

Team Name: HelloWorld

Team Members: Cody Rodriguez, Ryan Jammes, Sean McClennen, Gavin Bean

Chapter 1: Vision

Project Overview

Our team is developing an AI chatbot using the open-source Llama model, MongoDB for chat storage, and Express.js for the user interface. The system will be fully containerized to ensure consistency across development, testing, and deployment environments. The final deployment and demonstration will take place on CloudLab.

This project aims to provide researchers with access to a bare-metal cloud environment, allowing for precise experimentation, repeatability, and scientific design of cloud computing experiments. We will leverage CloudLab and GENI to ensure our implementation meets the necessary requirements for scalability and reliability.

Architecture

The architecture consists of several interconnected components:

1. **Chatbot Backend:** A Node.js service that processes user inputs using the Llama AI model.
2. **Database:** A MongoDB instance for storing chat history and user interactions.
3. **Frontend UI:** A lightweight Express.js-based web interface for user interaction.
4. **Containerization Layer:** Docker is used to encapsulate each component, ensuring compatibility across environments.
5. **Deployment Infrastructure:** CloudLab will host and manage the deployment.

This structure ensures modularity, scalability, and easy deployment in a cloud environment.

Chapter 2: Implementation

Containerization Strategy

To streamline development and deployment, all components will be containerized using Docker. This ensures:

- Consistency across different environments (development, testing, and production).
- Isolation between services, preventing conflicts.
- Easy scaling of individual components.

Tools Used:

- Docker for containerization.
- Docker Compose for defining multi-container services.
- Kubernetes for managing container orchestration (optional for scalability testing).

Implementation Plan

Component Breakdown

1. **Backend Service:**
 - Developed using Node.js and Express.js.
 - Hosts the AI chatbot (Llama model) and processes user messages.
 - Implements API routes for interaction.
2. **Database Service:**
 - Uses MongoDB to store chat logs and user data.
 - Ensures fast retrieval and optimized indexing for efficient search and query operations.
3. **Frontend Service:**
 - A simple yet interactive UI built using HTML, CSS, and JavaScript.
 - Communicates with the backend via API calls.
4. **Containerization and Orchestration:**
 - Each component runs in its own container.
 - Docker Compose used for local testing.
 - Kubernetes utilized for load balancing and high availability in CloudLab.

Automation and Deployment Strategy

- **CI/CD Pipeline:**
 - GitHub Actions automates testing and deployment.
 - Unit tests verify backend and database functionality before merging changes.
 - Automatic deployment to CloudLab on successful CI/CD run.
- **Logging and Monitoring:**
 - ELK Stack (Elasticsearch, Logstash, Kibana) used for real-time log monitoring.
 - Prometheus and Grafana set up for performance metrics.

- **Security Measures:**
 - API gateway with authentication to prevent unauthorized access.
 - HTTPS encryption enforced for data transfer.
 - Role-based access control (RBAC) implemented for secure interactions.
- **Performance Optimization:**
 - AI model optimized for fast response times using TensorFlow.js.
 - Load testing performed with Apache JMeter to analyze system behavior under different loads.

Final Deployment on CloudLab

- CloudLab configured with necessary dependencies and environment settings.
- Automated scripts ensure smooth deployment and initialization.
- Live demonstration showcasing chatbot interactions and system resilience.

Conclusion

This implementation strategy ensures our AI chatbot meets all required technical standards while maintaining flexibility and scalability. The project's cloud-based deployment guarantees accessibility and ease of integration with CloudLab's infrastructure.

Appendix: Team Resumes

Cody Rodriguez

Philadelphia, Pennsylvania | (215)-237-5934 | cody.rodriguez1970@gmail.com |

<https://www.linkedin.com/in/cody-rodriguez-5a83a724a/>

Profile

As a computer science student at West Chester University, I have cultivated a diverse skill set through hands-on experiences and academic pursuits. Proficient in Java, C, and JavaScript, I have a solid understanding in both front-end and back-end development. My familiarity with HTML, CSS, and JavaScript enables me to create responsive and visually appealing web pages. With my excellent interpersonal and communication skills, I can convey technical concepts to anyone. My ability to break down complex problems and devise effective solutions, and a willingness to adapt to new tools and methods, position me to excel in technical challenges.

Work Experience

WEB DEVELOPMENT INTERN | WEST CHESTER UNIVERSITY OF PENNSYLVANIA |
SEPTEMBER 2023-PRESENT

- Maintain and enhance university websites, ensuring compliance with branding and accessibility standards.
- Develop new web pages, contributing to both technical and creative aspects of online presence.
- Troubleshoot and resolve technical issues using XML, CSS, and JavaScript.
- Assist in website updates and maintenance, ensuring up-to-date and accurate content.
- Gain practical experience in web technologies, significantly improving technical skills.

BLI COMPUTER SCIENCE INSTRUCTOR | HEIGHTS PHILADELPHIA | JULY 2023-AUGUST 2023/JULY 2024-AUGUST 2024

- Collaborated with co-instructor to design and implement a curriculum covering Java basics and object-oriented programming concepts.
- Utilized interactive teaching methods to engage students in practical coding exercises and projects, reinforcing their understanding of Java principles.
- Guided students through the development of a culminating final project, providing support and feedback to ensure successful completion and application of learned skills.
- Monitored and assessed student performance throughout the program, identifying areas for improvement and adapting teaching strategies to meet individual learning needs.

BLI COMPUTER SCIENCE INSTRUCTOR | STEPPINGSTONE SCHOLARS | JULY 2022-AUGUST 2022

- Co-developed JavaScript-focused curriculum to effectively teach programming fundamentals.
- Implemented project-based learning methodologies to reinforce Java concepts and facilitate practical application.
- Provided personalized guidance and support to students, fostering a collaborative learning environment.
- Coordinated with co-instructors to perfect lesson plans and ensure cohesive teaching strategies.

Education

BACHELOR OF SCIENCE IN COMPUTER SCIENCE | 2021-CURRENT | WEST CHESTER UNIVERSITY OF PENNSYLVANIA, WEST CHESTER, PA

SKILLS & ABILITIES

- Proficiency in Java, C/C++, JavaScript.
- Familiarity with web development languages such as HTML, XML, CSS, and JavaScript.
- Excellent interpersonal and communication skills
- Ability to break down complex problems and devise effective solutions.
- Ability to articulate technical concepts to both technical and non-technical audiences.
- Willingness to adapt to new tools, languages, and methodologies.

Hobbies

- Web Development
- Making music
- Playing video games

RYAN JAMMES

137 East Market St. West Chester, PA 19382 Phone: 703-635-5745 | Email:
ryanjam2002@gmail.com

Dedicated and motivated individual with a strong computer science and AI development background. I am passionate about leveraging technology to solve real-world problems and continuously seek opportunities to grow and learn. With a proven ability to lead teams, tackle complex challenges, and adapt quickly to new environments, I am committed to driving innovation and delivering results. In addition to my technical expertise, I bring a diverse skill set, bilingual communication abilities, hard work, and a detail-oriented focus on collaboration and efficiency. Currently, I am exploring AI-driven solutions for stock trading as a personal project.

SKILLS

- Proficient in C/C++/C# Python, Java/Javascript, Haskell and HTML
- Strong team leader and quick learner
- Familiar with Docker
- Excellent organizational and problem-solving abilities
- Passionate about continuous learning
- Familiar with AWS

RELEVANT EXPERIENCE

SAIC | INTERN Chantilly, VA | June 2024 – August 2024

- Led a team on a project focused on AI development (details withheld due to NDA).
- Applied technical skills and leadership to ensure project success.
- Developed machine learning models using Python and TensorFlow.

- Implemented data preprocessing and feature engineering using Pandas and NumPy.
- Used Jupyter Notebooks and other IDEs to develop AI and coding projects related to training the AI.
- Collaborated with cross-functional teams to refine AI algorithms and improve performance

EXPERIENCE

YORI'S BAKERY | Assistant Manager West Chester, PA | May 2023 – Present

- Assist customers with custom orders and decorating baked goods.
- Operate cash registers and collaborate with a team of cashiers.
- Utilize quick thinking to address and resolve on-the-job challenges effectively.
- Learned new skills such as baking and decorating.
- Train new employees on customer service protocols and cash register operations.
- Manage daily cash flow and reconcile cash registers at the end of shifts.
- Coordinate with the bakery team to ensure timely completion of large orders.
- Implement inventory tracking to maintain stock levels and reduce waste.
- Lead team meetings to discuss strategies for improving customer satisfaction and operational efficiency.

EASTERN UNIVERSITY | OPERATIONS ASSISTANT St. Davids, PA | May 2022 – August 2022

- Coordinated event setup and dismantling, led volunteer teams, resolved challenges efficiently, optimized processes for increased efficiency, and served as the primary contact for organizers and attendees to ensure smooth operations.

FORD'S FISH SHACK | Food Runner South Riding, VA | August 2020 – February 2021

- Streamlined dine-in and takeout order processes, optimized team communication, trained staff on accuracy and customer service, and proactively resolved issues to improve efficiency and satisfaction

TAREY HOUSTON REFEREEING SERVICES | Referee Loudoun County, VA | January 2013 – January 2019

- Officiated youth soccer games focusing on safety and rule enforcement, maintained professionalism with stakeholders, organized league reports, led referee briefings, and mentored junior referees.

EDUCATION

WEST CHESTER UNIVERSITY / COMPUTER SCIENCE January 2023 – Present

- Currently studying computer science. Set to graduate in the Spring of 2025. Played on the school soccer team for a year.

EASTERN UNIVERSITY / COMPUTER SCIENCE August 2021 – December 2022, St. Davids, PA

- Studied computer science, was a member of the Honors College, and played on the school soccer team for a year and a half.

AWARDS

- Dean's List Honors College: Eastern University
- All-MAC Conference Academics 2021 Fall
- All-MAC Conference Academics 2022 Spring

- All-MAC Conference: Academics 2022 Fall
- Honorable Mention MAC Team 2022 Fall

Sean McClennen, Computer Science Student seanmcclennen@gmail.com (484) 832-9010

I am a Student at West Chester University of Pennsylvania and an IT Helpdesk Consultant with 4 years' experience seeking an opportunity to apply my skills in the Computer Industry.

Education:

West Chester University of Pennsylvania, West Chester, Pennsylvania Major: Computer Science 2022 - Present

Penncrest High school, Media, Pennsylvania, Class of 2021

Experience: 2021 - Present

- IT Helpdesk Consultant • West Chester University of Pennsylvania IT Helpdesk
- Technical Support for a Large Community:
- Provide technical support to over 17,000 students, faculty, and staU' in person and remotely.
- Use of Remote Assistance Tools:
- Utilize tools like Bomgar (BeyondTrust Remote Support) for secure remote access and control of computers and mobile devices.
- Employ Finesse for managing interactions across diU'erent communication channels (phone, email, chat, social media).
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- Device Management:
- Image and re-image faculty loaner devices to ensure they are ready for use.
- Install required software for faculty and staU', ensuring their devices are equipped with necessary tools.

Sean McClennen Computer Science Student seanmcclennen@gmail.com (484) 832-9010

2017 - 2018

Lifeguard • IM Pools Management, INC

- Safety and Supervision:
 - Enforce pool rules to maintain a safe environment.
 - Watch swimmers to ensure safety.
- Pool Maintenance and Management:
 - Responsible for cleaning the pool and maintaining proper chlorine levels.
- Access Control:
 - Managed who was allowed to enter the pool area, ensuring compliance with entry requirements.

Key Skills:

- Troubleshooting
- Coding (Java, Python, C++)
- MacOS, Windows and Linux
- Interpersonal Communication
- ServiceNow
- Duo Mobile Admin
- Beyond Trust Remote Support
- Microsoft Teams

Hobbies:

- Building Computers
- Video Games
- Modding
- 3D printing