

# Reed Bender

## Generative AI Engineer // Computational Biologist

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### About Me

Hi, my name is Reed Bender and I am a full-stack engineer with over 6 years of experience specializing in machine learning and cloud engineering for biomedical research. I am currently working as a freelance engineer, building intelligent systems with generative AI to address the needs of research labs and educational platforms.

My work is driven by the principle of super-exponential growth; I believe that innovation accelerates future innovation, and intelligent systems beget future intelligence. I collaborate closely with teams to develop these technologies, using my proficiency in various languages and frameworks to create impactful, advanced solutions. The things that I currently have the most experience working with are: Python, Docker, Nextflow, Kubernetes, git, ChatGPT, Langchain, HuggingFace, AWS, Tensorflow, Keras, and Scanpy.

### Projects

#### Pria

Pria began as an idea to build a Generative AI mentor to go along with Praxis AI's digital course content. I then proceeded to build the Generative Intelligence Engine™, Pria's backend Flask server. In addition to creating and maintaining this backend, I was responsible for developing Gitlab CI/CD pipelines and deploying the production application to a dynamically-scaled and load-balanced Elastic Container Service.

While building this generative AI backend for Pria, I learned how to utilize both OpenAI's LLMs and open-source models via HuggingFace, worked with Langchain agents and document integration chains, and created custom vector-embedding tools to expand Pria's knowledgebase.

Pria is now being successfully used by dozens of academic institutions across the country and received two recognitions in the 2023 American Business Awards: *GOLD* for *Achievement in Online Training*, and *BRONZE* for *Use of Artificial Intelligence in EdTech*.

### Experience

#### Generative AI Engineer at Praxis AI

In addition to building the backend for Pria, I created and led a 12-week *Foundations of AI* digital course, covering extensive topics from data science to generative AI integrations, which also received a *GOLD* for *K-12 Course or Learning Management Solution* at the 2023 American Business Awards. This course covers everything from introductory statistics and linear algebra to advanced deep learning architectures, culminating in students building a Transformer model from scratch.

## Research Associate, Computational Biology / AI at Flagship Labs 84

As the third employee to join Flagship Labs 84, I played a pivotal role in processing and analyzing our single-cell RNA-sequencing data, as well as in building our computational infrastructure from the ground up. I developed Python scripts for complex single-cell analyses while closely collaborating with wet-lab biologists to plan experiments and rapidly iterate the scope of our bioinformatics pipelines.

My role spanned across broad range of tasks including serving as the System Administrator for our team's expanding AWS environment, using machine learning to derive insights from **Electronic Medical Records**, processing single-cell gene expression data into visualizations and insights with **Scanpy**, and interfacing between the computational and biological sciences while communicating effectively with both.

## Publications

- **Cellular State Transformations Using Deep Learning for Precision Medicine Applications.** Colin Targonski, *M. Reed Bender*, et al. September 2020, Cell Patterns. [Link](#)
- **GEMmaker: process massive RNAseq datasets on heterogeneous computational infrastructure.** John A. Hadish, Tyler D. Biggs, Benjamin T. Shealy, *M. Reed Bender*, et al. May 2022, BMC Bioinformatics. [Link](#)
- **EdgeCrafting: mining embedded, latent, nonlinear patterns to construct gene relationship networks.** Benafsh Husain, *M. Reed Bender*, Frank Alex Feltus. April 2022, G3. [Link](#)
- **Simulating the restoration of normal gene expression from different thyroid cancer stages using deep learning.** Nicole M. Nelligan, *M. Reed Bender*, F. Alex Feltus. June 2022, BMC Cancer. [Link](#)
- **Exploring Lossy Compression of Gene Expression Matrices.** Coleman B. McKnight, Alexandra L. Poulos, *M. Reed Bender*, et al. November 2019, Supercomputing Conference. [Link](#)

## Education

### Clemson University

During my graduate research at Clemson University with Dr. Alex Feltus in the Genetics and Biochemistry Department, I focused on scaling bioinformatics workflows for cancer genomics. This involved optimizing computational pipelines for efficient analysis of large genomic datasets, and scaling those pipelines onto distributed Kubernetes systems such as the [Texas Advanced Computing Center](#).

### Clemson University

I completed my Bachelor of Science in Bioengineering with a concentration in Biomaterials and a minor in Genetics, graduating from the Clemson Honors College. In my undergraduate research, I integrated patient-specific RNA-sequencing data with public consortium datasets and then implemented a novel deep-learning approach for determining patient-specific transcriptomic aberrations in cancer.

This work resulted in a [co-first authorship publication](#), along with three other peer-reviewed publications and an additional conference proceeding.

## **Presentations and Seminars**

### **NIH Cancer Moonshot Symposium**

I presented at the NIH Cancer Moonshot Symposium on Patient Control of Genomic Data for Research and Health in Bethesda, MD. During the seminar, I discussed patient autonomy in managing genomic data records, highlighting the need for increased patient involvement in cancer treatment decisions. [Link](#)

### **Internet2's Technology Exchange Conference**

At the Internet2's Technology Exchange Conference in New Orleans, LA, I led a seminar workshop in collaboration with Cisco. The workshop aimed to educate cloud architects and computer engineering professionals about the basics of computational genomics and how to optimize cloud compute architecture for various bioinformatics workflows. [Link](#)

### **Tri-Con Drug Discovery Hackathon**

I led a hackathon team at the Tri-Con Drug Discovery Hackathon in San Francisco, CA. Our goal was to identify precision drugs capable of targeting genetic aberrations in a patient's cancer, specifically focusing on Bill Paseman's case. We presented our team's findings to the hackathon and Tri-Con seminar audience. [Link](#)

### **Cisco Container Platform**

I was interviewed as part of a Cisco marketing video promoting their Cisco Container Platform (CCP). During the interview, I discussed my experience deploying containerized software onto Cisco's cloud platform. [Link](#)