National College of Ireland

Configuration Manual

MSc Research Project
Masters in Artificial Intelligence

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MSc Project Submission Sheet

School of Computing

Student Name:	DURGA NAGENDRA PRASAD GONUGUNTA		
Student ID:	23285524		
Programme:	Masters in Artificial Intelligence	**Year:**	2025
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Lecturer:	Paul Stynes		
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Signature: DURGA NAGENDRA PRASAD GONUGUNTA

Date: 15-08-2025

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1 Dataset Configuration

The system uses the Amazon 5-core product review dataset, comprising 3,199,522 reviews across six categories: Toys and Games, Musical Instruments, Cell Phones and Accessories, Appliances, All Beauty, and Amazon Fashion. The "5-core" filter ensures each product and each user has a minimum of five reviews, enhancing data richness and reliability. The dataset contains fields such as reviewer ID, product ID, reviewtext, and rating. After cleaning and preprocessing, the dataset was reduced to 2,630,050 review-level entries, and subsequently aggregated into 137,635 product-level records for embedding generation

2 Model and Embedding Configuration

The semantic representation of products is achieved using the pre-trained all-MiniLM-L6-v2 model from the SentenceTransformers library, generating 384-dimensional embeddings for each product. These embeddings are indexed in a FAISS IndexFlatIP structure with L2 normalization to enable cosine similarity-based retrieval. For intent classification, a TF–IDF vectorizer is paired with a logistic regression model trained on cleaned review text. The generative response is produced using the OpenHermes 2.5 large language model (Mistral 7B architecture) in quantized GGUF format, enabling efficient inference in Google Colab environments without high-end GPU requirements.

3 Pipeline and Evaluation Configuration

The recommendation pipeline is implemented across three modules: (1) Data Preparation and EDA, (2) FAISS Retrieval Index creation, and (3) Generative Agentic AI pipeline. The Controller Agent orchestrates the flow from Intent Classification Agent, Retrieval Agent , Generative Agent. Evaluation is carried out using multiple metrics: Intent Accuracy for classification, Hit@5, MRR@5, and Precision@5 for retrieval, and BLEU, ROUGE-L, BERTScore, Faithfulness, and Relevancy for generation. Testing is conducted with realistic product-related queries to validate the system's ability to return relevant, grounded, and conversational recommendations.