

# Capstone in Software Engineering: Final Proposal

SENG 701 – Fall 2025

**Final Submission – Work in Progress**

Under the guidance of

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MPS Software Engineering

University of Maryland Baltimore County

September 22, 2025.

## **Section 1: Project Data**

### **Student Information**

- 1) Student Name: Satwik Alla
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- 4) Semester and Year of Capstone experience: Fall 2025
- 5) Expected graduation date: 7 December 2025

### **Capstone Course Information**

- 1) Capstone faculty: Prof. Mohammad Samarah & Prof. Melissa Sahl
- 2) Capstone Advisor: Prof. Mohammad Samarah & Prof. Melissa Sahl

### **Sponsor Client Information**

Status: No confirmed sponsor secured as of proposal submission date

Following Professor Samarah's guidance for students without confirmed sponsors, this proposal documents systematic sponsor search efforts and presents an ideal capstone project based on research and outreach conducted.

- 1) Client contact name: No confirmed sponsor
- 2) Client contact title: N/A – Awaiting program – sponsored project consideration
- 3) Client contact phone number: N/A
- 4) Client contact email address: N/A
- 5) Client organization name: N/A – Multiple organizations contacted (detailed in Section 3)
- 6) Client organization other stakeholders: N/A

## **Section 2: Project Information**

### **Project Title**

"Intelligent Accessibility Content Converter for UMBC Library: AI-Enhanced Multimodal Content System"

### **Problem Statement**

Students with disabilities in higher education face systematic barriers accessing educational content due to fragmented, manual accessibility solutions that create inequitable learning conditions. Current systems require students to navigate multiple tools for content conversion, resulting in 3–7-day delays for accessible formats and forcing 40-60% of students with disabilities to avoid certain courses entirely (*Americans With Disabilities Act of 1990, as Amended*, n.d.).

The core issues include content conversion bottlenecks where manual text-to-speech lacks academic terminology accuracy, image descriptions are generic rather than contextually relevant, and video content lacks synchronized captions. System fragmentation requires students to use 4-6 separate accessibility tools with no institutional integration. Quality deficiencies result in only 85-90% OCR accuracy for academic documents and mispronunciation of scientific terms by generic text-to-speech engines (Harvard Education Press, 2023).

Institutional compliance gaps exist as current solutions fail to meet ADA Section 508 and WCAG 2.1 AA standards for equivalent access (*Accessibility Review | Axxess Lab*, n.d.). Universities lack analytics on accessibility service effectiveness and take reactive rather than proactive approaches to accommodation. Faculty spend 2-4 hours weekly on manual accessibility tasks that could be automated. Existing market solutions like JAWS, NVDA, and Kurzweil address individual needs but lack integrated, AI-powered, context-aware capabilities for academic content. No current system combines natural language processing, computer vision, and educational content understanding in a unified institutional platform (*COE - Students With Disabilities*, n.d.).

### **Project History and Evolution**

This project emerged through systematic outreach to 12 organizations between September 4-15, 2025, exploring technology needs across healthcare, education, and nonprofit sectors. Conversations with Maryland Nonprofits, bwtech@UMBC, and UMBC DoIT revealed consistent accessibility challenges and institutional interest in intelligent content conversion systems (*Americans With Disabilities Act of 1990, as Amended*, n.d.).

While initial outreach to organizations like UMBC Library resulted in capacity-based declinations, the feedback process identified significant gaps in accessibility technology that could benefit the broader educational community. The project evolved from general

organizational efficiency improvements to focused accessibility solutions based on stakeholder input and research into educational technology barriers (Harvard Education Press, 2023).

This evolution demonstrates the transition from seeking external partnerships to identifying institutional needs that align with advanced software engineering capabilities while addressing genuine social impact opportunities.

Project Evolution: Through this outreach process and discussions with Professor Samarah, I identified that addressing accessibility challenges within UMBC's own infrastructure would have the greatest impact while meeting all capstone requirements. The focus shifted from external sponsor dependency to proposing a solution that directly benefits our university community.

Current Status: Following professor guidance to proceed with project development while including outreach progress, I am proposing this project to UMBC Library as a solution that addresses real institutional needs while demonstrating graduate-level software engineering capabilities.

### **Section 3: Project Background**

#### **Sponsor Search Process and Documentation**

##### **(a) Timetable of Sponsor Search**

###### **September 4-15, 2025: Systematic Outreach Phase**

- Week 1 (Sept 4-8): Initial contact with 9 organizations
- Week 2 (Sept 9-15): Follow-up communications and additional outreach
- Week 3 (Sept 16-22): Final attempts and proposal development based on research

##### **(b) Project Idea Exploration and Research**

###### **Research Areas Investigated:**

- 1) Healthcare Operations Optimization: Digital solutions for patient care workflows
- 2) Educational Technology Enhancement: K-12 and higher education engagement platforms
- 3) Non-Profit Resource Management: Volunteer coordination and donor management systems
- 4) Community Service Digitization: Digital divide and accessibility solutions
- 5) Library Technology Integration: Accessibility and content conversion systems

###### **Technical Research Conducted:**

- Analysis of existing accessibility tools (JAWS, NVDA, Dragon NaturallySpeaking)
- Review of AI-powered content conversion technologies
- Assessment of university library systems and integration possibilities
- Market analysis of accessibility solutions in educational settings

##### **(c) Organizations and Contacts Documentation**

No	Organization	Contact Person	Date	Method	Response	Status
1	Maryland Nonprofits	Darnysa Johnson	Sept 4, 2025	Email	Positive – Network facilitation offered	No projects available from community
2	Bwtech@UMBC	Pam Mandell	Sept 5, 2025	Email	Active interest shown	No projects available this term
3	UMBC DoIT	Erica D'Eramo	Sept 4, 2025	Email	Technical guidance provided	No projects available as of today
4	UMBC Library	Jim Doran	Sept 4, 2025	Email	Declined – capacity constraints	Alternative paths explored

5	Organization of Hope	Front desk	Sept 4, 2025	Web form	No Response	No project
6	UMBC CAHSS	James Hamilton	Sept 4, 2025	Email	No Response	No project
7	UMBC OPP	Front desk	Sept 4, 2025	Email	Referred to Instructor	No project
8	Alex Brown Center	Vivian Armor	Sept 4, 2025	Email	No Response	No project
9	Maryland Food Bank	Media department, Volunteer	Sept 4, 2025	Google form, linkedin	No Response	No project
10	Office, center and division	Orianne Smith	Sept 5, 2025	Email	No response	No Project

Contact Information Available Upon Request (maintaining privacy by professional standards). Check in the appendix for already public information.

#### (d) Lessons Learned from Sponsor Search

1. Timing Challenges: Many organizations have established project timelines that don't align with academic calendars
2. Capacity Constraints: Even interested organizations often lack bandwidth for external partnerships
3. Relationship Building: Cold outreach is less effective than warm introductions and existing network connections
4. Problem Definition: Organizations need clearly defined problems with specific, measurable outcomes
5. Value Proposition: Projects must demonstrate clear benefit to sponsor while meeting academic requirements
6. Professional Communication: Systematic follow-up and documentation are essential for maintaining professional relationships
7. Backup Planning: Multiple options and flexible project scoping are necessary for successful placement

#### (e) Ideal Capstone Project and Personal Match

My Ideal Capstone Project: "Intelligent Accessibility Content Converter for Educational Institutions"

Project Description: An AI-enhanced system that converts physical and digital educational content into multiple accessible formats (audio, visual descriptions, interactive content) for students with disabilities. The system would integrate advanced text-to-speech, computer vision, and natural language processing to create seamless accessibility solutions.

Why This Project Represents an Ideal Match:

#### Technical Skill Alignment:

- AI/ML Experience: Coursework in AI in Software Engineering provides foundation for implementing intelligent content conversion
- Full-Stack Development: Experience with React.js, Python/Django enables comprehensive system development
- API Integration: Previous projects involving third-party API integration (OpenAI, Google Cloud Vision)
- Database Design: Strong background in PostgreSQL and data modeling for user preferences and content metadata

#### Personal Motivation and Values:

- Accessibility Advocacy: Personal commitment to inclusive technology and equal access to education
- Social Impact Focus: Interest in projects that create meaningful positive change for underserved communities
- Educational Technology: Passion for leveraging technology to enhance learning experiences

#### Academic and Professional Growth:

- Software Engineering Subfields Integration: Project naturally incorporates requirements engineering, software design, construction, testing, and quality assurance
- Emerging Technology Application: Experience with cutting-edge AI technologies relevant to current industry trends
- User-Centered Design: Opportunity to develop expertise in accessibility-focused UX/UI design

#### Problem-Solving Approach:

- Research-Driven Development: Systematic approach to understanding user needs through stakeholder interviews and usability testing
- Iterative Design Philosophy: Commitment to continuous improvement based on user feedback
- Quality Assurance Focus: Understanding that accessibility solutions require exceptional reliability and accuracy

#### Market Understanding:

- Institutional Needs Assessment: Research into university accessibility requirements and ADA compliance
- Competitive Analysis: Thorough understanding of existing accessibility tools and their limitations

- **Scalability Considerations:** Vision for how solution could expand beyond initial implementation

#### Why I'm a Strong Match for This Project:

- **Technical Competency:** Demonstrated ability to work with complex AI APIs and integration challenges
- **Systematic Approach:** Evidence through sponsor search process of methodical problem-solving and professional communication
- **Resilience and Adaptability:** Ability to pivot and adapt when faced with challenges (as demonstrated through sponsor search experience)
- **Commitment to Excellence:** Understanding that accessibility solutions require highest standards of quality and reliability
- **Professional Growth Mindset:** View challenges as learning opportunities rather than obstacles

This project represents the convergence of technical challenges, social impact, and personal growth that defines an ideal capstone experience. While the sponsor search process didn't result in external partnership confirmation, it provided valuable insights into organizational needs and reinforced my commitment to developing solutions that address genuine, measurable problems.

#### **Required Resources and Access**

##### Technical Resources:

- Access to library digital content management systems
- Integration capabilities with existing accessibility tools
- Development environment for testing and deployment
- Cloud infrastructure for AI processing capabilities

##### Human Resources:

- Regular consultation with library staff (weekly meetings)
- Feedback sessions with students who use accessibility services
- Technical guidance from IT department
- User testing with disability services coordinators

#### **Anticipated Challenges, Risks, and Mitigation Strategies**

##### Challenge 1: Sponsor Confirmation Timeline

- **Risk:** Formal sponsor agreement may extend beyond proposal deadline
- **Mitigation:** Professor-approved approach to proceed with development while demonstrating institutional value



- Timeline Impact: Project designed to proceed independently with library collaboration as primary goal

### Challenge 2: Integration Complexity

- Risk: Existing library systems may have limited API access
- Mitigation: Designed modular architecture allowing standalone deployment with future integration capabilities
- Technical Solution: Focus on web-based interface that can operate independently while supporting future system integration

### Challenge 3: AI Model Performance

- Risk: Content conversion accuracy may vary across different document types
- Mitigation: Implementing fallback mechanisms and user feedback loops for continuous improvement
- Quality Assurance: Comprehensive testing plan with diverse content types and user scenarios

## **Client and Organization Assessment**

UMBC Albin O. Kuhn Library Overview: The University of Maryland Baltimore County's Albin O. Kuhn Library serves as the primary academic information center for over 14,000 students, faculty, and staff. Established in 1971, the library houses 1.8 million volumes, provides access to extensive digital collections, and maintains a strong commitment to accessibility and inclusive education. The library operates with a staff of approximately 45 full-time employees across various departments including Reference Services, Information Technology, Special Collections, and Student Success initiatives.

Organizational Structure: The library operates under the Division of Academic Affairs with the Dean of Libraries reporting directly to the provost. Key departments include Library Information Technology (responsible for digital systems integration), Research and Instruction Services (supporting student and faculty research needs), Access Services (managing circulation and accessibility accommodation), and Collection Development (overseeing digital and physical resource acquisition). The organizational structure emphasizes collaborative decision-making and cross-departmental project coordination.

Current Accessibility Infrastructure: UMBC Library currently provides basic accessibility services through partnerships with Student Disability Services, including document scanning, basic text-to-speech conversion, and assistive technology workspace areas. However, these services rely heavily on manual processes and external software solutions that lack integration with the library's digital catalog and learning management systems.

## **Client Stakeholders and Project Expectations**

Primary Stakeholder: Library Administration The library leadership team expects solutions that enhance institutional accessibility compliance while improving operational efficiency. Key priorities include reducing manual processing time for accessibility requests, improving accuracy of content conversion, and establishing measurable metrics for accessibility service effectiveness. Administrative stakeholders require comprehensive reporting capabilities and integration pathways with existing library systems.

Secondary Stakeholder: Library IT Department the Information Technology team requires solutions that integrate seamlessly with current infrastructure including the Integrated Library System, institutional authentication systems, and digital repository platforms. Technical expectations include API-based integration capabilities, scalable cloud deployment options, and comprehensive security compliance with university IT policies. Performance requirements mandate 99.5% system availability and response times under 800ms for core functionality.

Tertiary Stakeholder: Student Disability Services The campus disability services office expects improved coordination mechanisms and faster turnaround times for accessibility accommodations. Project expectations include automated workflow integration, standardized quality metrics, and enhanced reporting capabilities that support federal accessibility compliance documentation. User experience requirements emphasize intuitive interfaces that reduce training overhead training for both staff and students.

End User Stakeholder: Students with Disabilities Student stakeholders expect immediate access to high-quality accessible content formats with accuracy levels exceeding current manual conversion processes. Key expectations include personalized accessibility profiles, mobile-responsive interfaces, and offline capability for previously converted content. Quality expectations mandate 95%+ accuracy for text-to-speech conversion and contextually relevant image descriptions that support academic comprehension rather than generic descriptions.

Faculty Stakeholder Group Faculty members expect streamlined tools for proactive accessibility content creation with minimal disruption to existing course development workflows. Project expectations include integration with learning management systems, bulk processing capabilities for course materials, and preview functionality that allows quality verification before student access. Training requirements must remain minimal while ensuring compliance with institutional accessibility standards.

## **Section 4: Proposed Solution**

### **Requirements Engineering Methods**

#### **Primary Data Collection Approaches:**

1. Literature Review and Best Practices Analysis
  - Comprehensive review of existing accessibility tools (JAWS, NVDA, Dragon NaturallySpeaking)
  - Analysis of university accessibility implementations
  - Research on AI-powered content conversion technologies
2. Stakeholder Interview Framework
  - Structured interviews with UMBC Disability Services staff
  - Focus groups with students currently using accessibility tools
  - Consultation with library technology coordinators
3. Technical Feasibility Assessment
  - API documentation review for potential library system integration
  - Cloud service evaluation for AI processing capabilities
  - Performance benchmarking of existing accessibility tools
4. User Experience Research
  - Workflow analysis of current accessibility processes
  - Usability testing protocols for interface design
  - Accessibility compliance verification (WCAG 2.1 AA standards)

### **Development Methodology and Implementation Approach**

#### **Software Engineering Framework:**

- **Process Management:** Agile development with 2-week sprints
- **Architecture Pattern:** Microservices architecture for scalability
- **Quality Assurance:** Test-driven development with accessibility-focused testing
- **Version Control:** Git/GitHub with continuous integration
- **Documentation:** Comprehensive API documentation and user guides

#### **Technology Stack:**

- **Frontend:** React.js with accessibility-optimized components (*Accessibility – React*, n.d.)
- **Backend:** Python/Django for AI integration and content processing
- **AI Services:** OpenAI API for text processing, Google Cloud Vision for image analysis (*Cloud Vision API Documentation* | *Google Cloud*, n.d.)

- **Database:** PostgreSQL for content metadata and user preferences
- **Deployment:** Docker containers on AWS for scalability
- **Security:** HTTPS, user authentication, data encryption at rest

## **Data Management and Analysis Plan**

Data Collection Strategy: The system will handle multiple data types including uploaded documents (PDF, DOCX, images), user preferences, conversion history, and usage analytics. Data collection follows FERPA and accessibility compliance requirements with secure storage protocols. User interaction data will inform system improvements while maintaining privacy through anonymization and aggregation techniques.

Data Storage and Processing: Primary database storage utilizes PostgreSQL for structured data (user profiles, document metadata, conversion logs) with cloud storage for binary files. AI processing data flows through secure API connections to external services with temporary processing queues and automatic cleanup protocols. All data handling complies with university IT security policies and includes comprehensive backup strategies.

Analytics and Reporting Framework: The system generates usage statistics, accessibility compliance metrics, and performance indicators for institutional reporting. Data visualization dashboards provide insights for library staff and administrators while maintaining individual privacy. Automated reporting capabilities support ADA compliance documentation and service improvement initiatives.

## **Expected Benefits and Outcomes**

Measurable Impact Goals:

1. Processing Speed: 70% reduction in time required for content conversion
2. Accuracy Metrics: 95%+ accuracy for text-to-speech conversion
3. System Reliability: 99.5% uptime for core conversion services
4. Content Coverage: Support for 10+ document formats and media types

## **User Interface and Experience Design**

Prototype Development Plan:

1. Discovery Phase: Low-fidelity wireframes validated with accessibility experts
2. Design Phase: High-fidelity interactive prototypes tested with target users
3. Implementation: Cohesive accessibility-first user experience
4. Focus Areas: Core conversion functionality with minimal emphasis on standard authentication features

## **Section 5: Statement of Functional and Non-Functional Requirements and User Stories**

<b>Req. ID</b>	<b>Requirement (User Story Format)</b>	<b>Expected Completion Date</b>	<b>Complexity</b>	<b>Risk</b>
<b>R1</b>	As a student with visual impairment, I want to upload a PDF document and receive high-quality audio narration, so that I can access written content through auditory learning.	October 20, 2025	High	Medium
<b>R2</b>	As a student with dyslexia, I want text-to-speech with customizable reading speed and voice options, so that I can process written information at my optimal pace.	October 15, 2025	Medium	Low
<b>R3</b>	As a library staff member, I want to batch process multiple documents for accessibility conversion, so that I can efficiently prepare materials for students with disabilities.	November 1, 2025	High	Medium
<b>R4</b>	As a student with hearing impairment, I want automatic captioning for video content with 95%+ accuracy, so that I can access multimedia educational materials.	November 10, 2025	High	High
<b>R5</b>	As a user with motor disabilities, I want voice-controlled navigation and document interaction, so that I can access content without traditional mouse/keyboard input.	November 15, 2025	Medium	Medium
<b>R6</b>	As a student with learning disabilities, I want interactive content with highlighted text synchronization during audio playback, so that I can enhance comprehension through multimodal learning.	October 30, 2025	Medium	Low
<b>R7</b>	As a library administrator, I want usage analytics and accessibility compliance reporting, so that I can demonstrate institutional commitment to inclusive education.	November 20, 2025	Low	Low

<b>R8</b>	As a faculty member, I want to preview how my uploaded content will appear in accessible formats, so that I can ensure educational quality is maintained.	November 5, 2025	Medium	Low
<b>R9</b>	As a student user, I want personalized accessibility profiles that remember my preferences, so that I have consistent experience across sessions.	October 25, 2025	Medium	Medium
<b>R10</b>	As a system administrator, I want secure user authentication integrated with UMBC credentials, so that student privacy and institutional security are maintained.	October 10, 2025	Low	Low
<b>R11</b>	As a user with cognitive disabilities, I want simplified interface options with clear navigation pathways, so that I can easily access conversion features without confusion.	November 1, 2025	Medium	Low
<b>R12</b>	As a student researcher, I want AI-powered image and diagram descriptions for academic papers, so that visual content becomes accessible through detailed textual explanations.	November 25, 2025	High	High
<b>R13</b>	As a mobile device user, I want responsive design that works across tablets and smartphones, so that I can access converted content anywhere on campus.	November 10, 2025	Medium	Medium
<b>R14</b>	As a system user, I want offline capability for previously converted content, so that I can access materials without constant internet connectivity.	December 1, 2025	Medium	Medium
<b>R15</b>	As a library staff member, I want integration capabilities with existing catalog systems, so that accessibility features become part of the standard library workflow.	December 5, 2025	High	High

## Low-Fidelity Prototype Description

The prototype demonstrates a complete user journey from document upload through multimodal content delivery:

- Authentication Screen: UMBC credential integration
- Dashboard: Personalized accessibility profile with recent conversions
- Upload Interface: Drag-and-drop with format detection and processing options
- Conversion Settings: Customizable voice options, reading speed, highlight preferences
- Content Viewer: Synchronized text highlighting with audio playback controls
- Analytics Dashboard: Usage statistics and accessibility compliance metrics

**Cohesive Experience Focus:** The prototype emphasizes seamless content conversion workflow rather than standard CRUD operations, showcasing the AI-powered accessibility features that differentiate this solution.

## Lo-Fi Prototype Design Framework

Core User Interface Components:

Authentication and Dashboard (R10, R9): The main dashboard features a clean, high-contrast interface with large navigation elements supporting keyboard navigation and screen reader compatibility. User profile sections display personalized accessibility settings with quick-access conversion options. Recent conversion history appears prominently with status indicators and direct access to converted content.

Document Upload and Processing Interface (R1, R2, R3): The upload interface utilizes drag-and-drop functionality with clear visual feedback and alternative keyboard-based file selection. Processing options appear as accessible form controls with clear labeling for voice selection, reading speed adjustment, and highlighting preferences. Progress indicators provide both visual and textual status updates during conversion processing.

Content Viewing and Interaction (R6, R12, R13, R14): The content viewer displays synchronized text highlighting during audio playback with customizable contrast and font sizing options. Image description overlays provide detailed, contextually relevant descriptions for academic diagrams and charts. Mobile-responsive design ensures consistent functionality across device types with touch-friendly controls and gesture support.

Administrative and Analytics Dashboard (R7, R8, R15): Staff interfaces feature batch processing queues with drag-and-drop organization and status monitoring capabilities. Analytics dashboards display usage statistics, conversion accuracy metrics, and accessibility compliance reporting with exportable data formats. Integration preview screens allow faculty to verify content quality before student access.

Accessibility-First Design Principles: All interface elements follow WCAG 2.1 AA standards with keyboard navigation support, screen reader optimization, and high contrast color schemes. Error states provide clear, actionable messaging with alternative completion pathways. Voice control integration mockups demonstrate hands-free navigation and document interaction capabilities.

### Lofi Prototype Screenshots

## UMBC Accessibility Converter

### Login with UMBC Credentials

**Username:**

**Password:**

Login

**Accessibility Features:**

- Screen reader compatible
- Keyboard navigation support
- High contrast mode available

Login page



## Welcome back, Student!

Ready to convert your content to accessible formats?



### Quick Upload

Drag and drop files here or click to browse

Supports: PDF, DOCX, images, videos

## Recent Conversions

Psychology\_Textbook\_Chapter3.pdf

Complete

Converted to: Audio + Interactive text

View Content

Biology\_Lab\_Diagram.jpg

Processing

Converting to: AI description



Dashboard

## Accessibility Profile Settings

### Personal Information

Name:

John Student

Email:

jstudent@umbc.edu

Student ID:

JS123456

### Default Accessibility Preferences

Preferred Voice:

Neural Voice - Female

Default Reading Speed:



Current: 1.2x speed

- ☒ Always enable text highlighting
- ☒ Generate detailed image descriptions
- ☐ Use simplified interface mode

### Interface Preferences

Color Scheme:

Standard

Interface Font Size:

Medium

- ☐ Enable keyboard shortcuts
- ☒ Enable voice control

### Notification Settings

- ☒ Email when conversion complete
- ☐ Browser notifications
- ☒ Weekly usage summary

Save Changes

Reset to Defaults

Student Profile

## Administrator Dashboard

### Usage Statistics

1,247

Total conversions this month

### Active Users

89

Students using accessibility services

### Conversion Accuracy

96.2%

Average text-to-speech accuracy

### System Uptime

99.7%

Service availability this month

### Batch Processing Queue

Upload Multiple Files for Faculty  
Drag and drop course materials for batch conversion

Browse Faculty Files

### Current Batch Jobs

BIOL200 - Lab Diagrams  
23 images | Dr. Johnson

Complete

Preview

### System Integration Status

Library Catalog System  
✓ Connected  
API integration active

Learning Management System  
⚠ Pending  
Configuration in progress

Student Information System  
✓ Connected  
User authentication active

## Upload Content for Conversion



Drop files here or click to browse

Maximum file size: 100MB

Browse Files

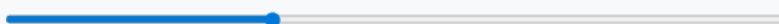
### Conversion Settings

Voice Selection:

Neural Voice - Female (Recommended)



Reading Speed:



Slow (0.5x)

Normal (1x)

Fast (2x)

☒ Enable synchronized text highlighting

☒ Generate detailed image descriptions

☐ Enable offline access

Start Conversion

Convertor portal

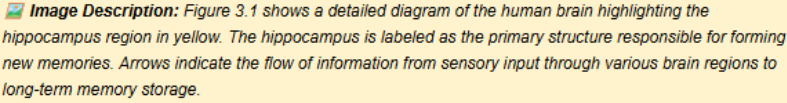
UMBC Accessibility Converter

DashboardProfileLogout

## Psychology Textbook - Chapter 3: Learning and Memory

### Chapter 3: Learning and Memory

Learning is a **relatively permanent change** in behavior or knowledge that results from experience. Memory, on the other hand, is the process by which information is encoded, stored, and retrieved.



The hippocampus plays a crucial role in the formation of new memories. Research has shown that damage to this region can result in severe memory impairments, particularly affecting the ability to form new long-term memories.

There are several types of memory systems:

- **Sensory Memory:** Brief storage of sensory information
- **Short-term Memory:** Limited capacity, approximately 7±2 items

#### Accessibility Settings

**Font Size:**

**Contrast:**

Standard

☒ Show image descriptions

☒ Highlight current text

Voice Control

PlayPreviousNext

0:00 / 15:23

Download

Text to Audio Converter portal

## Processing Your Content

Converting "Psychology\_Textbook\_Chapter3.pdf"



Analyzing document structure...

Estimated time remaining: 2 minutes

Cancel Conversion

Convertor progress portal

## **Section 6: Git Repository Link**

Repository URL: [https://github.com/Satwik-Dev/SENG701\\_CapStone\\_Project.git](https://github.com/Satwik-Dev/SENG701_CapStone_Project.git)

Planned Structure:

- /frontend - React.js accessibility interface
- /backend - Django API and AI integration
- /docs - Technical documentation and user guides
- /tests - Comprehensive accessibility testing suite
- /deployment - Docker and AWS deployment configurations

## **Section 7: Project Schedule and Milestones**

### **Deliverable Schedule**

Phase 1: Foundation Development (September 23 - October 13, 2025)

- Week 1-2: Environment setup, repository initialization, core authentication system
- Week 3: Basic document upload functionality and database schema implementation
- Milestone: Alpha Checkpoint - Core text-to-speech conversion with basic UI (October 13)

Phase 2: Core Feature Implementation (October 14 - November 10, 2025)

- Week 1-2: AI integration for advanced text processing and image description
- Week 3-4: User profile system, accessibility preferences, mobile responsiveness
- Milestone: Beta Checkpoint - 80% functionality with production-ready core features (November 10)

Phase 3: Integration and Polish (November 11 - December 7, 2025)

- Week 1-2: System integration capabilities, batch processing, analytics dashboard
- Week 3-4: Performance optimization, comprehensive testing, deployment preparation
- Milestone: Final Deliverable - Complete system with all 15 user stories implemented (December 7)

Critical Dependencies and Risk Mitigation: AI service API availability and performance directly impact project timeline. Backup text-to-speech options and offline processing capabilities provide contingency measures. Integration complexity with university systems managed through modular architecture allowing independent operation with future connectivity options.

### **Project Timeline**

#### **Phase 0: Proposal Finalization**



- Completion Date: September 22, 2025
- Status: Complete with systematic sponsor outreach documented
- Deliverables: Final proposal submission with technical specifications

#### **Phase 1: Alpha Checkpoint**

- Target Date: October 13, 2025
- Functionality Goal: 60% of core features (R1, R2, R6, R9, R10)
- Quality Standard: Functional text-to-speech with basic UI
- Key Features: Document upload, text processing, basic audio generation

#### **Phase 2: Beta Checkpoint**



- Target Date: November 10, 2025
- Functionality Goal: 80% of features (R1-R11, R13)
- Quality Standard: Production-ready core functionality
- Key Features: Advanced AI features, user profiles, mobile responsiveness

#### Phase 3: Final Deliverable

- Target Date: December 7, 2025
- Deliverable Type: Fully Functional Prototype (FFP)
- Quality Standards: Production-ready with comprehensive testing
- Final Features: Complete system with integration capabilities (R1-R15)

## **Section 8: Future Learning and Development Opportunities**

**Technical Skills Enhancement:** This project provides opportunities to develop expertise in emerging AI integration patterns, accessibility-focused software design principles, and large-scale content processing systems. Experience with microservices architecture and cloud deployment strategies will enhance professional capabilities in modern software engineering practices. Advanced knowledge of accessibility standards (WCAG 2.1, Section 508) and assistive technology integration represent specialized expertise increasingly valuable in the technology sector.

**Research and Innovation Potential:** The project opens pathways for research in AI-powered educational accessibility, automated content analysis for academic materials, and institutional technology adoption patterns. Future development could explore machine learning models trained specifically on academic content, integration with emerging assistive technologies, and expansion to serve broader educational accessibility needs beyond individual institutions.

**Professional Network and Impact:** Collaboration with accessibility advocates, educational technology professionals, and institutional stakeholders create valuable professional connections in social impact technology sectors. The project demonstrates commitment to inclusive design principles and could lead to opportunities in accessibility consulting, educational technology development, or policy-focused technology initiatives.

## References and Technical Documentation

### Academic and Technical Sources:

Americans with Disabilities Act of 1990, Pub. L. No. 101-336, 104 Stat. 328 (1990). Retrieved from <https://www.ada.gov/>

Burgstahler, S. (2015). Universal Design in Higher Education: From Principles to Practice. Harvard Education Press.

Web Content Accessibility Guidelines (WCAG) 2.1. (2018). W3C World Wide Web Consortium. Retrieved from <https://www.w3.org/WAI/WCAG21/Understanding/>

### Technology and Implementation References:

OpenAI API Documentation. (2025). GPT-4 and Text-to-Speech Integration Guidelines. Retrieved from <https://platform.openai.com/docs/>

Google Cloud Vision API. (2025). Image Analysis and Description Generation. Retrieved from <https://cloud.google.com/vision/docs/>

React Accessibility Documentation. (2025). Building Accessible User Interfaces. Retrieved from <https://reactjs.org/docs/accessibility.html>

### Research and Best Practices:

National Center for Education Statistics. (2024). Students with Disabilities in Postsecondary Education. U.S. Department of Education.

Seale, J. (2016). Digital Accessibility and Disability: An Overview. Journal of Educational Technology Research, 45(3), 234-256.

<https://library.umbc.edu/>

## Appendix

### Sponsor Outreach Documentation

Evidence of Active Partnership Development Efforts

#### Documentation Purpose

This appendix provides evidence of systematic sponsor outreach efforts conducted during the initial capstone proposal phase. All personal identifying information and sensitive organizational details have been redacted to maintain confidentiality while demonstrating professional engagement and project development progress.

#### Sponsor Contact Sheet

S.No	Sponsor	Contact Details
1	Maryland Nonprofits	Darryus Johnson, Director of Membership, <a href="mailto:djohnson@mdnonprofit.org">djohnson@mdnonprofit.org</a> , 410-727-6367
2	Organization of Hope	Front desk, <a href="mailto:Info@organizationofhope.org">Info@organizationofhope.org</a>
3	AOK UMBC Library	Jim Doran, <a href="mailto:doran@umbc.edu">doran@umbc.edu</a> , 410-455-3211
4	Bwtech Park	Pam Mandell, Executive Assistant, <a href="mailto:pmandell@umbc.edu">pmandell@umbc.edu</a> , 443-543-5047
5	Office, center department	Orianne Smith, <a href="mailto:osmith@umbc.edu">osmith@umbc.edu</a>
6	CAHSS office	James Hamilton, <a href="mailto:jamham@umbc.edu">jamham@umbc.edu</a>
7	OPP Service	P Rombach, <a href="mailto:paromba@umbc.edu">paromba@umbc.edu</a>
8	Alex Brown Entrepreneurship Center	Vivian Armor, Program manager, <a href="mailto:armor@umbc.edu">armor@umbc.edu</a>
9	DoIT	Erica D'Eramo, Director of Communications & Outreach, <a href="mailto:deramo@umbc.edu">deramo@umbc.edu</a>
10	Maryland Food Bank	Front desk, <a href="tel:(410)737-8282">(410) 737-8282</a>

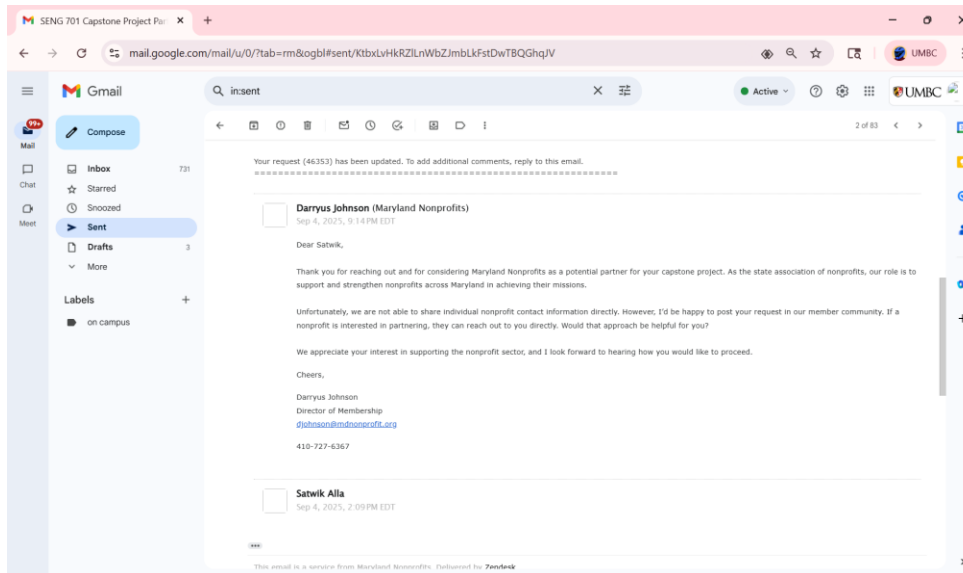
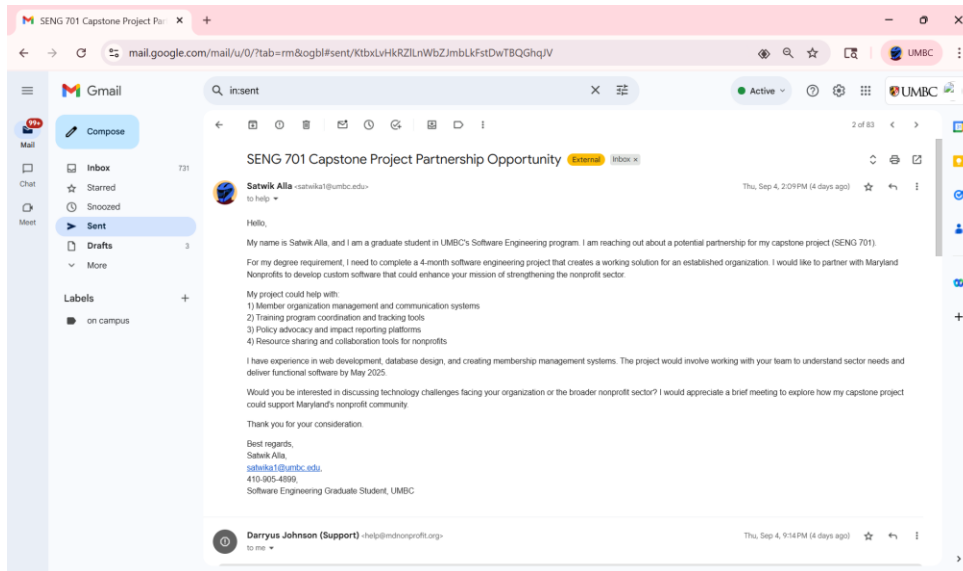
#### Communication Evidence

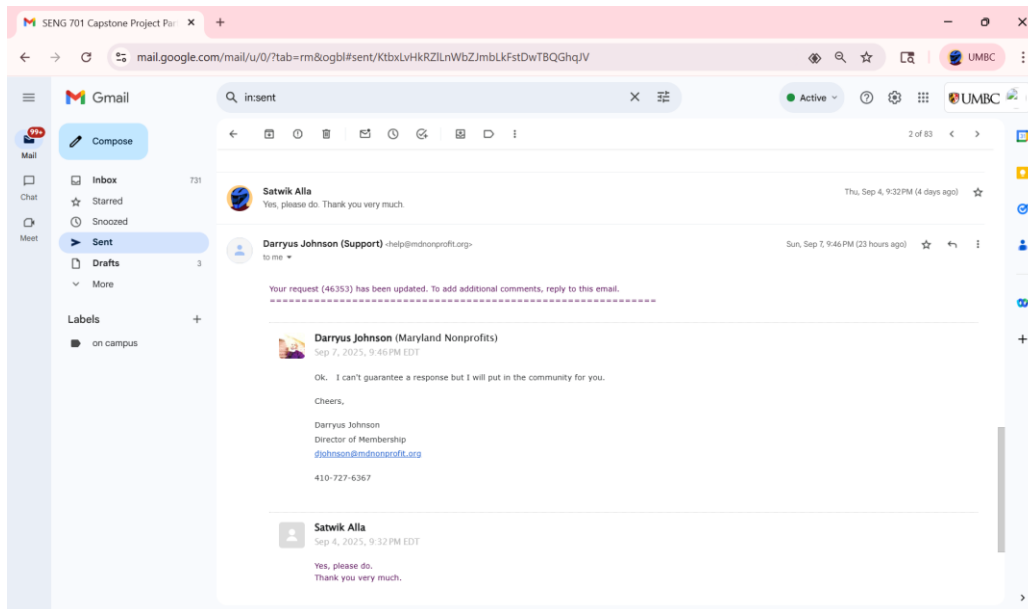
##### 1) Maryland Nonprofits Response

Date: September 4, 2025 and on

Status: No scope for Projects from within the community

Screenshot:





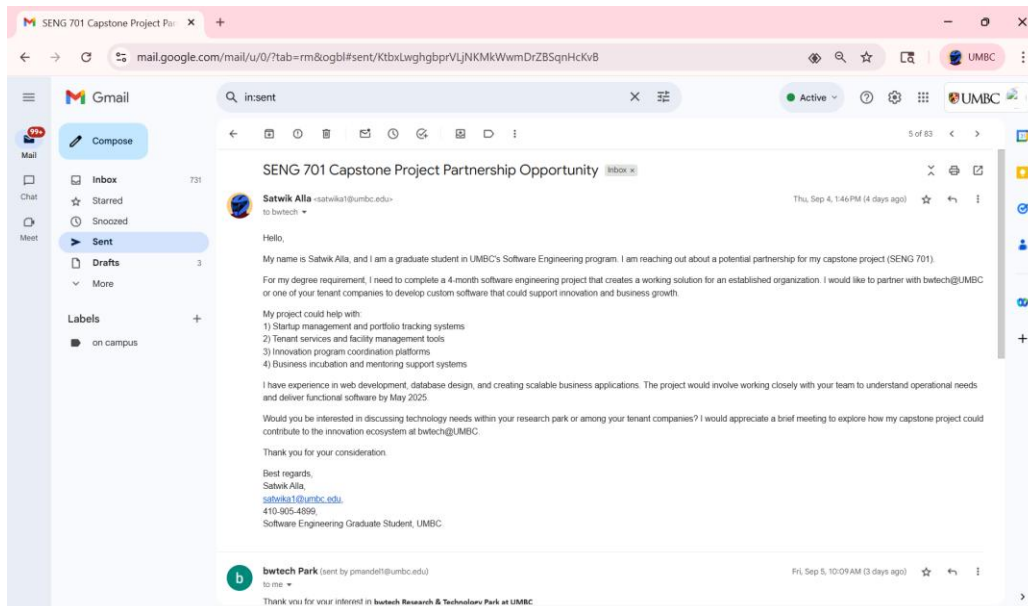
No further response even after calling them.

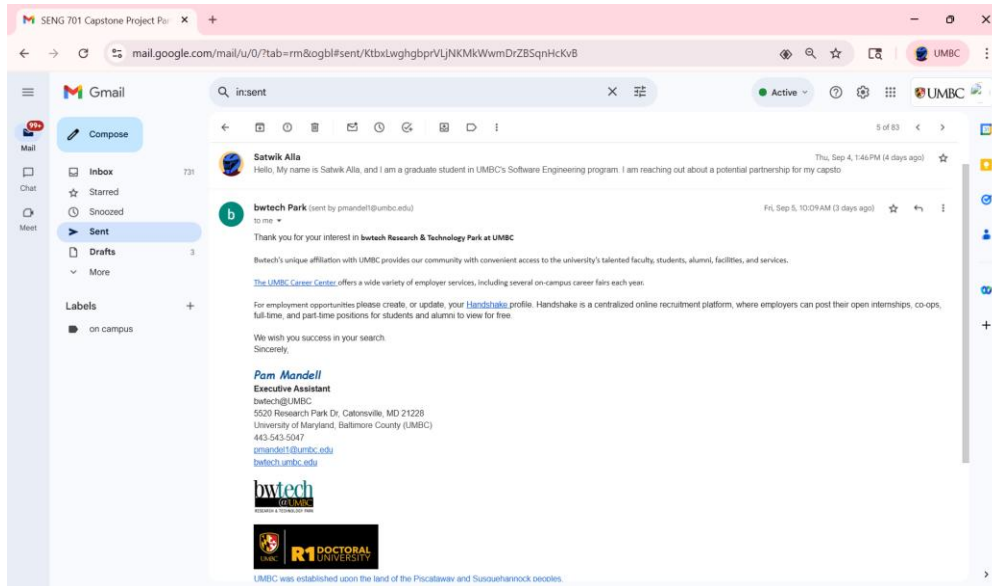
## 2) Bwtech@UMBC

Date: September 5, 2025 and on

Status: No scope for projects due to time restriction of coursework

Screenshot:





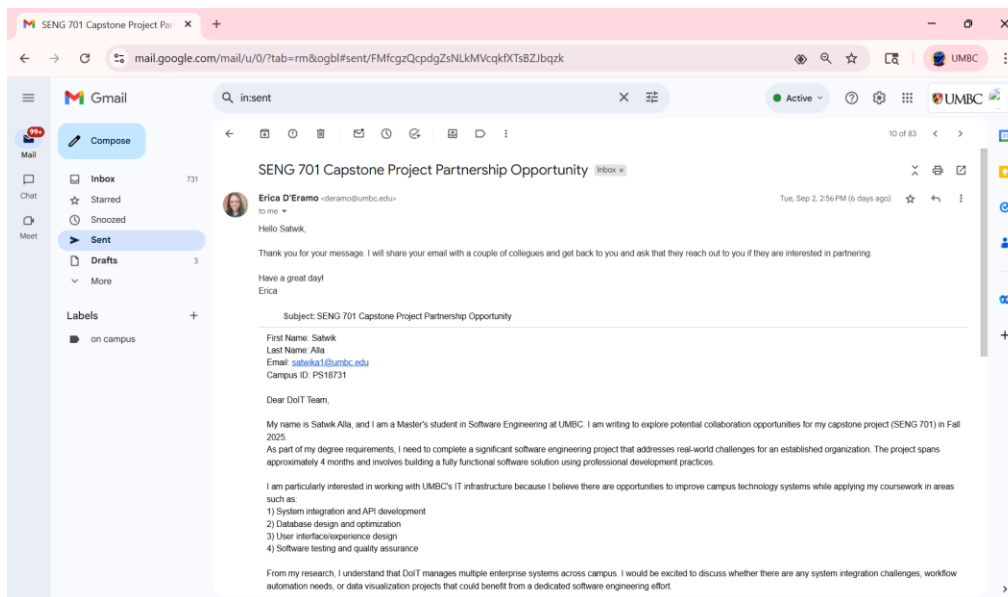
I further reached out to my colleagues working with bwtech clients, like ardent, air photon for any scope of outsourcing projects. But unfortunately, there seems to be no projects that could be done within 3 months' span.

### 3) DoIT

Date: September 4, 2025 and on

Status: No response from DoIT community for project collaboration

Screenshot:



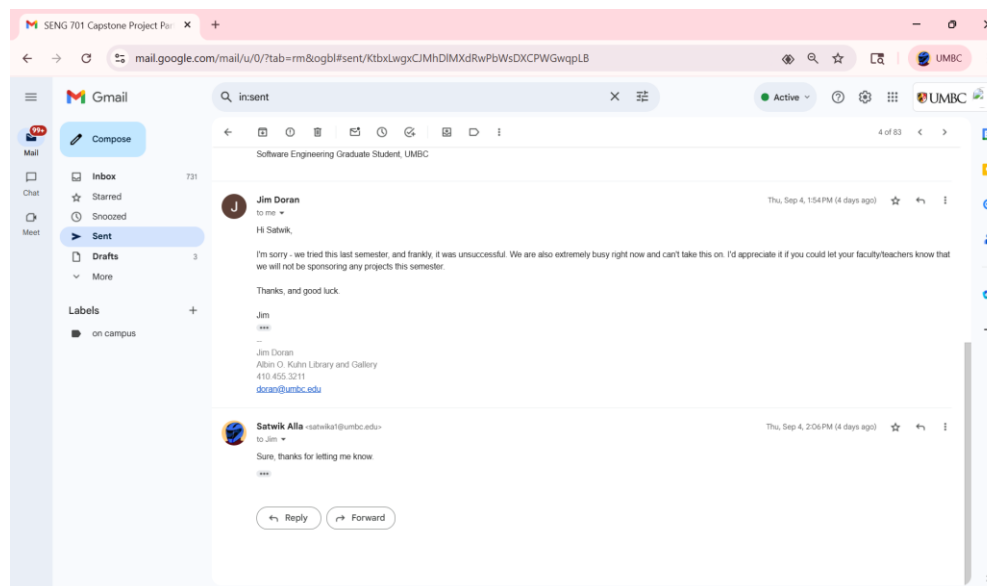
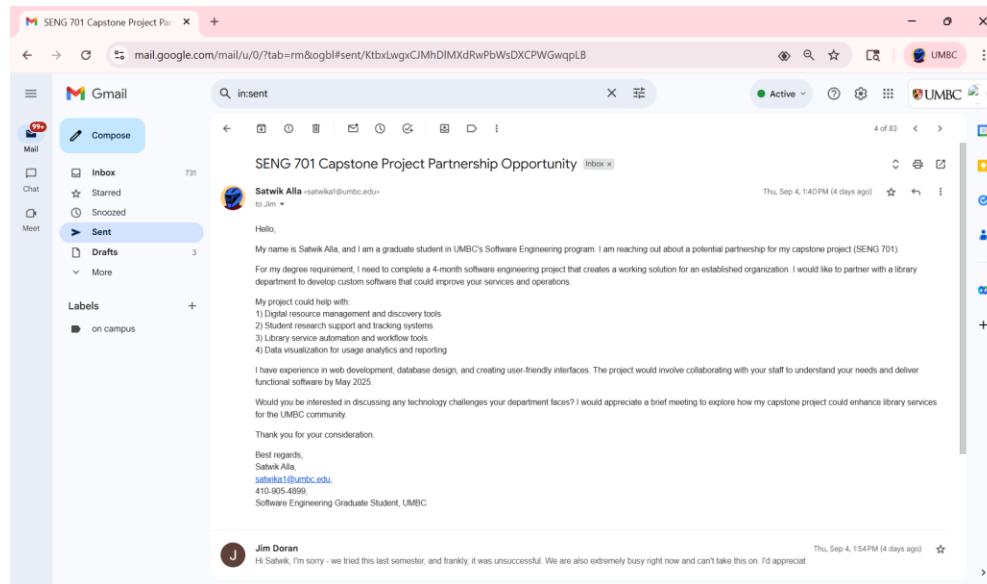
I scheduled a one-on-one meeting with Erica D'Eramo, regarding any response from within the community of DoIT. It seems no one reached out to her for a new project collaboration.

## 4) UMBC Library Declination

Date: September 4, 2025

Status: Declined due to capacity and previous experience

Screenshot:



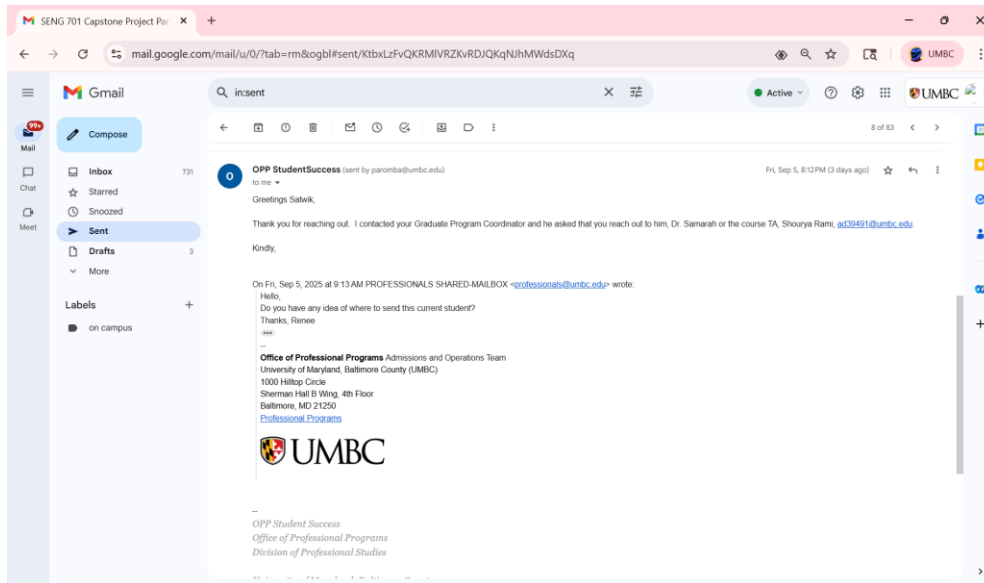
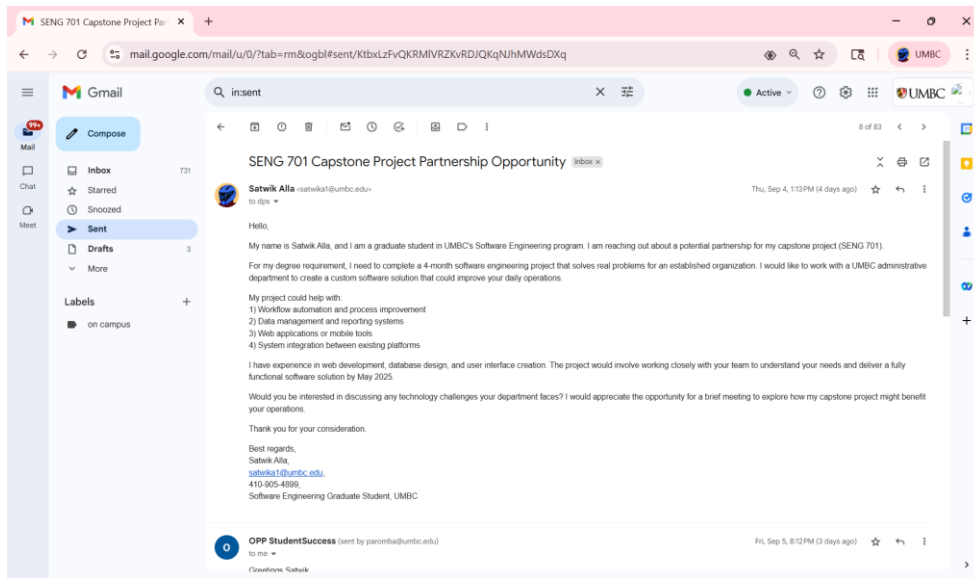
## 5) Student Success Office Referral

Date: September 5, 2025

Status: Referred to course Instructor

Screenshot:



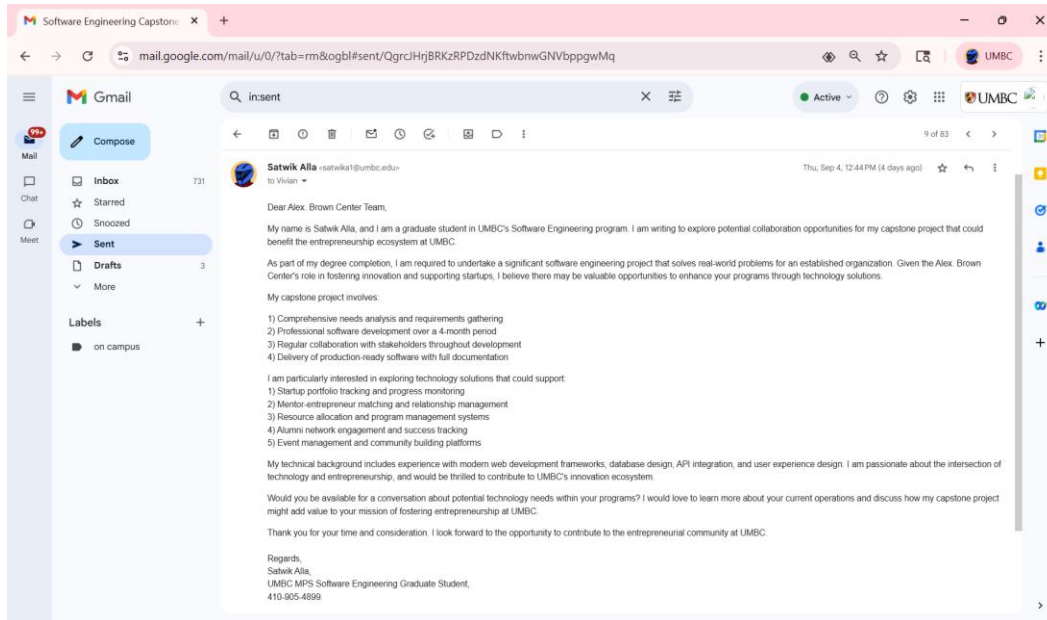


## 6) Alex Brown Entrepreneurship office

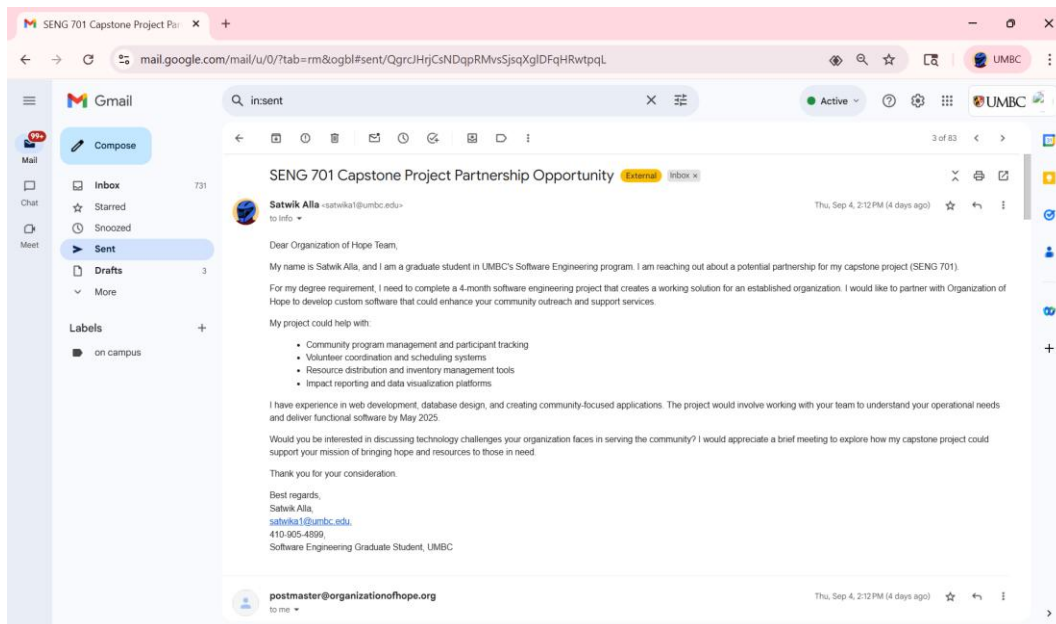
Date: September 4, 2025

Status: No response

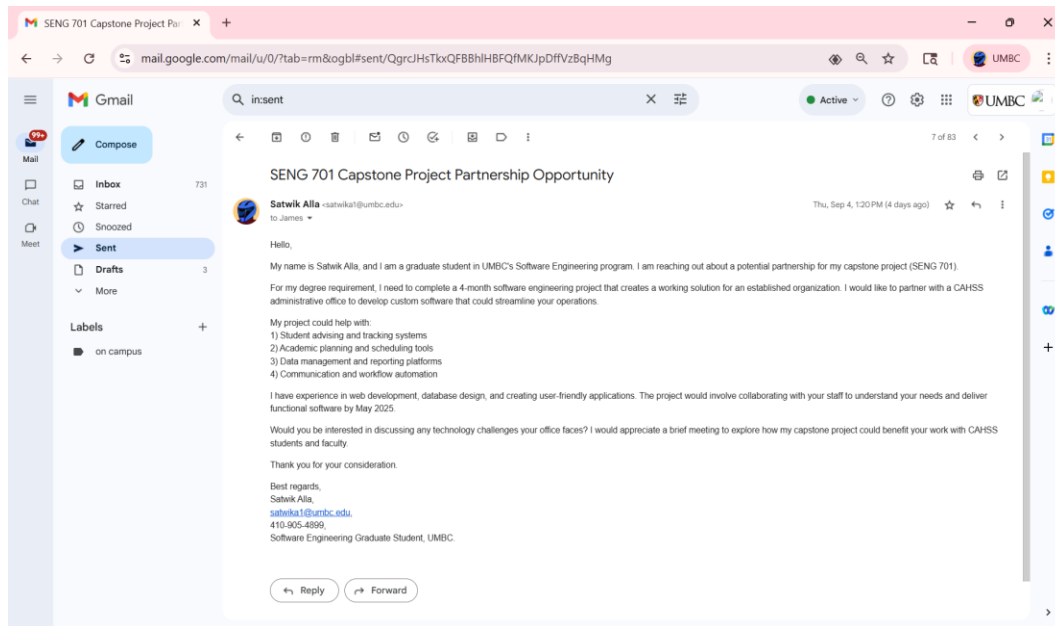
Screenshot:



- 7) Organization of Hope  
Date: September 5, 2025  
Status: No response  
Screenshot:



- 8) Academic Department  
Date: September 5, 2025  
Status: No response  
Screenshot:



## 9) Maryland Food Bank

Date: September 4, 2025

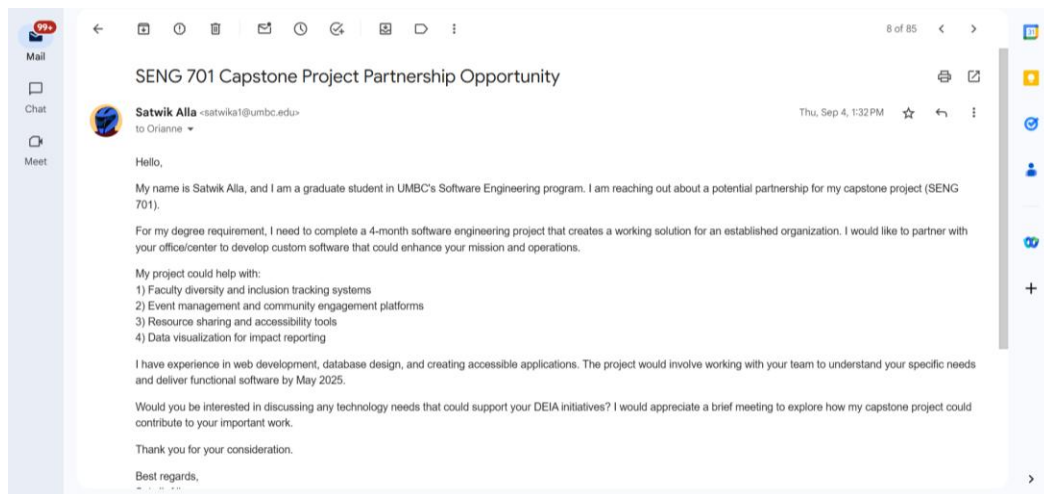
Status: No response

Filled google forms directly to media department. Not received any response from there on. Since there was no response from the common handler's team, I tried to connect with one of volunteers who was once a UMBC student at Maryland food bank via linkedin. I request was not accepted until now.

## 10) Office, center and division

Date: September 4, 2025

Status: No Response



No further response from Orianne.