ANIKET SANTOSH SHIRKE

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INTERESTS

Edge Computing, Sensing Systems, Internet of Things

EDUCATION

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN — EXPECTED: MAY 2021

MS in Computer Science
Thesis: Distributed Anomaly Detection on the Edge using Computer Vision techniques

INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY — AUG 2019

Bachelor of Technology (Honors) in Computer Science and Engineering — Cum. GPA: 9.00/10
Thesis: Distributed Learning on Edge for IoT-A Simulator Based Approach

PUBLICATIONS

[1] A Distributed Learning Simulation Platform for Edge Hierarchies — 2019

A distributed learning simulation platform that allows users to create multi-level Edge hierarchy for a given application by simulating resource constrained Edge devices and communication links amongst them.
Alka Bhushan, Aniket Shirke, Govind Lahoti, Umesh Bellur
Accepted at the 12th International Conference on Communication Systems & Networks (COMSNETS 2020)

[2] pcube: primitives for network dataplane programming — 2018

A framework that provides a set of primitives to simplify the development of P4-based dataplane applications and synchronize state variables across switches in distributed dataplane applications
Rinku Shah*, Aniket Shirke*, Akash Trehan*, Mythili Vutukuru, Purushottam Kulkarni
Presented at the 1st P4 Workshop in Europe, IEEE International Conference on Network Protocols 2018 (Awarded Travel Grant by IEEE)

[3] Finding by Counting: A Probabilistic Packet Count Model for Indoor Localization in Bluetooth Low Energy Environments — 2017

A probabilistic packet reception model for Bluetooth Low Energy (BLE) packets in indoor spaces and validation of the model by using it for indoor localization
Subham De, Shreyans Chowdhary, Aniket Shirke, Yat Long Lo, Robin Kravets, Hari Sundaram
Accepted in the 11th ACM Workshop on Wireless Network Testbeds, Experimental evaluation & Characterization (WiNTECH `17), International Conference on Mobile Computing and Networking 2017

WORK EXPERIENCE

AUTO SCHEDULER DASHBOARD — SUMMER 2018

Goldman Sachs — Bangalore

- Received a Return Offer from Goldman Sachs, Bangalore
- Aided the **Realty Management Department (RMD)** in tracking data file uploads to databases by implementing a live web application in **Slang** and **AngularJS**
- **Boosted employee productivity** by providing transparency to the underlying system procedures and minimizing the effort to approach the RMD Technology Team

DASHBOARD FOR MAP REDUCE JOBS — WINTER 2017

Focus Analytics — Mumbai

- Developed a **Map Reduce** Job based system for reach-estimation of users and tracking its progress on a web panel by using **asynchronous communication** using **MQTT protocol**
- Wrote algorithms for **location analytics** using clustering techniques such as DBSCAN and Gaussian Mixture Models
- Completed a literature survey of different NoSQL databases and carried out stress testing of **Dgraph**, an open-source graph database

* Co-first authors

RESEARCH EXPERIENCE

A SIMULATOR BASED APPROACH FOR DISTRIBUTED LEARNING ON EDGE — 2018/19

Guide: Prof. Umesh Bellur — Indian Institute of Technology, Bombay

- Built a Python-based simulator for simulating the functionality of Edge devices to train **Air Quality Index prediction** model in a distributed learning setup for various **distributed computing hierarchies**
- Implemented a **Master-Slave model** where the Master machine triggers the simulation remotely on Slave machines and collects simulation logs reported by the Slave machines
- Integrated **Kafka** to leverage its **publish-subscribe** model to simulate the effect of streaming data from sensors on training the learning model
- Containerized code execution using **Docker** to simulate the **resource constraints** on the Edge nodes, in terms of computational capability and memory allocated

EXPLORING P4 LANGUAGE FOR PROGRAMMING NETWORK SWITCHES — SPRING 2018

Guide: Prof. Purushottam Kulkarni — Indian Institute of Technology, Bombay

- Implemented a basic Stateless Load Balancer adhering to a Round Robin policy to acquaint with P4 (**Programming Protocol-independent Packet Processor**) language, **Mininet** and **bmv2 switch**
- Devised and Implemented a custom protocol involving **proactive and reactive** communication between switches to build a **Distributed Stateful Load Balancer** application in P4
- Utilized the **Hashing** and **Cloning** primitives in P4, and experimented with varying network traffic using **Scapy**
- Proposed an annotation based language to **enhance code readability** and **aid application development** in P4
- Presented the work at the **1st P4 Workshop in Europe** organized in the University of Cambridge

CORDLESS WI-FI — AUTUMN 2017

Guide: Prof. Bhaskaran Raman — Indian Institute of Technology, Bombay

- Involved in the development of an Android application, which relays incoming voice calls to trusted devices over a router
- Designed and implemented a distributed **Device Discovery protocol** which uses a 'ping' mechanism to alert all other devices in the local network available to be paired
- Designed and implemented a **Device Pairing protocol** for secure group formation in the local network

INDOOR LOCALIZATION USING BLUETOOTH LOW ENERGY BEACONS — SUMMER 2017

Guide: Prof. Hari Sundaram — University of Illinois at Urbana-Champaign

- Ideated and carried out **indoor localization experiments** in the Grainger library using a layout of Bluetooth Low Energy beacons for different power and frequency of packet transmission
- Collected and parsed stationary and dynamic data using a packet sniffer; the data helped in building a packet reception model used for localizing devices in the physical space
- Built an Android application to sniff **Bluetooth Low Energy advertisement** packets in IoT spaces, mark the ground truth location and save the data in the phone storage
- Published our work in the **ACM WiNTECH workshop, co-located with MobiCom 2017**

RESPONSIBILITIES

DEVELOPER AT ILLINOIS SOLAR DECATHLON — FALL `19

Developing applications to control appliances, lighting and temperature as well as view and track energy consumption using Openhab for a fully automated and sustainable house which will compete in the Solar Decathlon.

GRADUATE TEACHING ASSISTANT FOR SYSTEM PROGRAMMING [CS241] — FALL `19

- Leading weekly lab discussion sessions for 60 students and clearing difficulties faced by students during the lab
- Designing course syllabus for the Honors track and mentoring students for a semester-long project

UNDERGRADUATE TEACHING ASSISTANT — FALL `17,`18, SPRING `18,`19

- **Data Structures and Algorithms**: Responsible for setting assignments and preparing automated grading scripts
- **Computer Networks**: Assisted professor in grading exams and lab assignments, and handling course logistics
- **Computer Programming and Utilization**: Responsible for setting assignments and clearing difficulties faced by students

DEPARTMENT ACADEMIC MENTOR — FALL `18, SPRING `19

Mentored 9 students for resolving their academic concerns and helping them cope with the curriculum

TECHNICAL SKILLS

Python • C++ • C • P4-14 • Java • SQL • Docker • Mininet • Kafka • Mosquitto • Android • LaTeX• Git • Bash • MATLAB • Racket • Prolog • R • HTML • CSS • AngularJS • Django • Tkinter

KEY COURSE PROJECTS

RSSI-BASED INDOOR LOCALIZATION USING ESP32 | [CODE] WIRELESS NETWORKS

- The system architecture involved three ESP32 anchor nodes sniffing packets over air and communicating a stream of RSSI values to a host backend via MQTT
- Built an Indoor path loss model and used trilateration to localize wireless devices indoors up to an accuracy of ~2 metres with the help of ESP32 devices

SAFE REINFORCEMENT LEARNING IN PACMAN | [CODE] FOUNDATIONS OF INTELLIGENT AND LEARNING AGENTS

- Summarized the research paper "Safe Reinforcement Learning via Shielding", where safety is enforced via a shield for a learning agent given the safety specification in the form of Linear Temporal Logic and an abstraction of the environment in the form of a Markov Decision Process
- Implemented our shield on Pacman environment by introducing the notion of safety and evaluated our implementation against six metrics

IMAGE QUILTING FOR TEXTURE SYNTHESIS AND TRANSFER | [CODE] DIGITAL IMAGE PROCESSING

- Implemented the research paper "Image Quilting for Texture Synthesis and Transfer". Synthesized a larger texture by quilting a sample texture patch and using the **minimum boundary cut algorithm**
- Leveraged the code for image quilting to transfer texture on a target image by using **correspondence maps**

HUMAN ACTIVITY RECOGNITION | [CODE] FOUNDATIONS OF MACHINE LEARNING

- Classified the physical activities performed by a human into six categories: Stand, Sit, Stairs Up, Stairs Down, Walk and Bike using the **"Heterogeneity Human Activity Recognition Dataset"**
- Merged and downsampled the accelerometer and gyroscope sensor data for the training and testing phases, and implemented a Neural Network and LSTM using **Keras** library for classification

COURSEWORK

GRADUATE

Internet of Things* Real Time Systems*

UNDERGRADUATE

Wireless Networks	Data Analysis and Interpretation	Discrete Structures
Computer Networks	Foundations of Machine Learning	Automata Theory
Operating Systems	Artificial Intelligence	Logic for CS
Compilers	Foundations of Intelligent and Learning Agents	Digital Logic Design
Computer Architecture	Data Structures and Algorithms	Numerical Analysis
Database and Information Systems	Digital Image Processing	Linear Algebra
Performance Analysis in Systems	Design and Analysis of Algorithms	

SCHOLASTIC ACHIEVEMENTS

- **Mumbai City Rank 1** and Third highest aggregate (96.92%) in Maharashtra State in 12th grade 2015
- **All India Rank 340** in JEE Advanced out of 1.5 lakh students in India 2015
- **All India Rank 113** in JEE Mains out of 1.5 million candidates in India 2015
- Amongst the Top 300 students in National Standard Examination in Physics, conducted for selecting students to represent the country in International Olympiads 2015
- INSPIRE Scholarship awarded by the Indian Government to **top 1% students** in 12th Board Exams 2015
- Silver Medalist (given to top 0.375% participants) in Homi Bhabha Balvaidnyanik Exam 2009

EXTRACURRICULAR

- **Music:** Completed three courses in **Hindustani Classical Music Vocals**: Prarhambik, Praveshika Pratham and Praveshika Poorna.
- Worked as a **Coordinator** in **Hospitality & Public Relations department** in **Mood Indigo,2016**.