Tanmaey Gupta

Research Fellow
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EDUCATION

Indian Institute of Technology Gandhinagar *2017 - 2021*
B.Tech. in Electrical Engineering with Minor in Computer Science and Engineering
GPA: 8.84/10

RESEARCH EXPERIENCE

Microsoft Research India *2023-Present*
SCAI Research Fellow
Advisors: Dr. Ramachandran Ramjee

- **Systems for large-scale DNN tasks:** Working on efficient low-cost fault recovery of large-scale DNN training tasks using Just-in-time checkpoints, which provides close-to-zero wasted GPU hours and runtime overhead, ultimately saving cost and time required for training large models. The solution is aimed to be model-agnostic, easy-to-integrate, and compatible with different distributed training paradigms such as data, model and tensor parallelism.

Microsoft Research India *2021-Present*
SCAI Research Fellow
Advisors: Dr. Akshay Nambi

- **IoT sensor fault detection at Edge:** Developed a robust and scalable fault detection system for IoT sensors, being used by multiple partners in real-world deployments across 1000s of embedded devices. The work involved signal processing and its algorithms; writing low level, multithreaded and resource efficient RTOS and bare-metal code; building an SDK to enable cloud connectivity and control; and designing and fabricating hardware to increase compatibility of the fault-detection system.

- **AI for Smart buildings:** Working on getting accurate and detailed water usage insights in large residential and commercial settings with minimal sensor deployments, using time-series classification of pressure sensor data and unsupervised volume disaggregation techniques.

IRACS Lab, IIT Gandhinagar *2020 - 2021*
Research Assistant
Advisors: Prof. Uttama Lahiri

- **Real-time Exercise and Rehabilitation Guidance Platform:** Researched on developing an interactive, real time exercise guidance and rehabilitation platform based on pose estimation, which accurately records and matches body joints for trainer and patient movements, without being affected by position, rotation and size of the subjects relative to the camera.

PUBLICATIONS

1. **Verified Telemetry: A General, Easy to use, Scalable and Robust Fault Detection SDK for IoT Sensors**
   Tanmaey Gupta, Shubhankar Handa, Akshay Nambi
   accepted at 8th ACM/IEEE Conference on Internet of Things Design and Implementation (2023).

2. **Just-In-Time Checkpointing: Low Cost Error Recovery from Deep Learning Training Failures**
   Sanjeev Krishnan, Rituraj Kumar, **Tanmaey Gupta**, Abhishek Vijeev, Bhargav Gulavani, Nipun Kwatra, Ramachandran Ramjee, Muthian Sivathanu
   under review at 29th Symposium on Operating Systems Principles (SOSP 2023).

SOFTWARE

1. **Verified Telemetry : Fault Detection for IoT Sensors***.
   Sumukh Marathe, Nishant Shrivastava, Ryan Winter, Akshay Nambi, **Tanmaey Gupta**, Shubhankar Handa.
   Microsoft Research India, 2021 - present.
   ∗under discussion to be added to Azure Edge Stack

TALKS

1. **Verified Telemetry: A General, Easy to use, Scalable and Robust Fault Detection SDK for IoT Sensors**
   - Conference talk at ACM/IEEE IoTDI'2023 *May 2023*

2. **Robust, Scalable Fault Detection for IoT Sensors (Demo Talk)**
   - MSR India TAB 2022 *January 2022*

WORK EXPERIENCE

ITC India *April - June 2020*
Technology track KITES Intern

- **Energy Efficient Industry:** Researched on existing inefficiencies in energy consumption of 3 flour plants across India by analyzing 2 year logged data using statistical methods and collaborating with domain experts on process mechanisms study. Proposed 3 key factors of improvement and designed sensor aided automation system which could improve energy efficiency by 3%. The deployment of design was not possible due to COVID restrictions.

Detect Technologies, IIT Madras Research Park *May - July 2019*
Firmware Developer

- **Drone Telemetry:** Developed firmware on STM32 MCU to enable real-time data stream and feedback of custom sensor mounted on drone to the controlling base station using a proprietary RF communication protocol.

Invent@IITGn (Invention Factory, USA), IIT Gandhinagar *May - July 2018*
Inventor

- **Invent for Road Safety:** Developed a novel collision shock absorption system and underrun prevention assembly for high rise vehicles. Collaborated with domain experts (ARAI India), built simulation models and prototype and filed a provisional patent for the same.

UNDERGRADUATE PROJECTS

1. **LSTM based 3D-motion Text and Gesture Recognition**
   Used LSTM models for text recognition using accelerometer data of an IMU sensor to enable air-writing.

2. **Git from scratch in C++**
   Implemented Git version control system in C++ from scratch, using content addressable file system and SHA1 hashing.

3. **Linux Shell in C**
   Implemented Linux Shell in C from scratch using system calls.

4. **Multi-threaded Tries**
   Implemented thread-safe Tries in C with Single, Reader-Writer and Hand over Hand locking.

5. **FPGA based Two Level Morse Code Encoder-Decoder**
   Developed a two tier encryption-decryption machine on Basys 3 FPGA board with I/O using Morse code and Base 64.

6. **Robust, Low-resource Parking Space Identification**
   Used image processing of surveillance camera feed to detect empty parking spaces. Solution was robust against false positives and capable of running on highly resource constrained devices.

7. **Sea navigation and collision-avoidance system for fishermen**
   Designed and developed a prototype of a low-cost device to avoid ship collisions in low-visibility situations. Experimented with various standards like IEEE 802.11, 802.15.4, 802.15.1. Project came 7/21 IITs at Inter-IIT Tech Meet.

SELECTED AWARDS AND HONORS

- Winner of Microsoft Global Hackathon, 2021(Future Of Edge Computing Track) *2021*
- Selected for Inter- IIT Tech Meet (IIT Madras, IIT Bombay) *2017, 2018*
- Enlisted in Dean's List for Academic Excellence at IIT *2017, 2018*
- Among top 0.15% of 1.2 million candidates in IIT-JEE Examination *2017*
- Kulpati K.M.Munshi Award in Mathematics *2015*

PROFESSIONAL RESPONSIBILITIES

- *Mentor:* Peer-Assisted-Learning, IIT Gandhinagar *2021*
- *Undergraduate Teaching Assistantship* - ES102 Computing course, CSE, IIT Gandhinagar *2020*