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

NGU DANG

RESEARCH 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 (such as Gate Elimination) 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 (e.g., the algorithmic detectability of small circuits) can leverage structural characterizations of explicit functions. My long-term goal is to build a toolkit that connects circuit shape, provable lower bounds, and meta-complexity hardness.

EDUCATION

Department of Computer Science, Boston University — Boston, MA

Ph.D. in Computer Science — 2020 - 2026 *(expected)*

- Advisor: Prof. Steven Homer.
- Research area: Algorithms Design, Circuit Complexity, and The Minimum Circuit Size Problem (MCSP).
- GPA: 3.93/4.00 – Passed the PhD Candidate Qualifying Exam.
- Thesis Committee: Steven Homer, Marco Carmosino, Mark Bun, and Frederic Green.

Department of Computer Science, Clark University — Worcester, MA

B.A. in Computer Science, Minors: Data Science and Mathematics. — 2018 - 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.

LIST OF REFERENCES

1. Steven Homer, Ph.D., Professor in Computer Science at Boston University

2. Frederic Green, Ph.D., Senior Research Scientist in Computer Science at Clark University

3. Marco Carmosino, Ph.D., Research Scientist at IBM and Adjunct Assistant Professor in Computer Science at Boston University

PUBLICATIONS & MANUSCRIPTS

1. **Ngu Dang.** 2025. **A Survey on The Multiplexer (MUX).** A preprint of this work can be found here.

2. Marco Carmosino, **Ngu Dang**, Tim Jackman. 2024. **Simple Circuit Extensions for XOR in PTIME.** Under Submission to STACS 2026. A preprint of this work can be found here.

3. Marco Carmosino, **Ngu Dang**, Tim Jackman. 2023. **Formalizing Gate Elimination via Term Graphs Rewriting.** To be submitted to FSCD 2026. A preprint of this work can be found here.

WORK IN PROGRESS

1. **Ngu Dang**, Tim Jackman. 2025. **Characterizing Minimal Equality Testing Circuits.**

2. Marco Carmosino, **Ngu Dang**, Tim Jackman. 2025. **On Tightening Multiplexer Lower Bound.**

PROFESSIONAL EXPERIENCE

Graduate Research and Teaching Fellow | Boston University — 2020 - present

Undergraduate Research Assistant | Clark University — 2019 - 2020

TEACHING EXPERIENCE	**Graduate Teaching Assistant** | Boston University 2021 - present

TEACHING EXPERIENCE

Graduate Teaching Assistant | 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 SKILLS

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

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

Tools: Git, Jupyter, 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.*
  Massachusetts at Clark University on 05.24.2020.