CS-499 5-1 Journal

Chris Marrs

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Part One: Emerging Trends in Computer Science

Trend 1: Artificial Intelligence and Machine Learning

* **Significance**: Artificial Intelligence (AI) and Machine Learning (ML) continue to revolutionize industries by automating processes, enhancing decision-making, and enabling predictive analytics. These technologies are driving innovations in areas such as healthcare, autonomous vehicles, and personalized consumer experiences (Bergmann, 2024.)
* **Impact on the Field**: AI/ML is changing the landscape of computer science by emphasizing the need for expertise in algorithm optimization, data analytics, and neural networks. There is a rising demand for professionals skilled in designing, training, and deploying ML models has grown significantly.
* **Impact on Consumers and Workers**: AI/ML empowers consumers with personalized services, such as tailored recommendations and voice-activated assistants. For workers, it introduces both opportunities (e.g., new AI-driven roles) and challenges (e.g., potential job displacement due to automation).
* **Relevance to Career Aspirations**: My career interests align closely with AI/ML, particularly in developing intelligent systems that solve real-world problems. This trend motivates me to deepen my understanding of algorithms and data structures to optimize ML models effectively.
* **Course Outcomes Achieved**:
  + Outcome 3 (Design and evaluate computing solutions): The database design and integration showcase my ability to design solutions for managing and accessing structured data in real time.
  + Outcome 4 (Use well-founded and innovative techniques): Implementing MongoDB with AWS Lambda reflects the application of innovative techniques to achieve efficient, scalable database management.
  + Outcome 5 (Develop a security mindset): Error-handling and input-validation in the API has been implemented via AWS services to address potential vulnerabilities, and thus ensuring the system's reliability and security.

Trend 2: Cloud Computing and Serverless Architecture

* **Significance**: Cloud computing has quickly become a staple of modern computing, offering cost-efficient and scalable solutions for data storage, application hosting, and processing needs. Serverless architecture like Amazon Web Services Lambda allows developers to focus solely on feature creation instead of infrastructure management (Dickerson, 2024,)
* **Impact on the Field:** Cloud computing has revolutionized application development and deployment processes by driving microservices adoption and distributed systems architecture rethink. As this trend gains steam, cloud platforms and API integration skills become ever more essential to app development and deployment success.
* **Impact on Consumers and Workers**: Cloud computing has opened access to advanced computing resources for small businesses and individuals, fueling innovation and entrepreneurship. Workers benefit from remote-access tools that offer flexibility while adapting quickly to quickly evolving technologies.
* **Relevance to Career Aspirations:** As someone interested in developing scalable systems, this trend is highly pertinent to my career aspirations. My work with AWS Lambda and MongoDB/DocumentDB integration demonstrates my dedication to using cloud computing for efficient database solutions.
* **Course Outcomes Achieved:**
* Outcome 4 (utilize innovative techniques and tools) has been achieved through database integration enhancements.
* Outcome 1 (create collaborative environments) is partially addressed by using a repo for any project as well as this one. More focus on this could require collaborative work beyond the discussion groups in this project’s structure.

Part Two: Artifact Update

Software Design and Engineering

* Artifact used: Embedded Thermostat System
* Initial Enhancement: Completed the modularization of code, added error-handling for UART/I2C initialization and replaced magic constants with named constants to improve readability.
* Submission Status: Submit for instructor feedback.
* Final Enhancement: Based on the feedback, final adjustments are being made. The focus is on improving modularity and code maintainability.
* Upload Status: Still not uploaded.
* Finalized Status: Awaiting review of final content before submission to ePortfolio.

Algorithms & Data Structures

* Artifact used: Embedded Thermostat System
* Initial Enhancement: Implemented priority-based task scheduling to optimize task execution dynamically on the basis of importance and frequency.
* Submission Status: Submit for instructor feedback.
* Final Enhancement: Final testing and performance optimization are underway. There is a focus on improving the responsiveness and reliability of the scheduler.
* Upload Status: Still not uploaded.
* Finalized Status: Close to completion. Feedback will guide final revisions.

Databases

* Artifact used: Embedded Thermostat system with MongoDB Integration.
* Initial enhancement: Integrated MongoDB for temperature readings and setpoint data. AWS Lambda was used to develop REST API endpoints for CRUD operations.
* Submission Status: Partial submission, awaiting feedback regarding query optimization and error handling.
* Final Enhancement: Optimizing database queries and refining API endpoints to ensure real-time performance.
* Upload Status: Still not uploaded.
* Finalized Status: Finished finalizing database security measures and preparing for ePortfolio Submission.

Status Checkpoints for All Categories

Status Checkpoints Table

|  |  |  |  |
| --- | --- | --- | --- |
| **Checkpoint** | **Software Design and Engineering** | **Algorithms and Data Structures** | **Databases** |
| **Name of Artifact Used** | Embedded Thermostat System | Embedded Thermostat System | Embedded Thermostat System |
| **Status of Initial Enhancement** | Completed modularization of code, replaced magic numbers with constants, and implemented error handling for UART and I2C initialization | Completed priority-based scheduler with optimized task execution | Integrated MongoDB and developed APIs |
| **Submission Status** | Submitted for instructor feedback | Submitted for instructor feedback | Partial submission for feedback |
| **Status of Final Enhancement** | Final review underway based on instructor feedback | Final adjustments and testing in progress | Refining database queries, adding error handling, and testing API endpoints |
| **Uploaded to ePortfolio** | Project Link and Code Review video uploaded. | Uploaded | Not yet uploaded |
| **Status of Finalized ePortfolio** | In progress | In progress | In progress |

References

Bergmann, D. (2024, July 2). *The Top Artificial Intelligence Trends | IBM*. Ibm.com.   
<https://www.ibm.com/think/insights/artificial-intelligence-trends>

Dickerson, D. (2024, August 15). *Serverless Is Trending Again In Modern Application  
Development*. Forrester. <https://www.forrester.com/blogs/serverless-is-trending-again-in-modern-application-development/>