

# 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. Marco Carmosino, **Nguyen Dang**, Tim Jackman. 2024. **Simple Circuit Extensions for XOR in PTIME**. To appear in STACS 2026. A preprint of this work can be found [here](#).
2. Marco Carmosino, **Nguyen 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](#).
3. **Nguyen Dang**. 2025. **A Survey on The Multiplexer (MUX)**. A preprint of this work can be found [here](#).

## WORK IN PROGRESS

1. **Nguyen Dang**, Tim Jackman. 2025. **Characterizing Minimal Equality Testing Circuits**.
2. Marco Carmosino, **Nguyen 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	<b>Graduate Teaching Assistant</b>   Boston University <span style="float: right;">2021 - present</span> <ul style="list-style-type: none"> <li>• CS131: Combinatorics Structures — Summer 2022, 2023.</li> <li>• CS132: Geometric Algorithms — Summer 2022.</li> <li>• CS235: Algebraic Algorithms — Spring 2021, Fall 2025</li> <li>• CS237: Probability in Computing — Summer 2024.</li> <li>• CS332: Theory of Computation — Spring 2023, Fall 2023, 2024.</li> <li>• CS630: Advanced Algorithms — Fall 2021.</li> </ul>
	<b>Grader</b>   Boston University <span style="float: right;">2023 - 2024</span> <ul style="list-style-type: none"> <li>• CS535: Complexity Theory — Fall 2023.</li> </ul>
	<b>Undergraduate Teaching Assistant</b>   Clark University <span style="float: right;">2018 - 2019</span> <ul style="list-style-type: none"> <li>• CS120: Introduction to Computer Science — Fall 2018.</li> <li>• CS121: Data Structures — Spring 2019.</li> <li>• CS180: Automata Theory — Fall 2019.</li> </ul>
OTHER SKILLS	<p><b>Programming:</b> Python, Java, C++, MySQL.</p> <p><b>Libraries:</b> Pandas, Numpy, Scipy, Tensorflow, PyTorch, Natural Language Toolkit (NLTK), Keras, Scikit-Learn, Seaborn, Z3.</p> <p><b>Tools:</b> Git, Jupyter, Google Colab, Visual Studio, Microsoft Office Suite.</p> <p><b>Scripting:</b> LaTeX, HTML, CSS.</p> <p><b>OS:</b> Windows, Linux.</p>
CERTIFICATES	<ul style="list-style-type: none"> <li>• <b>IBM Data Science by IBM on Coursera.</b> Certificate earned on 08.31.2023.</li> <li>• <b>Neural Networks and Deep Learning by DeepLearning.AI on Coursera.</b> Certificate earned on 12.31.2024.</li> </ul>
AWARDS AND HONORS	<ul style="list-style-type: none"> <li>• <b>Outstanding Academic Achievements</b>, awarded by the Department of Computer Science at Clark University.</li> <li>• <b>Inducted to Phi Beta Kappa</b>, Lambda of Massachusetts at Clark University on 05.24.2020.</li> </ul>
ACADEMIC SERVICES	<ul style="list-style-type: none"> <li>• <b>Reviewer for:</b> <i>Journal of Computer and System Science (JCSS)</i>.</li> <li>• <b>Organizer for:</b> <i>Boston University Computer Science's Theory Seminar (Spring 2021)</i>.</li> <li>• <b>Vice President for:</b> <i>Clark University Computer Science's Competitive Programming Club</i>. Massachusetts at Clark University on 05.24.2020.</li> </ul>