

Nathan Brown

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PUBLICATIONS

- “Efficient Transformer Knowledge Distillation: A Performance Review”, Proceedings of the 2023 Conference on Empirical Methods in Natural Language Processing (EMNLP 2023), December 2023 | [arXiv:2311.13657](https://arxiv.org/abs/2311.13657)

WORK EXPERIENCE

CUhackit

August 2023 – Present

Codirector

Clemson, SC

- Actively leading the organization of CUhackit: Clemson University’s official student hackathon organization, the only hackathon organization in South Carolina recognized by Major League Hacking (MLH), and home of the largest hackathon in South Carolina.
- Leading several teams including Design, Partnerships, Public Relations, Hardware, HackerXP, and HackerHelp.
- Hosting HelloWorld, our freshmen-only hackathon event, CUhackit, our flagship hackathon, and BothoHacks, our hackathon held in Botswana in partnership with Botho University.

Microsoft

May 2023 – August 2023

Software Engineering Intern

Redmond, WA

- **Technologies:** Azure, MongoDB, React, C#, JavaScript, Python
- Using Azure technologies such as Cosmos DB, Web Applications, and Functions, developed a full-stack web application from scratch to enable service developers to easily submit and share key cloud service metrics such as availability, load, and response time with other developers and teams within the organization.
- Developed a serverless web REST API and web dashboard, significantly lowering the barrier to entry for sharing service metrics when compared to other offerings, making it easier for integration for services that are early in development.
- Owned project from beginning to end, leading all development and design with a focus on streamlining integration for teams prioritizing speed and ease-of-use in early-stage projects.
- Collaborated with another team within my organization to determine required features and use cases and to seamlessly integrate their cloud service into my project, demonstrating its usability in real-world development environments.

Giant Oak

September 2022 – Present

Artificial Intelligence Research Partner

Clemson, SC

- **Technologies:** Python, PyTorch, Hugging, CUDA, NVIDIA Apex
- In partnership with Giant Oak, compressed four state-of-the-art efficient attention NLP classification models via knowledge distillation, increasing model inference speeds by up to 58% while preserving up to roughly 97% of original model performance, making it an effective method of obtaining high performance and low cost long-context models.
- Assisted in the development of GONERD, a first-of-its-kind long-context Named Entity Recognition (NER) dataset.
- Conducted resource-intensive model training using the Clemson University Palmetto Cluster, employing a highly distributed approach across multiple compute nodes and up to 56x NVIDIA A100 GPUs.
- As the lead author and alongside three co-authors, wrote a scholarly publication on our process and findings which was accepted to the EMNLP 2023 conference and will be presented in Singapore December 2023.
- All models and datasets to be made publicly available on the [Hugging Face Hub](https://huggingface.co).

Clemson University

August 2022 – May 2022

Security Analyst Intern

Clemson, SC

- **Technologies:** Splunk, Microsoft 365 Defender, Elastic, Proofpoint, Abnormal, FireEye, Cherwell, Python
- Performed blue team activities by monitoring and responding to security events and notices, identifying incoming security incidents, identifying compromised systems and users, reviewing vulnerability reports, and researching and responding to phishing incidents.
- Performed red team activities by discovering and remedying web vulnerabilities in Clemson services that would have provided attackers access to sensitive personal information on both Clemson students and partners.

Ally Financial

Software Development Intern

May 2022 – August 2022

Charlotte, NC

- **Technologies:** TypeScript, JavaScript, React, Storybook, Docker, Node, Git, HTML, CSS
- Led the complete overhaul of an internal web application, transitioning from Ember.js to React for future development.
- Spearheaded the full visual redesign and redevelopment of the site, working to ensure an enhanced user experience.
- Introduced new features with a focus on quality-of-life improvements, modularity, and performance optimizations, significantly enhancing application efficiency, accuracy, and ease-of-use.

Clemson University

Virtual Reality Research Assistant

April 2021 – June 2022

Clemson, SC

- **Technologies:** Unity, C#, IBM Watson TTS/STT, SQL
- Led development of a cross-platform mobile VR Grand Canyon exploration simulation. Focus on wide range of target devices, heavy performance optimization techniques, and implementation of new features. Made in Unity.
- Led development of a hospital staff training simulation. Updated deprecated components and dependencies, debugged various pre-existing issues, enhanced user experience. Made in Unity using IBM Text-to-Speech API.
- Successfully negotiated additional project budgeting for new hardware, improving our capabilities and allowing us to target a much wider range of modern virtual reality devices.

EDUCATION

Clemson University, Honors College

M.S. and B.S. in Computer Science, concentration in Data Science and Informatics, Minor in Cybersecurity, Senior

Graduate August, 2024

Clemson, SC

- Anticipated graduation with B.S. in May 2024 and M.S. in August 2024.
- Honors, 3.81/4.0 GPA
- Competed in the 2020 HelloWorld and 2021 CUhackit Hackathons.
- Formula SAE – Served on the chassis division, focusing on developing structural and composite optimizations on vehicle's impact attenuator using Ansys Mechanical, Altair HyperWorks, and SOLIDWORKS.

SKILLS & INTERESTS

- **Skills:** Python, PyTorch, Hugging Face, BERT, LLM development, Machine Learning, Azure, AWS, C#, JavaScript, C/C++, Java, Cybersecurity, Unity, Virtual Reality, Git, Linux; Very strong leadership and interpersonal skills; Over a decade of experience in self-led learning related to artificial intelligence, software development, and cybersecurity.
- **Interests:** Research; Programming; Skiing; Running; Art; Game Development; Hiking; Camping

PROJECTS

- **Metto:** An early-in-development experimental ~1B LLM, currently being built on Microsoft's Retentive Network architecture with the long-term goal of rivaling the performance of larger LLMs through high-quality data selection, mimicking the Prompt Erasing process detailed in Microsoft's Orca 2, and other LLM training optimizations.
- **IBM Watson In The Watt Artificial Intelligence Creative Inquiry:** Used BERT-based Natural Language Processing and dimension reduction techniques to process and visually analyze trends in hospital reports.
- **Hydrogen:** Portfolio optimization software utilizing historical quantitative analysis of closing stock prices. Retrieves data from Yahoo Finance, optimizes portfolio based on specified tickers. Supports customizable backtesting on historical data.
- **Kano:** An interpreter for the CHIP-8 programming language with full graphics capabilities utilizing C++ and SDL2.
- **MarketBot:** Discord bot written for the HelloWorld Hackathon; acts as a service for users to find and list items for sale.

AWARDS/HONORS

- Eagle Scout; NYLT Staff
- 2nd place in 2019 NCCTM State Fair for "Deriving the Perimeter of Horizontally and Vertically Stretched Regular Shapes"
- Clemson National Scholar Finalist