

Universiti Teknologi MARA

**Skincare Product Recommendation System Using
Ruled-based Algorithm**

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ABSTRACT

With the rapid development of the commercial skincare business, the diversity of skincare products is overwhelming, and consumers are often confused and face a higher risk of skin adverse reactions such as contact dermatitis due to the lack of dermatological knowledge. Modern methods such as machine learning and collaborative filtering are commonly used for product recommendation, however, they are “black box” models that lack transparency and might lead to dangerous and unpredictable results for sensitive skin types. This project tackles these difficulties by inventing Skinalyze, an automated safety-critical facial skincare product recommender system based on a deterministic rule-based (IF-THEN) inference engine. The system is developed using the Agile Software Development Life Cycle (SDLC) methodology and operates on a secure Three-Tier Architecture using a Python stack. The presentation tier is built on the Streamlit framework with a limited number of dropdown inputs to minimise user data entering errors. To improve the data privacy, user parameters are captured in the volatile session states and are wiped clean on the browser shutdown. These inputs are then passed to the logic tier, which compares them to a knowledge base associated with an embedded SQLite relational database that contains structured product formulas extracted from curated public datasets. The parameterised SQL queries were hard-filtered, which resulted in a flawless precision rate; algorithmic verification was performed using a 20-combination cross-matrix test map. User Acceptance Testing (UAT) under institutional ethical approval received high mean values for Ease of Use, Relevance of Results and Trust in Logic. Furthermore, a bivariate Pearson correlation analysis was conducted, revealing a significant positive linear link between a user’s impression of backend rule safety and their commercial intent to follow the suggestions. The results show that transparent explainable AI (XAI) frameworks can safely bridge the consumer knowledge gap and provide a scalable architecture that can be replicated in other safety-critical domains such as dietetics or pharmaceuticals.

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CHAPTER 1

INTRODUCTION

This chapter presents a comprehensive overview of the proposal. It establishes the background of the thesis by describing the specific topic under investigation and express the primary motivation for the proposal.

1.1 Background

In this era of skincare marketing with the increasing variety of products, it has become increasingly overwhelming to choose which skincare would be suitable for one's skin. Consumers often face challenges due to the interpretation of dermatological peculiarities, and the lack of knowledge about the correct use of products may make individual instructions even more necessary (Kavitha et al., 2023). As a solution to this problem, a skincare product recommendation system was presented to enable consumers to determine the appropriate skincare products based on preferences. In the context of skincare, these systems make options narrower based on the skin type and concerns. The system will utilise a rule-based algorithm to generate the recommendations. This algorithm is applicable in a recommendation system by explicitly defined IF-THEN rules created during the building of the system, hence providing a more interpretability compared to model-based systems, including neural networks (Pelánek et al., 2024).