

# Kanchan Chowdhury

Webpage: [kanchanchy.github.io](https://kanchanchy.github.io)

Linkedin: [linkedin.com/in/kanchan-chowdhury-5729699a](https://www.linkedin.com/in/kanchan-chowdhury-5729699a)

Email : [kchowdh1@asu.edu](mailto:kchowdh1@asu.edu)

Mobile : +1-xxx-xxx-xxxx

## RESEARCH INTERESTS

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Machine Learning Systems, Database Systems, and Geospatial Data Analytics

## EDUCATION

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- **Arizona State University** Tempe, Arizona  
*PhD & MS in Computer Science* Aug. 2018 – July 2024  
*Advisor: Prof. Mohamed Sarwat & Prof. Jia Zou, CGPA: 4.00*
- **Chittagong University of Engineering and Technology** Chittagong, Bangladesh  
*Bachelor of Science in Computer Science and Engineering* Mar. 2010 – Nov. 2014  
*Advisor: Prof. Mohammed Moshikul Hoque, CGPA: 3.76*

## EXPERIENCE

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- **Arizona State University** Tempe, Arizona  
*Postdoctoral Research Scholar* Aug. 2024 - Present
  - **Responsibilities:** Optimizing end-to-end pipelines consisting of database queries and machine learning models for inference workloads, reducing runtime and memory usage of in-database machine learning systems.
- **Arizona State University** Tempe, Arizona  
*Research Assistant* Aug. 2018 - July 2024
  - **Research Projects:**
    - 1) Co-optimization of machine learning and join queries based on model decomposition and join push-down.
    - 2) Designing and implementing a deep-learning and data processing system for raster imagery and vector datasets.
    - 3) Engineering geospatial datasets to reduce spatial model training time.
    - 3) Evaluating state-of-the-art approaches for the synthesis of SQL queries from natural language questions.
    - 4) Evaluating machine learning models in predicting the next SQL query in a user-query session.
- **Wherobots Inc.** Scottsdale, Arizona  
*Research and Development Intern* Jan. 2023 - Aug. 2023
  - **Responsibilities:** Designing and developing spatial machine learning and deep learning tools, scalable map-matching, and geospatial data analytical algorithms. Integrating the developed tools into the Wherobots cloud platform.
- **Gagagugu PTE LTD** Dhaka, Bangladesh  
*Software Engineer* Jan. 2017 - Jun. 2018
  - **Responsibilities:** Developing Android Apps with social networking features such as calling, messaging, and posting.
- **Le Chef Plc** Dhaka, Bangladesh  
*Android Application Developer* Jan. 2015 - Dec. 2016
  - **Responsibilities:** Developing Android Apps featuring online order and reservation services for restaurants in the UK.

## TEACHING

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- **Instructor** Fall 2022  
*Spatial Data Science and Engineering (CSE 594)* Arizona State University
  - **Responsibilities:**
    - 1) Preparing lecture slides and conducting lectures.
    - 2) Preparing assignments, projects, exam questions, and grading rubrics.
    - 3) Office hours to help students understand lectures and projects.
- **Teaching Assistant** Fall 2021, Spring 2021, Fall 2020, and Spring 2020  
*Distributed Database Systems (CSE 512)* Arizona State University

- **Teaching Assistant** Fall 2019  
*Data Processing at Scale (CSE 511)* *Arizona State University*
- **Teaching Assistant** Spring 2019  
*Object-Oriented Programming & Data Structure (CSE 205)* *Arizona State University*
- **Teaching Assistant** Spring 2019  
*Principles of Programming with C++ (CSE 100)* *Arizona State University*
- **Teaching Assistant** Fall 2018  
*Principles of Programming with Java & Python (CSE 100)* *Arizona State University*

## MENTORING & TRAINING

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- Mentored a Ph.D. student and an MS student in the Data Systems Lab at Arizona State University.
- Trained more than 75 undergraduate students in Bangladesh on Android Application Development from Feb. 2015 to May 2015 under the ICT Division of Bangladesh.

## PUBLICATIONS

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- **Kanchan Chowdhury**, Mohamed Sarwat; Deep Learning with Spatiotemporal Data: A Deep Dive into GeotorchAI. *Accepted in 40th International Conference on Data Engineering (ICDE), 2024*
- Lixi Zhou, Qi Lin, **Kanchan Chowdhury**, Saif Masood, Alexandre Eichenberger, Hong Min, Alexander Sim, Jie Wang, Yida Wang, Kesheng Wu, Binhang Yuan, Jia Zou; Serving Deep Learning Models from Relational Databases. *Accepted in 27th International Conference on Extending Database Technology (EDBT), 2024*
- **Kanchan Chowdhury**, Mohamed Sarwat; A Demonstration of GeoTorchAI: A Spatiotemporal Deep Learning Framework. *ACM SIGMOD International Conference on Management of Data, 2023*
- **Kanchan Chowdhury**, Vamsi Meduri, Mohamed Sarwat; A Machine Learning-Aware Data Re-partitioning Framework for Spatial Datasets. *38th International Conference on Data Engineering (ICDE), 2022*
- **Kanchan Chowdhury**, Mohamed Sarwat; GeoTorch: A Spatiotemporal Deep Learning Framework. *30th International Conference on Advances in Geographic Information Systems (SIGSPATIAL '22), 2022*
- Vamsi Meduri, **Kanchan Chowdhury**, Mohamed Sarwat; Evaluation of Machine Learning Algorithms in Predicting the Next SQL Query From the Future. *ACM Transactions on Database Systems (TODS), 2021*
- Jia Yu, **Kanchan Chowdhury**, Mohamed Sarwat; Tabula in Action: A Sampling Middleware for Interactive Geospatial Visualization dashboards. *46th International Conference on Very Large Databases (VLDB), 2020.*
- Vamsi Meduri, **Kanchan Chowdhury**, Mohamed Sarwat; Recurrent Neural Networks for Dynamic User Intent Prediction in Human-Database Interaction. *22nd International Conference on EDBT, 2019*
- **Kanchan Chowdhury**, Lamia Alam, Shyla Sarmin, Safayet Arefin, Mohammed Moshikul Hoque; A Fuzzy Features Based Online Handwritten Bangla Word Recognition Framework. *18th ICCIT, 2015*

## ADDITIONAL SERVICES

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- **Paper Reviewer:** Served as a reviewer for the journal IEEE TKDE, Journal of Advances in Information Technology, and the conference ICCAD 2023.
- **External Reviewer:** Reviewed papers as an external reviewer for the following conferences and journals - SIGMOD 2020 & 2022, VLDB 2019-2022, ICDE 2020, SIGSPATIAL 2021, VLDB Journal, and TSAS Journal
- **Grant Reviewer:** Served as a travel grant reviewer for the Graduate and Professional Student Association (GPSA) at Arizona State University from May 2022 to August 2023.
- **Conference Volunteer:** Volunteered to organize two conferences - SIGSPATIAL 2022 and SIGMOD 2023.

- **Presentations & Talks:** Five conference presentations - SIGMOD 2023, FOSS4GNA 2023, ICDE 2022, SIGSPATIAL 2022, and ICCIT 2015.
- **Open Source Contribution:** Contributed to Apache Sedona, an open-source geospatial cluster computing framework with 1.9k+ GitHub Stars, by adding support for two new spatial data types.

## PARTICIPATION AND AWARDS

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- Recipient of ACM SIGMOD 2023 student travel award to attend the conference and present a paper.
- Recipient of ACM SIGSPATIAL 2022 travel award to attend the conference and present a paper.
- Received ASU Graduate and Professional Student Association (GPSA) travel grant twice - 2022 and 2023
- Recipient of CIDSE Doctoral Fellowship at Arizona State University for the academic year 2018-2019.
- 2nd Runner-up at National Hackathon organized by ICT Division of Bangladesh in 2014. The challenge of the hackathon was to design a project-based solution to solve a national problem of the country.
- 2nd Runner-up at National Mobile Application Code Hub organized by BUET, Bangladesh in 2014.
- Recipient of Honors award from my undergraduate university for maintaining academic excellence.
- Recipient of merit scholarship in all four years of my undergraduate education.
- Recipient of the government merit scholarship in Secondary School Certificate examination, Higher Secondary School Certificate examination, 8th-grade public examination, and 5th-grade public examination.

## TECHNICAL SKILLS

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- **Programming:** Python, Java, C, C++, Scala, SQL, and HTML
- **Databases:** PostgreSQL, SparkSQL, and MySQL
- **Machine Learning:** PyTorch, Scikit-learn, Keras, TensorFlow, ML & DL Models, and ML Statistics
- **Data Analytics:** Apache Spark, Apache Sedona, PySpark, GeoPandas, Pandas, Matplotlib, and Plotly
- **OS:** Unix/Linux and Windows
- **Others:** Distributed Computing, SDE Design Principles, CI/CD Pipeline, Docker, Jira, and Rest API

## IMPORTANT COURSEWORKS

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- **AI:** Statistical Machine Learning, Fundamentals of Statistical Learning, Data mining, Data Intensive Systems for Machine Learning, Deep Neural Networks with PyTorch, & Artificial Intelligence
- **DBMS:** Distributed Database Systems, Big Data Analysis with Scala and Spark, & Database Management Systems
- **Core:** Discrete Mathematics, Software Engineering, Operating Systems, Data Structure, & Algorithms

## PROJECTS

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- **GeoTorchAI:** A deep learning and data preprocessing framework for raster imagery and spatiotemporal vector datasets, with **400+ GitHub Stars**. It enables spatiotemporal machine learning practitioners to easily and efficiently implement spatiotemporal deep learning models, besides supporting scalable data preprocessing.
- **Map Matching:** A distributed and scalable map matching framework based on the Hidden Markov model and distance computation to map noisy GPS coordinates to road networks.
- **NLIDB-Bench:** A benchmark for evaluating state-of-the-art approaches of SQL query generation from natural language queries. It proposes a set of evaluation metrics and conducts experiments with four datasets.

- **Hotspot Analysis on Apache Sedona:** This work performs spatial queries and range joins between two spatial datasets and calculates the Getis-Ord statistic of NYC Taxi Trip dataset to perform hot-cell analysis.
- **Data Fragmentation:** It performs data partitioning operations on top of an open-source relational database management system (PostgreSQL). It loads data into a database using Range and round-robin partitioning.
- **Climate Change Forecasting:** A data science project to perform data cleaning, feature engineering, and data preprocessing operations on raw temperature data and predict temperature trends with the LSTM model.
- **Fake News Detection:** A data science project to perform data cleaning, feature engineering, and data preprocessing operations on news datasets and classifying fake and real news with a Bidirectional LSTM model.
- **Data Visualization in Python:** It performs statistical data analysis using useful visualization patterns with three Python libraries: Matplotlib, Seaborn, and Plotly Express.
- **Sentiment Analysis with BERT:** A PyTorch project to classify emotions using the Twitter smile dataset. It contains ML Engineering steps, such as data preprocessing, tokenization, encoding, training, and evaluation.

## REFEREES

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- **Dr. Jia Zou (jia.zou@asu.edu)**  
*Assistant Professor of Computer Science, Arizona State University*
- **Dr. Mohamed Sarwat (mo@wherobots.com)**  
*Former Associate Professor of Computer Science, Arizona State University*  
*Founder and CEO, Wherobots Inc*
- **Dr. Venkata Vamsikrishna Meduri (vamsi.meduri@ibm.com)**  
*Research Scientist, IBM Almaden Research Center*