Om Chabra
Urbana-Champaign, IL (willing to relocate)
omchabra@gmail.com
702-526-1921

Education
09/21 - 05/24 (Senior/Graduating in 3 years)

University of Illinois at Urbana-Champaign
B.S. in Computer Science, minor in Electrical Engineering. GPA: 3.91/4.0.

CS Coursework: Computer Networks (A), Mobile Computing (A), AI (A), Internet of Things (A+), System Programming (A+), Probability & Statistics (A+), Data Mining (A+), Mobile Robotics (A+), Numerical Methods (A), Intro. To Circuits (A), Intro. to CS II (A), Analog Signal processing (B), Data Structures (A), Computer Architecture (A)
Languages - Python, Java, C++

Research/Work Experience

Research Intern, Networking Research Group, Microsoft Research (MSR)
(June 2022 to Present)

June 2022 - Present

CosmicBeats: Leading the creation of a universal satellite simulator.
- Models are empirically validated from MSR's own satellites along with publicly available data.
- Link layer models match real-world LoRa and DVB-S2 modulation schemes.
- Applied new algorithms to improve field-of-view calculations as existing simulators scale poorly when nodes increase.
- Simulator supports research in rural connectivity, edge computing, and IoT networking.
- Project is open-sourced at: github.com/microsoft/CosmicBeats-Simulator

June – October

ARISE: a federated learning scheme for earth observation processing.
- Our method uses an optimization algorithm to determine if an image should be processed by a satellite, offloaded to a ground station, or transmitted to another satellite through inter-satellite links.
- Early results indicate a 1.5x-18.9x latency improvement and 0.6%-39% accuracy improvement relative to current centralized and federated learning systems. Project is open-sourced.

January - May 2023

Spectrumize: a phy-layer approach to improve LoRa picosat-to-ground station spectrum efficiency.
- Our algorithm uses a doppler-shift correction to increase the decoding accuracy in high-interference, low-cost satellite downlink networks.
- Our NSDI paper described a 3x improvement over traditional preamble-based correlation.

Undergraduate Research Assistant, Department of Computer Science. University of Illinois at Urbana-Champaign - advisors Dr. Deepak Vasisht & Dr. Indranil Gupta
(*Oct. 2021 to Present)*

August 2022 – May 2023

Serval: an edge-compute framework for delivery of critical images on earth observation satellites.
- System predicts images which likely contain high-priority information through running prediction models on historical imagery.
- Our NSDI paper showed a 700x latency speedup for critical data compared to in-order delivery.

June 2022 - Present

Piconet: A networking stack for LoRa based IoT-picosat communications.

- The IoT-satellite mac layer consists of a flow control algorithm that adjusts a binomial-based random-access scheme.
- The downlink consists of a graph-based design that reduces downlink collisions along with improving receiver diversity.
- Preliminary results indicate a 4x improvement on the uplink, 2x on downlink, and 2.5x end-to-end.

Research Assistant, Lunar and Planetary Laboratory. University of Arizona - advisor Dr. Vishnu Reddy (June 2018 to August 2021)

June 2019 – August 2021

- Led research project measuring effects of background lighting, weather, and camera settings on a commercial off-the-shelf camera's ability to track satellites.
- Research aim was to create an autonomous system to track geosynchronous satellites with low-cost cameras to reduce risk of collision, and monitor objects launched by foreign adversaries.

2018 Summer

- Developed software analyzing output from a near-infrared spectrometer into easy-to-use data formats for faster data analysis.
- Designed a database to store and access that data. This is part of a pipeline identifying chemical properties of meteors and understanding their origins

Volunteer work

Statistics Without Borders & IMPACT Initiatives - IMPACT aims to improve the impact of humanitarian, stabilization, and development in crisis-affected areas through collecting data.

October 2022 - December 2022

- Analyzed IMPACT's data collection and post-collection process to ensure that analysis drawn from their data is precise and accurate to inform targeted humanitarian action.
- Performed a review of their theoretical approach to sampling and improved regression technique.

September 2022 - January 2023

PolicyEngine - A nonprofit NGO which allows anyone to model new and existing tax and benefit systems in both the UK and US to see the impact on society and individual households.

- Implemented new functionality to estimate individual households' rebates and tax credits for clean energy purchases as described in the Inflation Reduction Act.

2021 Summer

Ethnicity and Covid-19 Research Consortium (ECRC) - The ECRC seeks to identify healthcare discrepancies in ethnic minorities and construct new policy.

- Constructed a website using Joomla & Bootstrap to design both the front- and back-end.
- The software connects researchers working on analyzing discrepancies in access to healthcare.
- Developed a query system to match researchers who possess needed skills with labs that require specific help with tasks.

2020 Summer

Pax Syriana Foundation - Pax Syriana works to improve the lives of Syrian refugees. Pax is also working on minimizing COVID impacts on refugee camps.

- Implemented epidemiology models to predict COVID infection rates in Northwest Syrian refugee camps where over one million people are displaced.
- Collaborated on a policy paper describing steps to reduce infections and get healthcare funding from WHO/UN/Gates Foundation.
- Worked with government organizations to implement suggested policies to mitigate COVID transmission.

Teaching/ Activities

CS 222 Course Assistant: Fall 2022
Mentored and graded 8 students on a semester-long project emphasizing code reviews, documentation, library usage, project management, git, and teamwork.

Starbucks Barista: September 2021 - Present
Received certification of Coffee Master and Black Apron indicating an expert knowledge on Starbucks coffee. Also rated as having excellent customer service skills by manager on annual review.

Talks

UW-MSR Rural Connectivity Summer Institute - A talk on CosmicBeats - August 2023
Microsoft Learning Series - An internal talk to Microsoft executives - February 2023

Awards

CRA Outstanding Undergraduate Researcher - 1 of UIUC's 4 allowed nominees – 2022, 2023
AP Scholar With Distinction - 2021

Conference Abstracts/Talks/Publications

Tao, B., **Chabra, O.**, Javeja, I., Gupta, I., Vasisht, D., 2024. Known Knowns and Unknowns: Near-realtime Earth Observation Via Query Bifurcation in Serval. USENIX NSDI 2024

Shenoy, J., **Chabra, O.**, Chakraborty, T., Jog, S., Vasisht, D., Chandra, R., 2023. PicoNet: A Network Stack for Next Generation IoT Satellite Networks. Submitted to USENIX NSDI 2024

Singh, V., Chakraborty, T., Jog, S., **Chabra, O.**, Vasisht, D., Chandra, R., 2023. Spectrumize: Spectrum-efficient Satellite Networks for the Internet of Things. USENIX NSDI 2024

Chenning, L., Hsieh, K., **Chabra, O.**, Segarra, S., Arzani, B., Olsen, P., Chandra, R., 2023. OrbitalBrain: Harnessing Distributed Training in Space under Stringent Physical Constraints. Submitted to MLSys 2024.

Sarkis, C., Pascual-García, A., Klein, J., Campillo-Funollet, E., Villers, J., Naidoo, M., Garcia-Sanchez, J., **Chabra, O.**, Amzil, S., Shelton, C., Protecting Refugee Camps From COVID-19: The Case Of Northwest Syria. A policy report by the PaxSyriana Foundation. 2020.

Cantillo, D.C., Reddy, V., Sharkey, B.N., Pearson, N.A., Sanchez, J.A., Izawa, M.R., Kareta, T., Campbell, T.S. and **Chabra, O.**, 2021. Constraining the Regolith Composition of Asteroid (16) Psyche via Laboratory Visible Near-infrared Spectroscopy. The Planetary Science Journal, 2(3), p.95.

Reddy, V., Pearson, N., Agee, C. B., Cantillo, D. C., Le Corre, L., Campbell, T., **Chabra, O.** 2019. *Spectral Investigation of Anomalous Metal-Rich Chondrite Northwest Africa (NWA) 12273: Implications for Asteroid (16) Psyche*, 50th Lunar and Planetary Science Conference, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.2212

Sanchez, J. A., Reddy, V., Le Corre, L., Campbell, T., **Chabra, O.** 2019. *Spectral Characteristics of Ordinary Chondrite Impact Melts, 50th Lunar and Planetary Science Conference*, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.1594

Cantillo, D. C., Reddy, V., Pearson, N., Sanchez, J. A., Takir, D., Campbell, T., **Chabra, O.** 2019. *Constraining Exogenic Carbonaceous Material Abundance on (16) Psyche from Laboratory Spectral Measurements, 50th Lunar and Planetary Science Conference*, held 18-22 March, 2019 at The Woodlands, Texas. LPI Contribution No. 2132, id.1703