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Original Article

Newsmate: A Cloud-Based Personalized News Aggregation and Intelligent News Analysis System

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Abstract:

The rapid growth of digital news platforms has made a large amount of information available to users within a short time. Although this makes news easier to access, it can also make it difficult to find articles that match individual interests. NewsMate is a personalized news aggregation system developed to bring news from a reliable external source into a single web application. The current system uses React with Vite for the frontend, Flask for backend services, MongoDB Atlas for data storage, and The Guardian Content API for news retrieval. It provides category-based filtering, keyword search, pagination, user registration, login, authentication, and bookmarking.

The backend acts as an intermediary between the frontend and the external news service. This keeps the API interaction within the server and allows the frontend to focus on displaying the retrieved content. User passwords are protected using bcrypt hashing, while JWT-based authentication is used for protected operations. The application also provides a responsive newspaper-style interface with loading states to make navigation easier.

The research focuses on the practical development of a news aggregation platform that can later be extended toward intelligent personalization. Future extensions can study article content, user preferences, reading behaviour, and visual information to improve recommendation quality. The system therefore provides a practical foundation for studying how a conventional news aggregator can gradually be extended into a more personalized news platform.

Index Term: News Aggregation, Personalized News, News Recommendation, Web Application, The Guardian API, React, Flask, MongoDB Atlas, User Preferences

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Introduction:

Digital news has become an important source of information for topics such as current affairs, business, technology, sports, and entertainment. Users can access articles from many different platforms, but finding relevant information can still take time. A large number of available articles can make the process of selecting useful content difficult.

News aggregation provides one way to address this problem. Instead of requiring users to visit several websites, an aggregation system collects news from an external source and presents it through a common interface. Personalization can take this idea one step further by considering the interests and behaviour of individual users.

Research in personalized news recommendation shows that effective recommendation depends on how both news content and user interests are represented. Wu et al. discuss news modelling, user modelling, ranking, datasets, and evaluation as important parts of personalized news recommendation. They also point out challenges caused by changing user interests and the short life cycle of news content [1].

NewsMate was developed as a practical web-based news aggregation system. The application uses React and Vite for the frontend, Flask for the backend, MongoDB Atlas for persistent storage, and The Guardian Content API as the external news source. The implemented system supports real-time news retrieval, category filtering, keyword search, pagination, user registration, login, authentication, and bookmarking.

The main purpose of the system is to make news access more organized and convenient while keeping the architecture simple enough for further development. The current application provides the basic foundation, while intelligent personalization and deeper content analysis can be investigated as future extensions.

Problem Statement:

The large volume of online news makes it difficult for users to quickly identify information that matches their interests. Basic category filtering helps organize articles, but it does not fully represent individual user preferences. A practical system is therefore needed that can combine centralized news retrieval, category filtering, search, user accounts, and bookmarking while leaving room for future personalization.

Objectives:

The main objectives of NewsMate are:

1. To develop a web-based platform for centralized news aggregation.
2. To retrieve current news articles through The Guardian Content API.
3. To organize articles using category-based filtering.
4. To provide keyword-based search and pagination.
5. To provide user registration and secure login.
6. To protect user passwords using secure hashing.
7. To allow authenticated users to bookmark articles.
8. To provide a responsive and simple interface for accessing news.
9. To create a foundation for future personalized news recommendation.

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Literature Review:

Several research studies have examined personalized news recommendation and the methods used to select relevant articles for users. Wu et al. provide a detailed study of personalized news recommendation and discuss important areas such as news representation, user modelling, ranking methods, datasets, and evaluation. Their work shows that personalization involves more than simple category or keyword filtering because user interests can change over time and news content has a short life cycle [1].

Tran et al. introduced CupMar, a deep-learning approach for personalized news recommendation that considers different properties of news articles together with contextual user profiles. Their work highlights the importance of representing both the article and the user when generating personalized recommendations. The study also shows how reading history and article characteristics can be combined to improve the recommendation process [3].

Another direction in this area is the use of information beyond article text. Wu et al. proposed MM-Rec, a multimodal news recommendation approach that combines textual and visual information from news articles. Their work shows that article images can provide additional information that may be useful when recommending news to users [2]. This is important because modern news articles commonly contain both written content and related images.

Recent research continues to explore neural and multimodal approaches for personalized news recommendation. These studies indicate a gradual movement from basic filtering methods toward systems that consider article meaning, user behaviour, contextual information, and multiple forms of content [4], [5]. Such approaches can provide more detailed representations of user interests, but they also require suitable data, processing methods, and evaluation procedures.

The existing literature provides strong evidence that personalized news recommendation is an active research area. However, there is still practical value in studying how these ideas can be introduced into a lightweight web-based news aggregation system without replacing its basic news retrieval and browsing functions.

The research gap addressed by NewsMate is therefore application-oriented. Existing research focuses heavily on advanced recommendation models, while NewsMate provides a practical environment where conventional category-based filtering can act as a starting point for future personalization. The system can later be extended to study article content, user preferences, interaction history, and visual information within the same application architecture. The purpose is not to claim that personalized or multimodal news recommendation is unexplored, but to provide a practical platform in which these approaches can be implemented and evaluated.

System Architecture:

NewsMate follows a separated frontend and backend architecture. The React frontend manages the user interface, while the Flask backend handles news retrieval and application-level operations. The backend communicates with The Guardian Content API and sends the required news information to the frontend.

MongoDB Atlas is used for persistent storage. User information and bookmark data

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are stored in the database. Authentication is handled through JWT tokens, and passwords are stored using bcrypt hashing.

The overall flow of the system can be represented as:

The Guardian Content API
↓
Flask Backend
↓
Data Retrieval and Processing
↓
MongoDB Atlas / Application Data
↓
React + Tailwind CSS Interface
↓
User

The frontend does not directly communicate with The Guardian API. Instead, the Flask backend works as an intermediary. This separation keeps the application structure organized and makes it easier to modify backend services without changing the complete user interface.

Methodology:

The development of NewsMate follows a modular approach in which news retrieval, user management, database operations, and presentation are handled through separate components.

A. News Acquisition:

News articles are obtained from The Guardian Content API through the Flask backend. The backend accepts parameters such as category, search query, page number, and page size, and uses them to retrieve the required articles.

B. News Filtering and Search:

The system supports category-based filtering so that users can browse topics such as world news, business, sports, technology, culture, and general news. Keyword search allows users to find articles related to a specific topic.

C. Data Storage:

MongoDB Atlas is used to store application data. The system maintains user-related information and bookmarked articles. Cloud-backed storage allows the application to access persistent data rather than depending only on temporary browser storage.

D. Authentication:

The application provides registration and login functionality. During registration, passwords are hashed using bcrypt before being stored. During login, the submitted password is checked against the stored hash. JWT tokens are then used to identify authenticated users when accessing protected operations.

E. Bookmark Management:

Authenticated users can save articles as bookmarks. The bookmark functionality allows users to return to articles they previously selected without having to search for them again.

F. User Interface:

The frontend is developed using React with Vite and styled using Tailwind CSS. React Router is used for navigation between different pages. The interface follows a newspaper-inspired layout and includes category navigation, search, article cards, loading states, and responsive behaviour.

Implementation:

The NewsMate frontend is implemented using React, Vite, JavaScript, Tailwind CSS,

and React Router. The frontend communicates with the Flask backend through HTTP requests.

The Flask backend is responsible for application logic and communication with The Guardian Content API. The /news endpoint retrieves news articles according to the requested category, search query, and pagination settings.

The authentication system includes registration and login endpoints. The registration process stores user information after hashing the password with bcrypt. The login process verifies the credentials and generates a JWT access token.

Protected operations use JWT authentication. The bookmark functionality uses the authenticated user's token to associate saved articles with the correct account.

MongoDB Atlas is used as the database layer. The main application data includes users and bookmarks. This structure keeps user information separate from news retrieval while allowing bookmarked articles to remain available across sessions.

The application also includes loading states and error handling so that users receive appropriate feedback while news is being retrieved. The frontend-backend separation makes the system easier to maintain and provides a foundation for future recommendation or analysis components.

Testing and Results:

The implemented NewsMate system was tested according to its main functional requirements. Testing focused on checking whether the major application components behaved as expected.

News retrieval was tested by requesting different categories and verifying that articles were returned correctly. Search functionality was checked using different keywords. Pagination was tested by moving between available pages of news articles.

The registration and login processes were tested using valid and invalid user information. Authentication was also checked for protected operations. Bookmark functionality was tested by saving articles and retrieving the saved information for the authenticated user.

The user interface was checked on different screen sizes to verify responsive behaviour. Loading states were also checked during news retrieval.

The implemented features function as intended within the current application. The system successfully provides news retrieval, category filtering, search, pagination, authentication, and bookmarking. No fabricated numerical accuracy or performance values are reported because those measurements require controlled experiments and recorded test data.

Discussion:

NewsMate provides a practical approach to organizing online news within a single web application. The current system focuses on the core functions required for news aggregation rather than immediately introducing complex recommendation models.

The literature shows that personalized recommendation can benefit from combining information about news content with information about users [1], [3]. Multimodal research also indicates that images can provide useful information alongside article text [2]. These findings provide possible directions for extending NewsMate.

The current category-based filtering mechanism can serve as a simple baseline for future research. Additional methods could then be evaluated against this baseline using a defined dataset and suitable recommendation metrics. This would make it possible to determine whether additional personalization actually improves the user's experience rather than assuming that a more complex approach will always produce better results.

The architecture also provides a useful separation between the interface, backend services, external news retrieval, and database operations. This makes future extensions possible without redesigning the complete application.

There are some limitations. The system depends on the availability and structure of the external news API. News content changes frequently, which makes long-term analysis more difficult. The current application also does not contain a large historical record of user interactions, so advanced personalization models would require additional data. Image-based analysis would also depend on the availability and quality of images associated with individual articles.

Conclusion And Future Scope:

NewsMate provides a practical foundation for a personalized news aggregation system. The implemented application combines React, Vite, Flask, MongoDB Atlas, and The Guardian Content API to provide news retrieval, category filtering, search, pagination, authentication, and bookmarking.

The main contribution of the system is the integration of these functions into a single web application with a separated frontend and backend architecture. This makes news access more organized while providing a suitable foundation for future research.

The literature indicates that personalized news recommendation can benefit from effective modelling of both news content and user interests. Multimodal research also suggests that textual and visual information can be used together when representing news articles [1], [2]. These research directions can be explored in future versions of NewsMate.

Future work can include text-based article classification, personalized recommendation using user preferences and interaction history, sentiment analysis, multilingual news recommendation, and multimodal analysis using article images. Transformer-based text representations and advanced image models can also be investigated. Another possible direction is diversity-aware recommendation, where the system avoids repeatedly presenting highly similar articles.

Future experiments should use a clearly defined dataset and measurable evaluation methods. Different recommendation approaches can then be compared under the same conditions to determine whether personalization provides a meaningful improvement over basic category-based filtering.

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