# Udit Paul

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## Education

**University of California Santa Barbara** **Expected: September 2023**
*Doctor of Philosophy (Ph.D.), Computer Science*

**University of Cape Town** **June 2018**
*Master of Science (M.S.), Electrical Engineering*

## Research Interests

Experienced computer scientist engaged in measuring and evaluating the quality of internet access for different user groups. Presently concentrating efforts on characterizing digital inequality through the collection and analysis of large-scale internet measurement data sets to identify disenfranchised communities. Long-term research objective is to identify and understand factors that contribute to internet disparity amongst communities and develop solutions that would enable stakeholders mitigate the persistent digital gap.

## Professional Experience

**Graduate Research Assistant** **September 2018 – Present**
*University of California Santa Barbara* *Santa Barbara, California*

- Developed Broadband-plan Querying Tool (BQT) that employs web scrapers for multiple internet service providers' web services to scalably obtain broadband services offer-related information such as download speed and cost of access at any given street address in the US.
- Developed Broadband Subscription Tier (BST) methodology which is a two-stage hierarchical unsupervised classification technique to identify broadband subscription tier information from crowdsourced network measurements. BST is able to classify subscription tiers of measurements with **99%** accuracy.
- Curated a data set of 17,000 tweets obtained from the social media platform, Twitter, and developed a natural language processing framework to detect and isolate power and communication outage-related tweets to assist first responders in the event of natural disasters. Implemented 22 different machine learning algorithms and achieved close to **90%** accuracy in performing the required classification task.

**PhD Research Intern** **June 2022 – September 2022**
*IBM* *Yorktown Heights, New York*

- Contributed to an Agent-Based Model (ABM) that simulates the impact of lack of good quality internet connectivity on populations of different socioeconomic statuses. Built the component of the model that estimates the effect of poor quality internet for different households. Additionally, contributed to the building of a web application that provides the whole model as a service to the public. Work under review for publication.
- Conducted a longitudinal analysis on a dataset of **30M** to understand how the internet quality has changed for different population groups. Applied statistical tests to determine the magnitude of difference in internet quality between sub-populations. Finally, deployed machine learning models to predict internet performance from demographics and infrastructure metrics. Work under review for publication.

## Awards

- UCSB CS Department Outstanding Dissertation Award, 2023.
- UCSB CS Department Outstanding Publication Award, 2023.
- Best Paper Award winner, ACM SIGCOMM IMC'22.
- Poster runner-up, ACM HotMobile'19.

## Refereed Publications

- **Udit Paul**, Jiamo Liu, Vinothini Gunasekaran, Tejas N Narechania, Arpit Gupta, and Elizabeth Belding, "Decoding the Divide: Analyzing Disparities in Broadband Plans Offered by Major US ISPs", To appear in ACM SIGCOMM 2023..
- **Udit Paul**, Jiamo Liu, Mengyang Gu, Arpit Gupta, and Elizabeth Belding, "The Importance of Contextualization of Crowdsourced Active Speed Test Measurements", Proceedings of the ACM SIGCOMM Internet Measurement Conference 2022 (**IMC'22**).[***Best paper***].
- Tarun Mangla, **Udit Paul**, Arpit Gupta, Nicole Marwell, and Nick Feamster, "Internet Inequity in Chicago: Adoption, Affordability, and Availability", Proceedings of the $50^{th}$ Research Conference on Communications, Information and Internet Policy (**TPRC'22**).
- **Udit Paul**, Jiamo Liu, David Farias-Llerenas, Vivek Adarsh, Arpit Gupta, and Elizabeth Belding, "Characterizing Internet Access and Quality Inequities in California M-Lab Measurements", Proceedings of the Conference on Computing and Sustainable Societies (**COMPASS'22**).
- Vivek Adarsh, Michael Nekrasov, **Udit Paul**, Tarun Mangla, Arpit Gupta, Morgan Vigil-Hayes, Ellen Zegura, and Elizabeth Belding, "Coverage is not binary: Quantifying mobile broadband quality in urban, rural, and tribal contexts", Proceedings of the International Conference on Computer Communications and Networks (ICCCN) 2021 (**ICCN'21**).
- Vivek Adarsh, Michael Nekrasov, **Udit Paul**, Alex Ermakov, Arpit Gupta,Morgan Vigil-Hayes, Ellen Zegura, and Elizabeth Belding, "Too Late for Playback: Estimation of Video Stream Quality in Rural and Urban Contexts", Proceedings of the Passive and Active Measurement Conference (**PAM'21**).
- Vivek Adarsh, Michael Nekrasov, **Udit Paul**, and Elizabeth Belding, "Estimation of congestion from cellular walled gardens using passive measurements", IEEE Transactions on Mobile Computing, vol. 21, no. 10, 2021.
- **Udit Paul**, Alex Ermakov, Michael Nekrasov, Vivek Adarsh, and Elizabeth Belding, "#Outage: Detecting Power and Communication Outages from Social Networks", Proceedings of the World Wide Web Conference (**WWW '20**).
- Michael Nekrasov, Vivek Adarsh, **Udit Paul**, Esther Showalter, Ellen Zegura, Morgan Vigil-Hayes, and Elizabeth Belding, "Evaluating LTE coverage and quality from an unmanned aircraft system", International Conference on Mobile Ad Hoc and Sensor Systems **(MASS'19)**.

## Invited Talks

- **Improving understanding of crowdsourced measurements** **September 2022**
  *Google - Measurement Lab*
- **Contextualizing crowdsourced measurements** **October 2022**
  *Ookla*

## Teaching

- Introduction to Computer Networks (CMPSC 176A) - Spring, 2019.
- Computer Networking (CMPSC 176B) - Winter, 2019.
- Introduction to Computer Networks (CMPSC 176A) - Fall, 2018.

## Technical Skills

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| **Languages** | Python, Ruby, C/C++, JavaScript, MySQL, PostgresSQL, Bash. |
| **Developer Tools** | Google Cloud Platform, Amazon Web Services, Android Studio. |
| **Technologies/Frameworks** | Linux, GitHub, Hadoop, Spark, Tableau, Docker, Tensorflow, Pytorch. |