Email: ndang [at] bu [dot] edu
Website: nathandang97.github.io
LinkedIn | Github
Boston, MA, 02215

Ngu Dang

Summary

I'm a sixth-year CS PhD candidate who enjoys **computational complexity** with a focus on **circuit complexity** and its connection to **meta-complexity**. In particular, I study how popular and fundamental techniques can be used to characterize optimal Boolean circuits—fan-in/fan-out, wiring patterns, and compositional "shapes." Beyond these structural questions, I explore how meta-complexity questions can leverage structural characterizations of explicit functions. I started researching in computer vision as an undergraduate and now regularly ship small, focused projects in ML, data science, and NLP—both to broaden my range and to demonstrate how quickly I can adapt and how well I can deliver in new technical areas.

Education

Department of Computer Science, Boston University Boston, MA
Ph.D. in Computer Science 09/2020 - 05/2026 *(expected)*

- Advisor: Prof. Steven Homer.
- Research area: Algorithms Design, Circuit Complexity, and The Minimum Circuit Size Problem (MCSP).
- GPA: 3.94/4.00 – Passed the PhD Candidate Qualifying Exam and Thesis Defense.

Department of Computer Science, Clark University Worcester, MA
B.A. in Computer Science, Minors: Data Science and Mathematics. 01/2018 - 05/2020

- Advisor: Prof. Frederick Green.
- GPA: 3.93/4.00 — Graduated with Summa Cum Laude and High Honors.
- First Honors Dean's List in 2018, 2019, and 2020.

Professional Experience

Graduate Research Assistant | Boston University 09/2020 - present

- Research: Working on joint projects on computational lower bounds and upper bounds of complex algorithms and design improvements on top of current state-of-the-art results.
- Implementing our algorithms, experiments, and scripts simulating Boolean circuits in Python using Z3 SAT-solver library.

Undergraduate Research Assistant | Clark University 05/2019 - 05/2020

- Contributed to computer vision and computational geometry research projects for the Computer Science Department.
- Implemented experiments, statistical analysis (e.g. ANOVA, Kruskal-Wallis), visualization, and geometrical simulations in Python and Java.

Publications & Manuscripts

1. Marco Carmosino, **Ngu Dang**, and Tim Jackman. **Simple Circuit Extensions for XOR in PTIME**. In 43rd International Symposium on Theoretical Aspects of Computer Science (STACS 2026). *Leibniz International Proceedings in Informatics (LIPIcs), Volume 364, pp. 23:1-23:20, Schloss Dagstuhl – Leibniz-Zentrum für Informatik (2026)*. DOI.
2. Marco Carmosino, **Ngu Dang**, Tim Jackman. **Convergent Gate Elimination and Constructive Circuit Lower Bounds**. 2026. Preprint.
3. Marco Carmosino, **Ngu Dang**, Tim Jackman. **A New Constructive Lower Bound for The Multiplexer (MUX)**. 2025. Preprint.
4. Mariah Papy, Duncan Calder, **Ngu Dang**, Aidan McLaughlin, Breanna Desrochers, and John Magee. **Simulation of Motor Impairment with "Reversed Angle Mouse" in Head-Controlled Pointer Fitts's Law Task**. *In Proceedings of the 21st International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS '19); ACM, Pittsburgh, PA, USA*. DOI.

Teaching Experience

Teaching Fellow | Boston University 2021 - present

- CS131: Combinatorics Structures — Summer 2022, 2023.
- CS132: Geometric Algorithms — Summer 2022.
- CS235: Algebraic Algorithms — Spring 2021, Fall 2025
- CS237: Probability in Computing — Summer 2024.
- CS332: Theory of Computation — Spring 2023, Fall 2023, 2024.
- CS630: Advanced Algorithms — Fall 2021.

Grader | Boston University 2023 - 2024

- CS535: Complexity Theory — Fall 2023.

Undergraduate Teaching Assistant | Clark University 2018 - 2019

- CS120: Introduction to Computer Science — Fall 2018.
- CS121: Data Structures — Spring 2019.
- CS180: Automata Theory — Fall 2019.

Other Projects

Tweet Dialect Classifier

. *Personal Project — Github Link* 06/2025 - 07/2025

- Built a dialect classifying pipeline in Python with BERTweet-based model that distinguishes African American Vernacular English from Standard and regular African American English and achieved 0.95, 0.99, and 0.97 for accuracy, recall, and F1 score respectively.
- Integrated the classifier into a bias-aware sentiment analysis pipeline, with statistical analysis (Kruskal-Wallis H Test) to provide insights on fairness in interpretation of social media text across different models (i.e. RoBERTa, RoBERTa-Latest, BERTweet).

Real-Time Object Detector

. *Personal Project — Github Link* 05/2025 - 06/2025

- Built a real-time object detection system by training YOLOv8 on Pascal VOC (Python) and implementing C++ ONNX Runtime inference with OpenCV for webcam-based detection.
- Applied transfer learning with pretrained YOLOv8n weights and integrated ONNX Runtime C++ API to deliver fast, resource-efficient object detection with dynamic bounding box visualization and minimal latency.

Human Activity Recognition Using Deep Learning

. *Personal Project — Github Link* 04/2025 - 05/2025

- Built a deep learning pipeline using Python and PyTorch to classify human activities from Wi-Fi CSI data, achieving 0.98 accuracy score with a custom CNN-LSTM model.
- Designed a complete preprocessing workflow including reshaping, normalization, smoothing, and statistical feature augmentation to improve model robustness.

Churn Predictor for Subscription Service

. *Coursera's Challenge — Github Link* 03/2025 - 04/2025

- Implemented an end-to-end churn prediction pipeline in Python for a video streaming service using a real-world imbalanced subscription dataset using an ensemble of three models — a neural network, XGBoost, and Random Forest — using weighted soft voting to optimize class ranking and maximize AUC.
- Engineered advanced features (e.g., ratio metrics, interaction terms behavioral buckets, etc.) on top of 20 given features to boost signal quality and improve model discrimination and achieved achieved a ROC AUC score of 0.75.

Skills

Programming: Python, Java, C++, MySQL.

Libraries: Pandas, Numpy, Scipy, Tensorflow, PyTorch, Natural Language Toolkit (NLTK), Keras, Scikit-Learn, Seaborn, Z3.

Tools: LLMs, Git, Jupyter Notebook, Google Colab, Visual Studio, Microsoft Office Suite

Scripting: LaTeX, HTML, CSS.

OS: Windows, Linux.

Certificates

- **IBM Data Science by IBM on Coursera**. Certificate earned on 08/31/2023.
- **Neural Networks and Deep Learning by DeepLearning.AI on Coursera**. Certificate earned on 12/31/2024.

Awards and Honors

- **Outstanding Academic Achievements**, awarded by the Department of Computer Science at Clark University.
- **Inducted to Phi Beta Kappa**, Lambda of Massachusetts at Clark University on 05.24.2020.

Academic Services

Reviewer for: *Journal of Computer and System Science (JCSS)*.

Organizer for: *Boston University Computer Science's Theory Seminar (Spring 2021)*.

Vice President for: *Clark University Computer Science's Competitive Programming Club*.