NewsWise: AI-Powered Contextualized News Feed - Phase 1 Deliverables

By:
C072 Samira Deepak
C093 Vansh Kharidia
C098 Dhruvi Paprunia
C101 Abdulla Dalwai

1. Synopsis Document

Project Name: NewsWise: AI-Powered Contextualized News Feed

Introduction:

In today's fast-paced information environment, users are overwhelmed by the sheer volume of news articles. Navigating this landscape to find relevant, trustworthy, and unbiased information is a significant challenge. Furthermore, understanding complex topics and identifying potential biases within news sources requires significant effort and critical thinking. NewsWise aims to address these challenges by providing a personalized and contextualized news experience.

Problem Statement:

- Information Overload: Users struggle to find relevant news amidst the overwhelming amount of content.
- Lack of Context: News articles often lack sufficient context, making it difficult to understand the nuances of complex topics.
- Bias Detection: Identifying and understanding potential biases in news articles is challenging.
- Personalization Limitations: Existing news aggregators often lack sophisticated personalization capabilities, resulting in generic news feeds.

Objectives:

- **Personalized News Feed:** Provide a news feed tailored to individual user interests and preferences.
- **Contextual Understanding:** Utilize AI to analyze news articles and extract key information, including topics, entities, and sentiments.
- **Bias Detection:** Identify and highlight potential biases within news articles, promoting media literacy.
- **Explanation Generation:** Generate simplified explanations of complex topics to enhance user understanding.
- **User Empowerment:** Empower users to make informed decisions by providing contextualized information and insights.

- **Modular Architecture:** Develop a scalable and maintainable system using microservices.

Scope of the Project:

This project encompasses the development of the following core functionalities:

- **News Aggregation:** Fetching news articles from various sources (APIs, RSS feeds, web scraping).
- **Contextualization:** Utilizing an LLM to extract context, identify entities, detect biases, and generate summaries.
- **Personalization:** Recommending news articles based on user interests and article context.
- **User Management:** Managing user profiles, interests, and preferences.
- **API Gateway:** Providing a unified entry point for accessing microservices.
- **Service Discovery:** Implementing service discovery to enable communication between microservices.
- **Configuration Management:** Enabling centralized configuration of microservices.

Technologies Used:

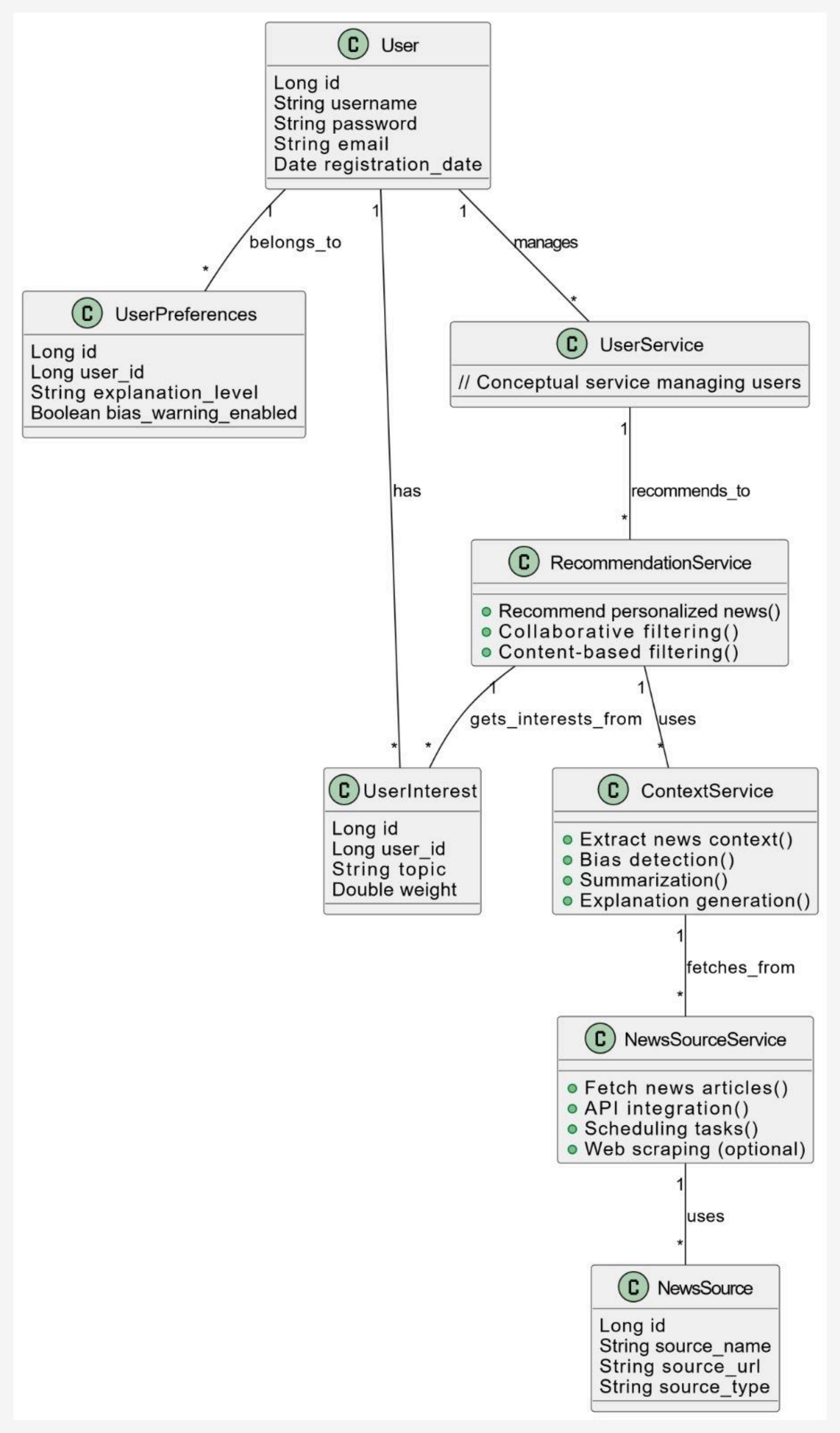
- **Programming Language:** Java
- **Framework:** Spring Boot
- **Database:** MySQL (with Spring Data JPA)
- **Microservices Architecture:** Utilizing RESTful APIs
- **API Client:** Spring WebClient
- **Web Scraping (Optional):** Jsoup (If required for specific news sources)
- **LLM Integration:** OpenAI Java SDK (or similar)
- **Service Discovery:** Eureka
- **API Gateway:** Spring Cloud Gateway
- **Configuration Management:** Spring Cloud Config
- **Authentication & Authorization:** Spring Security, JWT (Recommended)
- **Caching:** Spring Cache
- **Scheduling:** Spring Scheduler
- **Version Control:** Git (with GitHub)
- **Containerization:** Docker
- **Orchestration:** Kubernetes (EKS on AWS)
- **Monitoring:** Spring Boot Actuator, Micrometer, Prometheus, Grafana (ELK Stack or AWS CloudWatch for logging)
- **Resilience:** Resilience4J
- **Cloud Platform:** AWS

Expected Outcome:

- A functional and scalable AI-powered personalized news aggregator.

- A modular system utilizing microservices for maintainability and scalability.
- A user-friendly interface for accessing personalized news feeds, managing interests, and adjusting preferences.
- Integration with external news sources via API calls, RSS feeds, and web scraping (if necessary).
- Implementation of core features like context extraction, bias detection, and summarization using an LLM.
- Secure user authentication and authorization.
- Clear documentation for deployment, maintenance, and future development.

2. ERD (Entity-Relationship Diagram)


C User
Long id
String username
String password
String email
Date registration_date
1
belongs_to
*
1
1
manages
*
C UserPreferences
Long id
Long user_id
String explanation_level
Boolean bias_warning_enabled
has
C UserService
// Conceptual service managing users
1
recommends_to
*
C RecommendationService
Recommend personalized news()
Collaborative filtering()
Content-based filtering()
1
gets_interests_from
1
uses
*
*
*
C UserInterest
Long id
Long user_id
String topic
Double weight
C ContextService
Extract news context()
Bias detection()
Summarization()
Explanation generation()
1
fetches_from
*
C NewsSourceService
Fetch news articles()
API integration()
Scheduling tasks()
Web scraping (optional)
1
uses
*
C NewsSource
Long id
String source_name
String source_url
String source_type

Explanation of ERD:

- **Entities:** User, UserInterest, UserPreferences, NewsSource (Optional)
- **Relationships:**
  - User can have multiple UserInterest (One-to-Many).
  - User has one UserPreferences (One-to-One).
  - UserInterest belongs to one User (Many-to-One).
  - UserPreferences belong to one User (Many-to-One).
  - NewsSourceService uses NewsSource (if configured)
  - ContextService uses information fetched from NewsSourceService
  - RecommendationService uses information provided by the UserService and ContextService
  - UserService manages User accounts
-
- **Primary Keys (PK):** id for all tables, autogenerated.
- **Foreign Keys (FK):**
  - user_id in UserInterest and UserPreferences tables referencing User.id.
-
- **Unique Key (UK):** username in the User table.
- **Normalization:** The database design adheres to normalization principles. Specifically:
  - **1NF (First Normal Form):** Each table contains atomic values. No repeating groups.
  - **2NF (Second Normal Form):** In addition to 1NF, all non-key attributes are fully functionally dependent on the primary key.
  - **3NF (Third Normal Form):** In addition to 2NF, no non-key attributes are transitively dependent on the primary key (i.e., no dependencies on other non-key attributes).
- **Microservices and Data Flow:** The diagram illustrates the interactions of different microservices without specifying the exact content of their databases (which are mostly service-specific, outside the core User data). The arrows show how information flows between them.

This comprehensive ERD supports the relational database requirements of the UserService, while also representing the interactions with the other microservices. The document also provides an overview of the system as a whole.

Github link: https://github.com/samirad123/Newswise