1.overview

As artificial intelligence technology rapidly advances, Generative AI is increasingly prominent in the field of software development. In particular, Generative AI has introduced new opportunities and challenges in the realms of database design and data modeling. For instance, during the recent COVID-19 pandemic, AI proved to be a reliable tool in combating the crisis (Ali, 2020). Therefore, this report aims to explore the key aspects of using Generative AI tools in database design and data modeling for software applications, as well as how these technologies impact modern web development.

 1AI Enhances Modern Communications Through Data Collection  
According to Du (2024), AI significantly enhances real-time network management by quickly responding to various systems through single data collection, distributed pre-training, and rapid decision-making. This unleashes the full potential of networks, meaning that with sufficient data, AI can now start to enhance hardware performance. However, concerns about the security of AI systems still persist among users.

 2 AI Brings Major Breakthroughs in the Medical Field  
Saeed et al. (2023) reported significant advancements in skin cancer diagnostics, achieving a 96% accuracy rate using CNN-based methods that aggregate results from multiple transfer learning models. This suggests that AI can greatly accelerate progress in medical research and diagnosis. However, there are still limitations that need to be addressed.

 3 AI Databases Will Reimagine Enterprise Data Management  
Enterprise Data Management (EDM) is a comprehensive approach to managing company data. Open-source LLM models significantly reduce the time required for the entire EDM process (Varma et al., 2024). This means that using AI with extensive data management capabilities can greatly improve organizational efficiency. However, questions remain about whether AI can truly align with corporate hierarchy structures.

 4AI Databases Can Inspire Designers  
AI enhances the creative process for designers by utilizing the latest advancements in image-to-image translation through Generative Adversarial Networks (GANs) (Yan et al., 2022). This implies that AI can assist in the arts by providing creative inspiration, though it also risks making artworks increasingly similar and less unique.

5 AI Is Transforming Our Lives  
AI databases excel in text summarization, suggesting that they can be used to assist in various tasks (Hagos et al., 2024). AI’s rapid advancements are revolutionizing multiple fields, underscoring the importance of understanding its progress. However, this also brings additional risks that need to be considered.

**Reflection**

Our exploration of Generative AI in database design and data modeling reveals that AI can significantly enhance development efficiency and data integration capabilities. However, relying on these automated tools introduces new challenges, such as information security and ethical considerations. While Generative AI drives technological advancement, it also necessitates a cautious approach to balance technological progress with potential risks.

**Conclusion**

In summary, Generative AI shows great potential in database design and data modeling. While its benefits are noteworthy, it is also essential to address ethical and management concerns that may arise with its application. Future research could focus on finding ways to harness the advantages of AI technology while mitigating its potential risks.

Reference:

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2：**Declaration of Generative AI Use**

**Description of Using Generative AI Tools**

In this assignment, I utilized the generative AI tool ChatGPT to assist with the following tasks:

1. **Generating Initial Ideas**:
   * During the conceptualization phase of the database design and debugging processes, ChatGPT provided insights and initial structures. Through interactions with AI, I identified the tasks to complete and the data required.
   * I combined ChatGPT's suggestions with actual research to arrive at appropriate conclusions.
2. **Database Design**:
   * ChatGPT helped create an initial ER diagram and table structure for the database, which included a basic star schema. I further refined this by adding additional foreign keys and detailed field definitions.
3. **Debugging**:
   * When encountering errors in code, I used ChatGPT to help with debugging. This included diagnosing database errors, handling data packet loss, and resolving issues with data length or type mismatches. ChatGPT assisted in identifying common issues and suggesting solutions.

**Acknowledgement of AI Use**

In accordance with Monash University's policy on AI use, I followed these steps while using AI tools:

* **Clear Marking**: I marked which parts were AI-assisted and distinguished them from my original content.
* **Screenshot Documentation**: I saved all screenshots of AI-generated content as evidence.
* **Result Explanation**: I described the applicability of AI-generated content and how it contributed to my actual work.

**Screenshots of AI-Generated Content**

1. **Generating Initial Ideas**:
   * In the initial planning phase, I input the database design requirements into ChatGPT and received suggestions for table structures and field descriptions.
   * Screenshot 1 shows the input prompt and the generated database structure.
2. **Modifications to Database Design**:
   * The ER diagram generated by ChatGPT focused on basic relationships and fields, but lacked business constraints. Based on the AI-generated content, I added additional foreign keys and detailed relationship diagrams.
   * Screenshot 2 shows the modified database design, with AI-assisted and manual modifications labeled.
3. **Debugging Code**:
   * When encountering syntax errors and data processing issues, I used ChatGPT to diagnose and received possible solutions.
   * Screenshot 3 shows the interaction with ChatGPT during the debugging process.

**Analysis and Evaluation of AI-Generated Content**

**Effectiveness**:

* **Initial Design Generation**: ChatGPT was very helpful in generating the basic structure for the database, allowing me to better understand relationships between data.
* **Error Troubleshooting**: During debugging, ChatGPT provided useful error messages and solutions, saving me a significant amount of time.

**Limitations**:

* **Lack of Business Understanding**: While comprehensive, AI-generated designs lack deep understanding of specific business logic, which sometimes resulted in significant issues with the ER diagram.
* **Inaccurate Details**: For specialized databases, the AI-generated content was not always precise and required further manual adjustments.
* **Algorithm Suggestions Not Always Applicable**: Although AI provided various suggestions for algorithms, it often presented rigid solutions, which sometimes led to incorrect answers.

**Improvement of AI-Generated Content**

Throughout the process, I made the following adjustments to AI-generated content:

1. **Enhancement of Database Design**: The initial AI-generated design only contained basic table structures and lacked detailed business constraints. I manually added primary keys, foreign keys, and data types to meet business requirements.
2. **Adjustment of Debugging Suggestions**: ChatGPT's debugging suggestions were based on generic syntax rules. Some recommendations required fine-tuning to fit my development environment.

**Conclusion**

By using the generative AI tool ChatGPT, I was able to gain initial inspiration, and it greatly assisted in database design and debugging, saving me considerable time. Although AI-generated content has certain limitations, further adjustments through human intervention can effectively enhance efficiency and accuracy. In future projects, combining AI with human expertise in design and debugging will help optimize workflow.



