Siddhant Ray

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Education

- **PhD in Computer Architecture** — **UPC Barcelona**
  Barcelona, Spain — *2022 –*
- **MSc in Electrical Engineering and Information Technology** — **ETH Zürich**
  Zürich, Switzerland — *2020 – 2022*
- **B.Tech in Electronics and Communication Engineering** — **VIT Vellore**
  Vellore, Tamil Nadu, India — *2016 – 2020*

Research Experience

- **Advancing Packet-Level Traffic Predictions with Transformers** — **ETH Zurich**
  Master thesis at the Networked Systems Group — *Feb 2022 – Aug 2022*
  - Transformer based neural network learn network dynamics and make smarter packet-level decisions.
  - Used both packet and network state features to capture the underlying patterns in netwrok traffic with a task-agnostic pre-training phase.
  - Followed by task-specific fine-tuning phases to leverage this learnt behaviour, make quicker updates and make better forwarding decisions.
- **Towards a New Framework for Integration of Network Planes** — **ETH Zurich**
  Research project at the Networked Systems Group — *Mar 2021 – Jun 2021*
  - Prototype for a new programmble forwarding node (a Super-Node) for dynamic control over forwarding in Layer-3 networks.
  - Super-Node retains a traditional L3 router's control plane (CP) and combines a P4 programmable data plane (DP) for forwarding packets.
  - Accelerated forwarding and network convergence by leveraging the newly combined CP and DP.
- **Attentive Neural Networks for News Classification** — **ETH Zurich**
  Research project at the Chair for Mathematical Information Science — *Feb 2021 – May 2021*
  - Transformer based neural network to classify a multi-class hierarchical, context-overlapping news dataset.
  - Created a new statistical algorithm to detect context overlap in dataset classes, used it to reduce class label redundancy.
  - We demonstrated improvements of the classification model based on the algorithm's reduction.
- **Machine Learning based Cell Association for 5G Communication Networks** — **VIT Vellore**
  Bachelor thesis at the Networking Lab — *Dec 2019 – May 2020*
  - New cell association scheme to meet the ultra low latency, higher load and traffic needs of the 5G networks.
  - Hidden Markov Model based learning algorithm followed by a Viterbi based decoding scheme, on the network's telemetry data, to learn network parameters and select the optimal eNodeB for cell association.

Professional Experience

- **Graduate Research Assistant** — **Zürich, Switzerland**
  Law, Economics, and Data Science Group, ETH Zurich — *Oct 2021 – Sep 2022*
  - Research Assistant to Professor Dr. Elliott Ash and currently working on improving semantic labelling for text corpora using newer NLP models and sentence simplification and clustering for topic modelling.
  - Working on a paraphrase mining project to determine clusters of similar narratives in legal corpora and also using NLP models to capture underlying narratives in meat policy documents and analyse societal impacts and political discourse.
- **Software Development Intern** — **Gurgaon, India**
  Capgemini Engineering — *May 2019 – July 2019*
  - Developed a K-Shortest Path Searching algorithm for the ONOS platform in a Java environment, automated and deployed using Maven.
  - The algorithm was subject to dynamic constraints in terms of network resources such as required edges and vertices etc. and was used for path calculation for deployed in in Software Defined Layer 2 VPNs.

- **Software Development Intern** — **Gurgaon, India**
  BlueStacks — *May 2018 – July 2018*
  - Worked on a machine learning algorithm to predict the App Engine's appropriate display screen based on the customer's past experiences.
  - Developed an automation script for generating SVG cards for the App Engine's game front end and also worked on an address verification tool using the EasyPost API.

Publications

[1] Alexander Dietmüller, Siddhant Ray, Romain Jacob, and Laurent Vanbever. A new hope for network model generalization. *arXiv preprint arXiv:2207.05843*, 2022. To appear at ACM HotNets 2022 [link, code]

[2] Siddhant Ray and Budhaditya Bhattacharyya. Machine learning based cell association for mmtc 5g communication networks. *International Journal of Mobile Network Design and Innovation*, 10(1):10–16, 2020 [link, code]

Skills

- **Programming:** Python, C++, Java, Bash, Rust, SQL, C
- **Tools:** Linux, Git, TeX, Docker, P4 switches, ONOS controller, Google Cloud, AWS, Maven, MATLAB, NetSim, Cadence
- **Frameworks:** Mininet, FRR suite, PyTorch, TensorFlow, Sklearn, NLTK, Flask, SciPy, Scapy, Spacy, BeautifulSoup, NS3
- **Natural Languages** – English(C1), Hindi, Bengali, Deutsch(B1)

Course Projects

- **Investigating Possible Inductive Biases in Local Sparse Attention ViT Architectures Against Traditional CNNs** - ETH Zurich 2021
- **Automatic Certificate Management Environment framework** - ETH Zurich 2021
- **Maximizing Cross Traffic Flows in a L2/L3 Network with Programmable Switches** - ETH Zurich 2020

Relevant Courses

- **CS & EE** - Advanced Computer Networks, System Security, Network Security, Distributed Computing, Discrete Event Systems, Computer Networks Seminar, Computer Networks, Operating Systems, Wireless Communication
- **Math & ML** - Introductory Machine Learning, Deep Learning, Learning and Classification Theory, Mathematics of Data Science, Neural Network Theory, Linear Algebra

Honors and Awards

- **Winner at Datathon 2022, ETH Zurich (Microsoft Challenge)** – (2022)
- **Best Outgoing Student (SENSE department, VIT Vellore)** – (2020)
- **Runner-Up at VIT Hack 2019, VIT Vellore (Education Track)** – (2019)
- **Merit Scholarship for Academic Excellence, VIT Vellore** – (2016-17, 2017-18, 2018-19)

Leadership and Volunteering

- **Technical Advisor at IETE VIT** – (2019-20)
- **President at Anokha NGO** – (2018-19)
- **Organizer at TEDx VIT Vellore** – (2018-19)
- **Outreach Worker at Anokha NGO** – (2017-18, 2018-19, 2019-20)