Manish Acharya

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Education

Vanderbilt University Nashville, TN
BS in Computer Science and Mathematics, Electrical & Computer Engineering (Minor) *Aug. 2023 – May 2027*

- **GPA:** 4.0/4.0
- **Honors:**
  - Chancellor's Scholarship (awarded to <1% of incoming students for outstanding leadership, character, academic achievement, and commitment to diversity and social justice)
  - Dean's List (all semesters for academic excellence with a 4.0 GPA)
- **Relevant Coursework:**
  - **Computer Science:** Algorithms, Data Structures, Discrete Structures, Computer Architecture, Intermediate Software Design,
  - **Mathematics:** Probability and Statistics, Advanced Linear Algebra, Linear Algebra, Multi-variable Calculus, Calculus I-II

Technical Skills

Languages: Python, Java, C/C++, SQL, JavaScript, HTML5/CSS, MATLAB
Frameworks: PyTorch, Tensorflow React, Node.js, Flutter, Spring, Django
AI/ML Expertise: Machine Learning, Reinforcement Learning, Deep Learning, Neural Networks
Developer Tools: Git, Unix, Docker
Libraries: NumPy, SciPy, Pandas, Scikit-Learn, Matplotlib, OpenCV, D3JS

Research Experience

Undergraduate Research Assistant March 2024 – Present
Huang Lab, Vanderbilt University *Nashville, TN*

Context-Aware Retrieval-Augmented Generation System *March - November 2024*

- **Engineered AUTOPATCH Framework:** Designed a context-aware system integrating Retrieval-Augmented Generation (RAG) with Control Flow Graphs (CFG) to optimize code execution, achieving a 7.3% runtime efficiency improvement over baseline methods.
- **Advanced Program Optimization Techniques:** Enhanced LLM-driven optimization by incorporating CFG-based analysis, identifying inefficiencies, and generating targeted refinements for complex code structures.
- **Utilized Historical Patterns for Performance Gains:** Built a retrieval pipeline utilizing historical optimization examples to guide program restructuring, improving adaptability and scalability of automated code refinement.

Designing Novel Models for Mathematical Reasoning and Problem Solving *November 2024 - Present*

- **Developing Novel Models:** Creating custom models designed specifically to address mathematical problem-solving and reasoning tasks by leveraging problem-specific datasets and innovative architectures.
- **Establishing Performance Benchmarks:** Designing and implementing benchmarks to evaluate the effectiveness of models on tasks such as theorem proving, symbolic algebra, and logical reasoning.
- **Integrating AI in Education:** Exploring applications of reasoning-driven AI models in educational and research tools to solve complex mathematical problems.

Undergraduate Research Assistant September 2023 – Present
Vanderbilt AI Negotiation Lab, Owen Graduate School of Management *Nashville, TN*

- **Oversaw Website Development:** Led the website development project for the Vanderbilt AI Negotiation Lab, utilizing Django and Python.
- **Integrated and Enhanced AI Model:** Successfully incorporated the AI negotiation model into the website for public access, while contributing to its development by proposing performance improvements.
- **Optimized Website Performance:** Enhanced website performance by 30%, reduced loading speed by 50%, and lowered latency by 40% using DjangoQ.

Researcher July – September 2022

Incubate Nepal *Kathmandu, Nepal*

- **Developed Algorithm:** Engineered a Fourier Transform-based algorithm to analyze breathing patterns, achieving a 92% accuracy rate.
- **Collected Data:** Conducted data acquisition from 10+ individuals in various breathing states, evaluating the app's performance and calculating a mean error rate.
- **Led App Development:** Directed the integration of the algorithm into a mobile application, designed for accessible health monitoring in regions with high pollution levels in Nepal, where COPD cases are on the rise.

Teaching Experience

Undergraduate Course Assistant October 2024 – Present

MATH 2300: Multivariable Calculus, Vanderbilt University *Nashville, TN*

- **Conduct Group Learning:** Mentor 80+ students across two sections, reinforcing multivariable calculus concepts and guiding collaborative problem-solving.
- **Design Teaching Resources:** Collaborate with the instructional team to review materials and plan activities that enhance understanding.
- **Mentor Individual Students:** Mentor students through one-on-one sessions and facilitate external study groups to ensure engagement and success.

Student Mentor and AI Project Lead May – July 2024

Uunchai Summer Program *Nepal*

- **Led Student Team:** Mentored a group of 10 students to promote and preserve folk stories from marginalized and underrepresented ethnic communities in Nepal.
- **Taught AI and Technical Skills:** Trained students from diverse backgrounds in fine-tuning AI models, using GitHub for collaboration, and collecting and processing data for storytelling applications.
- **Developed Storytelling AI:** Guided students in creating AI model that generates folk stories based on prompts in Nepali, supporting accessibility and cultural preservation for local communities.

Industry Experience

Associate Software Developer August 2022 – March 2023

Gurzu Inc. *Lalitpur, Nepal*

- **Engineered Advanced Medical Detection Tools:** Collaborated with a team of 5 developers to create breast cancer detection software for DeepLook Medical.
- **Enhanced Imaging Accuracy:** Designed an algorithm to detect multiple cancer types, increasing detection accuracy by 17%.
- **Documented Project Deliverables:** Created comprehensive project documentation, user manuals, and product manifestos for stakeholders.

Software Developer December 2021 – July 2022

E-Digital Nepal *Kathmandu, Nepal*

- **Developed School Management System:** Collaborated with a team of 4 developers and 4 designers to create a system adopted by 150+ schools and colleges, improving educational management across Nepal.
- **Designed Mobile Application:** Designed and maintained key features of E-Digital Nepal mobile apps, ensuring robust functionality and seamless user experience.
- **Mentored Junior Developers:** Guided interns and junior developers in building Examination Management Modules using Java and Spring, ensuring high-quality code and fostering professional growth.

Leadership Experience

Co-Founder March 2023 – Present

NPL Coder *Nepal/USA*

- **Spearhead Competitive Programming Initiatives:** Direct a team of 10 to design contests and training sessions, preparing high school students for national and international Olympiads.
- **Cultivate a Programming Community:** Organize events and initiatives to cultivate a competitive programming culture in Nepal, engaging high school and university students in coding and data challenges.
- **Design Training Curriculum:** Oversee the creation of a structured curriculum and syllabus, coordinating resource collection to provide comprehensive mentorship in computer science and mathematics.

Co-Founder January 2024 – Present

Uunchai Summer Program *Nepal*

- **Empower Underserved Students:** Co-founded Uunchai, a 6-8 week program mentoring 40-50 low-income students frome remote areas of Nepal with multidisciplinary guidance from professionals.
- **Guide Local Impact Projects:** Mentor students in developing projects that address local needs and challenges, fostering practical problem-solving skills.
- **Establish Internship Partnerships:** Secure partnerships with companies to offer students internship opportunities upon program completion, enhancing real-world experience.

Publications

R. Friedman, J. Cho, J. Brett, X. Zhan, N. Han, S. Kannan, Y. Ma, J. Spencer-Smith, E. Jäckel, A. Zerres, M. Hooper, K. Babbit, **Manish Acharya**, et al. *An Application of Large Language Models to Coding Negotiation Transcripts. arXiv preprint*, arXiv:2407.21037, 2024. https://arxiv.org/abs/2407.21037

Papers in Submitting & Under Review

Manish Acharya, Yifan Zhang, Kevin Leach, Yu Huang: *Optimizing Code Runtime Performance through Context-Aware Retrieval-Augmented Generation.* Under Review at the 33rd IEEE/ACM International Conference on Program Comprehension (ICPC 2025) – ERA Track.

Projects

Brain-to-Art Interface | *Python, Raspberry Pi, EEG Sensor, Spotify API* August - November 2024

- Developed a system that converts EEG sensor data into dynamic visual art displayed on an LED matrix.
- Programmed in Python to process brain signals and extract insights about mental states.
- Integrated Spotify API to generate personalized music playlists based on mental state analysis.
- Designed a real-time data pipeline for acquisition, processing, and visualization, ensuring responsiveness and accuracy.

Bookem | *React, TypeScript, MongoDB, NextJs* October 2023 – April 2024

- Collaborated in a team to design and develop a full-stack website for an NGO called Bookem.
- Led the backend development efforts, creating APIs and server-side functionality using Node.js and Express.
- Utilized MongoDB for efficient data storage and retrieval, ensuring seamless integration with the backend.
- Designed and implemented admin and user portals to manage content and user interactions, enhancing usability and accessibility.

Project Saas | *Flutter, Python, Flask, Firebase* July – September 2022

- Developed a mobile app to detect human breathing rate using smartphone sensors (accelerometer and gyroscope).
- Setup Firebase for long-term tracking and analysis of respiratory patterns.
- Designed a Fourier Transform-based algorithm to analyze breathing patterns
- Implemented a Flask REST API to process and analyze collected breathing data.

Project Yatri | *JavaScript, Node.js, React* March – May 2022

- Developed a web platform using React to provide real-time information on bus routes, fares, and vehicle availability in Kathmandu, Nepal.
- Designed and implemented algorithms to calculate the fastest routes and nearest bus stops, optimizing travel plans based on local traffic and road conditions.
- Built server-side functionality with Node.js to process real-time user requests and retrieve transportation data efficiently.
- Improved public transportation accessibility by leveraging computational methods to address real-world routing challenges.

Funds & Awards

Fellowships

- SyBBURE Searle Undergraduate Research Program (Top 20 students annually) ($12,500/year)

Awards

- Best Project Award (Brain-to-Art Interface), SyBBURE Research Program: Recognized for innovation in real-time data processing and visualization.
- Second Place, Public Choice Adult Individual - MIT Appathon 2022
- Global Finalists Honorable Mention/Galactic Problem Solver - NASA Space App Challenge 2022
- All Nepal Rank-1, National Informatics Olympiad