

# Bennett Zug

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## Education

### North Carolina State University

August 2024 – Present

*B.S in Computer Science, Minor in Mathematics | 3.6 GPA, 3.9 Major GPA*

*Raleigh, NC*

**Relevant Coursework:** *Automated Learning and Data Analysis, Mathematics of Scientific Computing, Operating Systems, Natural Language Processing, Dynamic Systems and Multivariate Control*

### Appalachian State University

August 2022 – May 2024

*Studied Computer Science, Minor in Mathematics | 3.9 GPA*

*Boone, NC*

**Relevant Coursework:** *Data Structures, Introduction to Theoretical Computer Science, Discrete Math, Linear Algebra*

## Projects

### class-search.com | *Python, Flask, PyTorch, PostgreSQL*

- Developed a web application to search and discover relevant university courses by computing vector embeddings for over 30,000 gathered course descriptions from multiple institutions using PyTorch and pre-trained language models.
- Built a Flask backend to efficiently match user queries against the corpus of course embeddings by leveraging PostgreSQL with the pgvector extension for fast approximate nearest neighbor search.
- Designed an interactive frontend with dynamic content updates to provide a seamless user experience.
- Deployed the Flask web server to production using Gunicorn and Nginx, ensuring high availability and sub-200ms search latency through optimized vector search without external API calls.

### **MatrixOCR** | *Python, OpenCV, Tesseract, SymPy*

- Developed a Python command-line tool to automatically extract mathematical matrices from images by integrating OpenCV for image pre-processing and Tesseract OCR engine, enabling efficient data extraction from screenshots.
- Optimized image pre-processing pipeline using OpenCV functions like thresholding and contour detection to improve matrix detection accuracy to >95%

### **Self-Supervised Learning with SimCLR** | *Final Project – CSC 422, North Carolina State University*

- Evaluated the SimCLR framework on STL-10 using a provided PyTorch implementation, modified the codebase to log learned embeddings and generate t-SNE visualizations across training epochs.
- Co-authored a NeurIPS-style research paper summarizing methodology, results, and relevance to data-scarce domains like medical imaging.

## Experience

### Information Technology Assistant

Summers, 2018–2023

*St Timothy's School*

*Raleigh, NC*

- Managed online accounts and prepared education hardware for over 550 students and 100 faculty members.
- Demonstrated strong problem-solving abilities by independently troubleshooting and resolving technology issues reported by staff while providing clear guidance.
- Grew into a leadership role over successive summers by proactively identifying process improvements to enhance overall technology support efficiency.

### Youth Coach and Event Belayer

October 2021 – January 2023

*Triangle Rock Club*

*Raleigh, NC*

- Effectively communicated safety instructions and climbing techniques to youth and adult climbers in a clear and engaging manner to ensure a secure and enjoyable experience.
- Managed after-school youth programs by coordinating activities, delegating tasks to staff, and ensuring a structured yet fun experience for participants.

## Organizations

### FTC 2901 Member

August 2018 – May 2020

*Cardinal Gibbons High School*

*Raleigh, NC*

- Contributed as a programmer on the FIRST Tech Challenge robotics team to develop autonomous driving capabilities for the competition robot using Java.
- Collaborated in a team environment to enhance the robot's movement code quality through code refactoring
- Played a key role in enabling the team to qualify for FTC Nationals by delivering robust autonomous navigation software adhering to competition guidelines.

## Technical Skills

**Languages:** Java, Python, R, SQL, HTML/CSS,  $\text{\LaTeX}$

**Frameworks/Libraries:** Svelte, Flask, PyTorch, NumPy, Pandas, OpenCV

**Tools/Platforms:** Git, Vim, VS Code, PostgreSQL