**Full Report: URL Management Application**

**1. Introduction**

The URL Management Application is designed to facilitate the storage, retrieval, and recommendation of URLs based on content analysis. This report provides an overview of the application's functionality, implementation details, and performance considerations.

**2. Objectives**

The primary objectives of the URL Management Application include:

* Allowing users to save URLs along with their content and relevant metadata.
* Enabling users to search for URLs based on keywords.
* Providing recommendations for URLs similar to the last saved URL based on content analysis.

**3. System Architecture**

**3.1 Components**

The application comprises the following main components:

* **DatabaseHandler**: Manages interactions with the MySQL database, including table creation and operations for URLs.
* **SearchHandler**: Handles searching for URLs based on keywords stored in the database.
* **Recommender**: Implements a recommendation system to suggest URLs based on keywords associated with the last saved URL.
* **URLManager**: Coordinates user interactions through a command-line interface (CLI), offering functionalities to save URLs, search for URLs, recommend URLs, and manage the application flow.

**3.2 Technology Stack**

* **Programming Languages**: Python
* **Libraries and Frameworks**:
* MySQL: relational database management system used for storing URLs, search queries, and recommendations.
* Requests: A Python library used for making HTTP requests to fetch content from URLs.
* Beautiful Soup (bs4): A Python library used for parsing HTML and XML documents to extract content from web pages.
* Transformers (from Hugging Face): A Python library providing access to pre-trained transformer models, including BERT, which is used for text summarization.
* NumPy: A fundamental package for scientific computing with Python, used for numerical operations.
* scikit-learn: A machine learning library in Python, used for implementing cosine similarity calculations.

**3.3 Database Schema**

The URLs table schema in MySQL includes fields for:

* id: Unique identifier for each URL entry.
* url: URL of the web page.
* content: Full content of the web page.
* summary: Summary of the content.
* keywords: Extracted keywords from the content.
* url\_savetime: Timestamp of when the URL was saved.

**4. Functionality and Implementation**

**4.1 Saving URLs (DatabaseHandler)**

* Checks for existing URLs before saving.
* Retrieves content from URLs, adhering to rules.
* Summarizes content and extracts keywords using natural language processing techniques.
* Stores URLs, content, summaries, and keywords in the database.

**4.2 Searching for URLs (SearchHandler)**

* Allows users to search for URLs based on keywords.
* Executes SQL queries to retrieve URLs matching specified keywords.
* Displays search results including URLs and their save times.

**4.3 Recommending URLs (Recommender)**

* Recommends URLs based on keywords associated with the last saved URL.
* Retrieves URLs from the database with similar keywords and displays them in descending order of save time.

**4.4 User Interaction (URLManager)**

* Provides a CLI for users to interact with the application.
* **Options include saving URLs (save), searching for URLs (search), recommending URLs (recommend), and ending the program (end).**
* Validates user inputs and manages the flow of operations.
* **Exception Handling**: Manages errors gracefully during URL fetching, database operations, and application runtime.

**7. Conclusion**

The URL Management Application provides robust functionality for saving, searching, and recommending URLs based on content analysis. It effectively leverages natural language processing and database management techniques to fulfill its objectives..