**Module 5: Critical Thinking**

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CSC506: Design and Analysis of Algorithms

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**Optimizing Social Media Content Recommendations Using Hash Tables**

**Introduction**

Social media platforms require efficient content recommendation systems to handle vast user data and real-time updates. A hash table is an ideal choice due to its fast retrieval time, ensuring seamless personalization.

**Implementation and Justification**

A hash table stores user preferences with user IDs as keys and interest categories as values. This allows constant-time lookups, making it scalable for large platforms. Python’s dictionary provides an efficient built-in hash table, enabling quick insertions, updates, and deletions.

**Challenges and Solutions**

A key challenge was updating user preferences dynamically without affecting retrieval speed. Using direct key-value storage solved this issue. Another challenge was handling missing user queries, which was addressed using the function to prevent crashes.

**Real-Life Performance Factors**

Although hash tables offer complexity, real-world issues like hash collisions, memory constraints, and load factor impact performance. Collisions occur when multiple users hash to the same index, requiring chaining or open addressing to resolve conflicts. Proper table sizing helps minimize costly resizing operations.

**Conclusion**

Hash tables provide speed, scalability, and efficiency for content recommendations. While challenges like collisions exist, proper implementation techniques ensure optimal performance, making hash tables a strong choice for large-scale social media platforms.

**References**

Lysecky, R., & Vahid, F. (2019, August). *Design and analysis of algorithms*. In R. Lysecky, & F. Vahid, *Data structures essential: Pseudocode with Python examples*. Zybooks. ISBN: 9781394012268.

Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2009). *Introduction to algorithms* (3rd ed.). MIT Press.

GeeksforGeeks. (2024). *Hash Tables and Collision Resolution Techniques*. Retrieved from <https://www.geeksforgeeks.org/collision-resolution-techniques/>

Code screenshot:

A screen shot of a computer program

AI-generated content may be incorrect.