# Model Development Phase

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| Date | 06 June 2025 |
| Member ID | SWUID20250148853 |
| Project Title | Restaurant Recommendation System |
| Maximum Marks | 5 Marks |

**Model Selection Report:**

| Model | Description |
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| **Content-Based Filtering** | This approach suggests restaurants by matching user preferences (e.g., cuisine, budget, dietary needs) with restaurant features. It relies on item-user similarity rather than other users' behavior. While effective for niche preferences, it may underperform when user data is sparse (cold start issue). |
| **Collaborative Filtering** | This method generates recommendations by analyzing patterns in ratings and reviews from similar users. It excels at surfacing new options but faces challenges with sparse datasets or new users (cold start and sparsity problems). |
| **Hybrid Recommendation Model** | A combination of content-based and collaborative filtering, this model mitigates the weaknesses of each. By merging user-specific preferences with crowd-sourced behavior, it enhances recommendation quality, diversity, and scalability—ideal for large, sparse datasets like restaurant suggestions. |
| **Matrix Factorization** | Techniques like Singular Value Decomposition (SVD) break down user-item interactions into latent features, uncovering hidden preference patterns. Efficient for large datasets but depends on sufficient rating data. |
| **Deep Learning (Neural Networks)** | Neural networks can be used to build recommendation systems by learning complex, non-linear relationships between users and restaurants from rich feature sets including reviews, preferences, and metadata. While powerful, they require large datasets and are computationally intensive. |

**Conclusion:**

| Model Selected | |
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| **Hybrid Recommendation Model** | The hybrid model was selected because it addresses the limitations of both content-based and collaborative filtering approaches. It effectively handles the cold start and sparsity issues by integrating multiple data sources such as user profiles, restaurant attributes, and behavioral data. This results in more personalized, diverse, and accurate recommendations, making it highly suitable for a restaurant recommendation system with varying user preferences and data availability. |