

# Protik Bose Pranto

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## SUMMARY

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I am currently a PhD student in Computer Science at Arizona State University, focusing on geospatial machine learning, urban informatics, and remote sensing to advance urban planning and sustainability. I develop geospatial pipelines leveraging LiDAR, aerial imagery, and street-level vision to map pedestrian infrastructure, inventory urban trees, and evaluate shade and extreme heat exposure. My work blends statistical and geospatial analysis with AI-driven models to turn pixels into actionable insights for planners and communities. I am especially interested in city-scale systems that are explainable, reproducible, and deployable. I also enjoy connecting with peers to drive collaborative research and contribute to community-focused projects.

## RESEARCH AREA

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Geospatial Machine Learning, Computer Vision, Remote Sensing, Spatial Statistics, Urban Informatics

## EDUCATION

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**Arizona State University**  
Ph.D. in Computer Science

Expected December 2027

**Arizona State University**  
M.S. in Computer Science

December 2025

**Relevant Coursework:** Data Mining, Statistical Machine Learning, ML for Remote Sensing

**Bangladesh University of Engineering and Technology**  
Bachelor's in Computer Science and Engineering

February 2021

## RESEARCH EXPERIENCE

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**SHaDE Lab: Sensable Heatscapes and Digital Environments Lab**  
Graduate Student Assistant with **Dr. Ariane Middel**

2023 – Present

**Graph Drawing and Information Visualization Laboratory, BUET**  
Undergraduate Researcher with **Dr. Md. Saidur Rahman**

2019 – 2021

## PUBLICATION

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- **Protik Bose Pranto**, Isaac Buo, Ariane Middel. *Paper*: "WayNet: A Semi-Automated Framework for Mapping Urban Pedestrian Infrastructure Using Street-Level Imagery". In **Review** at **Journal of Transport Geography**.
- **Protik Bose Pranto**, Minhazul Islam, Ripon Saha, Abimelec Mercado Rivera, and Namig Abbasov. *Paper*: "From Hubs to Deserts: Mapping and Explaining Urban Cultural Accessibility". In **Accepted** at **Urban AI (ACM SIGSPATIAL), 2025**.
- **Protik Bose Pranto**. *Paper*: "Satire or Fake News? Machine Learning-Based Approaches to Resolve the Dilemma". In: **Accepted** at *International Conference on Electrical, Computer, Communications and Mechatronics Engineering, ICECCME (2024)*.
- **Protik Bose Pranto**, Waqar Hassan Khan, Sahar Abdelnabi, Rebecca Weil, Mario Fritz and Rakibul Hasan. *Paper*: "From Bad to Worse: Using Private Data to Propagate Disinformation on Online Platforms with a Greater Efficiency". In: **Accepted** at *Design x Policy, CHI Workshop (2023)*.
- **Protik Bose Pranto**, Bishal Basak Papan, and Md. Saidur Rahman. *Paper*: "k-Safe Labelings of Connected Graphs". In: **Accepted** at *IEEE International Conference on Telecommunications and Photonics, ICTP (2021)*.
- Bishal Basak Papan, **Protik Bose Pranto**, and Md. Saidur Rahman. *Paper*: "On 2-Interval Pairwise Compatibility Properties of Two Classes of Grid Graphs". In: **Accepted** at *The Computer Journal, COMPJ (2021)*.

## POSTER/PRESENTATION

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- **Protik Bose Pranto.** *Talk:* "Walk in the Shade: Citywide Route Maps". In: **Accepted** at *Three Minute Thesis, 3MT (2026)*.
- **Protik Bose Pranto,** Isaac Buo, Ariane Middel. *Poster:* "Scalable LiDAR-Based Framework for Automated Tree Inventory and Management". In: **Accepted** at *CAP LTER All-Scientists Meeting and Poster Symposium, CAP Poster Symposium (2026)*.
- **Protik Bose Pranto,** Isaac Buo, Ariane Middel. *Presentation:* "WalkNet: A Vision-Based Framework for Mapping Urban Pedestrian Infrastructure". In: **Accepted** at *American Geophysical Union, AGU (2025)*.
- **Protik Bose Pranto,** Waqar Hassan Khan, Ariane Middel. *Poster:* "A Systematic Literature Review on Urban Climate Informatics". In: **Accepted** at *Urban Climate Research Center Poster Event, UCRC (2025)*.
- **Protik Bose Pranto,** Waqar Hassan Khan, Sahar Abdelnabi, Rebecca Weil, Mario Fritz, and Rakibul Hasan. *Poster:* "Understanding the Effect of Private Data in Disinformation Propagation". In: **Accepted** at *Symposium on Usable Privacy and Security, SOUPS (2023)*.
- Waqar Hassan Khan, **Protik Bose Pranto,** Tianyi Yang, Rakibul Hasan. *Poster:* "Exploring Privacy and Security Concerns of EdTech Users: A Qualitative Analysis of User Written Reviews". In: **Accepted** at *Symposium on Usable Privacy and Security, SOUPS (2023)*.
- **Protik Bose Pranto.** *Presentation:* "Targeted Misinformation based on Personal Data". In: **Accepted** at *ASU CyberSecurity Symposium, ASUCSS (2023)*.

## SELECTED RESEARCH EXPERIENCE

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- **Literature Review on Urban Climate Informatics:** Conducting a comprehensive systematic literature review to explore the intersection of urban climate and computer science and examine how this cross-disciplinary approach addresses various urban climate challenges. Our initial findings show a growing interest in social media and crowdsourced approaches in urban climate research.
- **Pedestrian Network Mapping:** Developed a scalable framework to generate detailed pedestrian networks (sidewalks, crosswalks, public access paths), integrating sidewalk width and road type, using vision-based segmentation models, street-level imagery, and open geospatial data. Applied it to Phoenix, Arizona, achieving 78.2% classification accuracy.
- **LiDAR-Based Urban Tree Mapping:** Developed an automated pipeline using LiDAR and ML to create a detailed, georeferenced tree inventory. The process involved classifying LiDAR data with NDVI, building, and land cover data, followed by individual tree segmentation using GDAL polygonization, statistical, and clustering methods (86% accuracy). Morphological metrics were calculated for each tree, and using U-Net, trees were classified into mesic and xeric types.
- **Cultural Accessibility Analysis:** Integrated open city data, socio-economic datasets, and cultural infrastructure information to map cultural hubs and deserts across New York City. Developed a novel "Socio-Cultural Accessibility Score" using statistical analysis, machine learning ( $R^2$  of 0.91), a weight-decaying algorithm, and an interpretable model (SHAP) to identify and explain underserved and overserved regions from cultural, economic, and health perspectives.
- **Fake News and Misinformation Detection:** Developed and evaluated ML models, including traditional algorithms and transformer-based models (e.g., BERT, XLM-RoBERTa), for fake and misleading news detection across various domains. Applied data preprocessing techniques to optimize model performance, with SVM achieving the best results on small datasets (86% accuracy). Used novel text augmentation strategies to enhance model accuracy, achieving 97% accuracy with XLM-RoBERTa. Additionally, applied BERT for misinformation detection in a regional language (Bengali), obtaining a 97% F1-score.

## DATASET CONTRIBUTION

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- Isaac Buo, Waqar Hassan Khan, **Protik Bose Pranto,** and Ariane Middel. "*Hourly Mean Radiant Temperature Distribution on a Summer Day, Maricopa County, Arizona, USA*". DOI: [10.6073/pasta/300ddb6879bab8a5e0208f6df3ed2cc0](https://doi.org/10.6073/pasta/300ddb6879bab8a5e0208f6df3ed2cc0)

## GRANTS

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- **CAP LTER Grad Grant:** Awarded \$5000 in funding from the Central Arizona–Phoenix Long-Term Ecological Research program (CAP LTER), a National Science Foundation (NSF)-funded initiative focusing on urban ecology. As the lead researcher on the project "Mapping the Distribution and Characteristics of Native and Non-Native Tree Species," This work supports urban forestry planning and heat mitigation strategies in the Phoenix-Tempe region.
- **Travel Grant:** SCAI conference funding (\$250), Graduate College Travel Award (\$300), GSG Travel Fund (\$700)
- **USENIX Security Student Grant:** Awarded \$700 to attend the USENIX Security'23 conference, where I presented my work on misinformation. This grant supported my participation in the conference.

## ACADEMIC SERVICES

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- **Peer Reviewer for Papers** ML4RS 2026, ICECET 2026, ICECCME 2025, ICECET 2025, ACDSA 2025
- **Conference Session Chair** ICECCME 2024
- **Invited Talk** ASU CyberSecurity Symposium 2023
- **Student Volunteer** AIES 2025, SOUPS 2023

## ACHIEVEMENTS

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- Finalist at **Three Minute Thesis (3MT)** 2026
- Secured runners-up at **SpaceHACK for Sustainability Hackathon** 2025
- Won 3rd place in the graduate category at the **UCRC Poster Event** 2025
- Awarded **USENIX Security Student Grant** 2023
- Got accepted into the **post-CHI summer school** on Usable Privacy and Security 2023
- Been awarded the **SCAI Doctoral Fellowship** 2022
- Completed **Google Foobar Challenge** 2020
- Ranked 3rd place in **South Asia Center for Media in Development** 2020
- Winner of the **HackTheCode** contest in **Google Cloud DevFest** 2019

## LEADERSHIP EXPERIENCES

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- **Coordinator**, OLSA-Arizona Laboratorians Chapter 2024 - Present
- **Student Representative**, Bangladesh Student Association, Arizona State University 2023 - Present
- **Organising Member**, Laboratorian Association of BUET 2019 - 2020

## INDUSTRY EXPERIENCE

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**GIS Tech Research Intern** May 2026 – Aug 2026

DLC Resources

Developing a geospatial computer vision pipeline to detect tree locations from drone-based aerial imagery and street-view images, applying GIS, remote sensing, machine learning, and image analysis methods to support tree inventory development.

**Consultant** Mar 2022 – Jul 2022

Start Network

Contributed to the Forecast-based Warning, Analysis, and Response Network (**FOREWARN**) project by developing data science workflows, applying advanced analytics, and providing technical expertise to support a peer-reviewed publication.

**Software Engineer** Mar 2021 – Feb 2022

Chaldal Engineering

An online grocery and food delivery platform. Enhanced customer-facing platforms (website, mobile app, APIs, search catalog) and optimized order management systems. Contributed to the development of the **EggShell** frontend framework, integrating F#, React, Fable, and ReactXP, enabling unified and faster development for both web and Android platforms.

## TEACHING ASSISTANT

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- **CSE 100 (Principle of Programming with C++)**  
The course focuses on programming concepts, problem-solving, and program design.
- **CSE 360 (Introduction to Software Engineering)**  
Introduces software engineering principles such as life cycle models, development methods, UML, project management, testing, and quality assurance standards.
- **CSE 467 (Data and Information Security)**  
This course is intended to provide students with an introductory understanding of the technical and behavioral mechanisms for information security and privacy.
- **CSE 470 (Computer Graphics)**  
This course introduces the basic concepts of interactive computer graphics, realistic rendering, and 3D viewing.
- **CSE 477 (Intro Computer-Aided Geometric Design)**  
The course introduces basic concepts of 3-D computer geometry, including curves, surfaces, and meshes.

- **CSE 485 (ASU Capstone Project)**

It is a project-based course linking students with industry and faculty-sponsored projects, cultivating practical experience, and preparing them for the professional world.

## TECHNICAL SKILLS

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- **Programming Languages:** Python, R, SQL, C++, Java, Dart, Typescript, F#, Flutter.
- **ML & Data Science:** Keras, PyTorch, Scikit-learn, Statistics, Time-series analysis, NLP, Feature extraction, SHAP, Image segmentation, Regression/Classification, Reproducibility (Weights & Biases), Data visualization.
- **Geospatial & Computer Vision:** OpenCV, CUDA, Geemap, GDAL, Rasterio, GeoPandas, Shapely, PyProj, White-Box Geospatial, Spatial analysis, LiDAR analysis.
- **Tools & Platforms:** Docker, Google Earth Engine, QGIS, Git, Docker, Jupyter, LAStools, Cyberduck, Excel.

## SELECTED ACADEMIC PROJECTS

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### Vasha-Sikkha

**Tech Stack:** Dart, Flutter, Firebase

Developed a mobile application for interactive English learning with speaking, reading, listening, and writing modules. Implemented score tracking, progress monitoring, and a real-time leaderboard using a Firebase backend.

### CovidLife

**Tech Stack:** Dart, Flutter, REST APIs

Built a health monitoring application displaying COVID-19 data for Bangladesh. Integrated two REST APIs for district-level and daily statistics, and added appointment scheduling, in-app calling, and messaging features.

### Real-Time Vehicle Detection

**Tech Stack:** Python, YOLOv5, OpenCV

Developed an object detection pipeline for fisheye traffic camera footage using YOLOv5. Applied geometric transformations for distortion correction, improving multi-vehicle tracking accuracy.

### Gesture Sensed Snake Game

**Tech Stack:** C, C++, Embedded Systems, Atmega32, Accelerometer

Designed an embedded motion-controlled game using an Atmega32 microcontroller and accelerometer. Controlled 8x8 RGB matrices through decoder circuits for real-time rendering.

## REFERENCES

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### Dr. Ariane Middel

*Associate Professor, School of Computing and Augmented Intelligence, Arizona State University*

Relationship: Ph.D. Advisor

Email: [amiddel@asu.edu](mailto:amiddel@asu.edu)

### Dr. Isaac Buo

*Postdoctoral Scholar, School of Arts, Media and Engineering, Arizona State University*

Relationship: Research Collaborator

Email: [ibuo1@asu.edu](mailto:ibuo1@asu.edu)

### Dr. Nishan Kumar Biswas

*Associate Scientist, Hydrological Research Laboratory, NASA Goddard Space Flight Center*

Relationship: Research Collaborator

Email: [n.biswas@nasa.gov](mailto:n.biswas@nasa.gov)

### Dr. Lynn Robert Carter

*Professor of Practice, School of Computing and Augmented Intelligence, Arizona State University*

Relationship: Teaching Mentor

Email: [lrcarte2@asu.edu](mailto:lrcarte2@asu.edu)