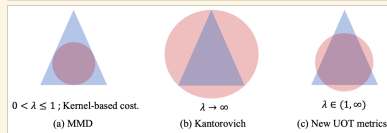
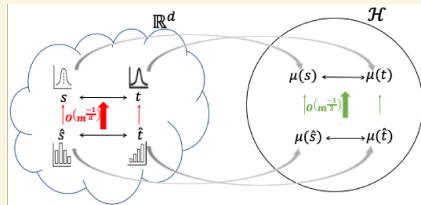
Social Media Analytics

- ▶ Information diffusion in social network
- ▶ Summarize social media content
- ▶ Categorize content
 - ▶ Spam vs non-spam
 - ▶ Quality of posts and replies
- ▶ Content routing



Applied Learning Theory

- ▶ Kernel methods
- ▶ Statistical learning theory
- ▶ Optimization
- ▶ Generative AI



Machine Learning Faculty



C Krishna Mohan

Video Content Analysis, Machine Learning,
Sparsity Based Methods, Deep Learning



Manish Singh

Databases, Data Mining, Information Retrieval



Sobhan Babu

Big Data Analytics, Graph Theory and Applied
Algorithms



Srijith P.K.

Bayesian Data Analysis, Probabilistic Machine
Learning, Survival Analysis and Text Analytics



Saketha Nath Jagarlapudi

Machine Learning



Maunendra Desarkar

Recommender Systems, Information Retrieval



Vineeth N. Balasubramanian

Machine Learning, Computer Vision



Sandipan Dandapat

Natural Language Processing Generative AI

Collaborations

Industry

accenture

Honeywell



Adobe



nasscom

Qualcomm



Innominds

Microsoft

FUJITSU

DENSO

International



RICE UNIVERSITY



Massachusetts
Institute of
Technology



TECHNION
Israel Institute
of Technology



UMBC

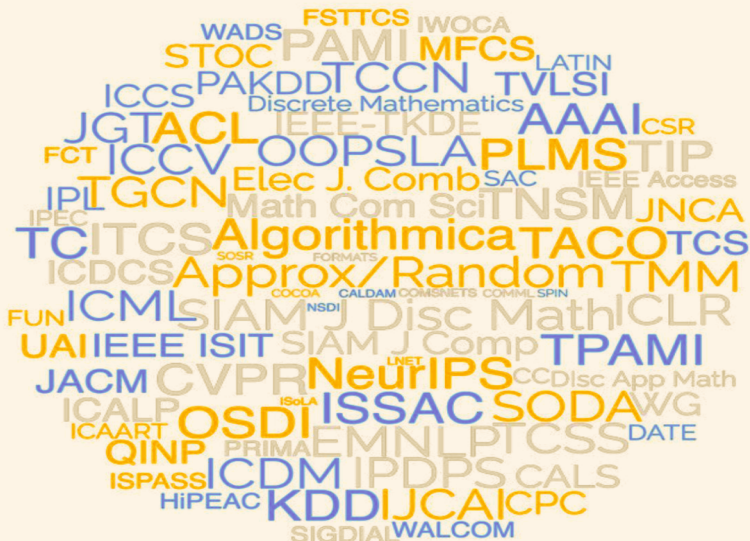


MOHAMED BIN ZAYED
UNIVERSITY OF
ARTIFICIAL INTELLIGENCE

National



Publication Venues



Infrastructure

- ▶ Large number of servers (with CPU and GPU) available through SLURM and MAAS infrastructure
- ▶ High Performance Computing (HPC) cluster available under the National Supercomputing Mission
- ▶ OpenStack-based private cloud for Virtual Machines (VMs)
- ▶ A large range of IoT and embedded processors and FPGA boards
- ▶ State-of-the-art DGX Servers
- ▶ High-end network switches such as 3.2 Tbps Intel Tofino Programmable Switch
- ▶ Labs with dedicated workstation for every Ph.D. scholar, with 24x7 access

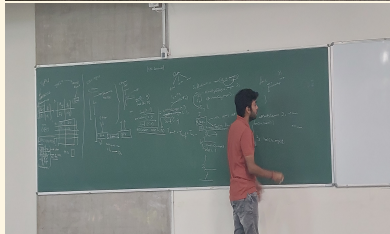


Fellowships

- ▶ Ministry of Education (MoE) fellowships
- ▶ Sponsored research project fellowships
- ▶ Joint Ph.D. fellowships with IDBRT Hyderabad, Swinburne University Australia, and Deakin University Australia
- ▶ Industry fellowships such as Google, TCS, Intel fellowships
- ▶ PM Research Fellowship (PMRF)
- ▶ Visvesvaraya Fellowship
- ▶ Financial assistance for Ph.D. students to present their research papers in international and national venues

Life @CSE, IITH

- ▶ PhD seminar talks:
CSE Ph.D Seminar Talks IIT-Hyderabad
- ▶ Several international and national computer science conferences held @IITH, e.g. ACML 2022, CALDAM 2020, etc.
- ▶ Research Scholars Day



CSE PhD Alumni

Alumni in PostDoc positions

Technion
IIT Kanpur
IMSc, Chennai A*STAR
Verisk AI Research
Monash University CSHL
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UTSA Harvard University MIT
Shizuoka University
Aalto University
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Lip6 Paris

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Celona HCL
Salesforce ASCI
Supraoracles
Rakutan Mobiles
Samsung Research
Adobe Research
IIAI Jio Platforms
NPCI Qualcomm
Intel Amazon
DELL

Alumni in Academia

IIT Dharwad
NIT Calicut
NIT Rourkela IIT Indore
SSIPMT-Raipur IIT Bhilai
Monash University
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Woosong University
JNU
JNTU Amrita University
IIT Tirupati IITDM Kurnool
BITS Pilani NIT Nagpur
IIT Palakkad
IIIT Kottayam

How to Apply?

- ▶ We have two regular rounds of admissions with deadlines typically at the end of April and the end of November. *We also sometimes have special rounds of admissions in between the regular rounds.*
- ▶ All calls for admissions with the details on how to apply will be updated here: [CSE Ph.D Admissions](#). Do check out the sections on “Eligibility criteria” and “How to prepare for the interviews?” on the same page.
- ▶ For any queries, please reach out to phd.admissions@cse.iith.ac.in.