ROBERT GORDON UNIVERSITY ABERDEEN TEF Gold

INFORMATICS INSTITUTE OF TECHNOLOGY

BSc (Hons) Artificial Intelligence and Data Science

Module: CM2601 Object Oriented Development

Individual Coursework Report

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Introduction

Software development is a dynamic field that combines creativity, analytical thinking, and technical expertise. This assignment is designed to provide practical experience in tackling a real-world problem by translating a set of requirements into a functional software solution. It emphasizes the importance of understanding the problem domain and devising a solution that meets both user and system needs.

The assignment begins with an analysis of the problem statement, identifying the core functionalities and constraints. Using the principles of system design, we are required to create UML diagrams that provide a clear representation of the system's architecture. This step ensures a structured approach to software development and lays a foundation for efficient implementation. (Sommerville, 2015)

The implementation phase challenges us to transform our designs into a working application. This process involves selecting appropriate programming techniques, adhering to coding best practices, and ensuring that the final product is robust and user-friendly. By emphasizing both design and execution, the assignment mirrors the iterative processes followed in professional software engineering projects.

Overall, this assignment serves as a comprehensive exercise in problem-solving, design, and implementation. It prepares us to approach software development with confidence and equips them with valuable skills applicable in both academic and professional settings. (Fowler, 2003)

Requirement Analysis

Use Case Diagram

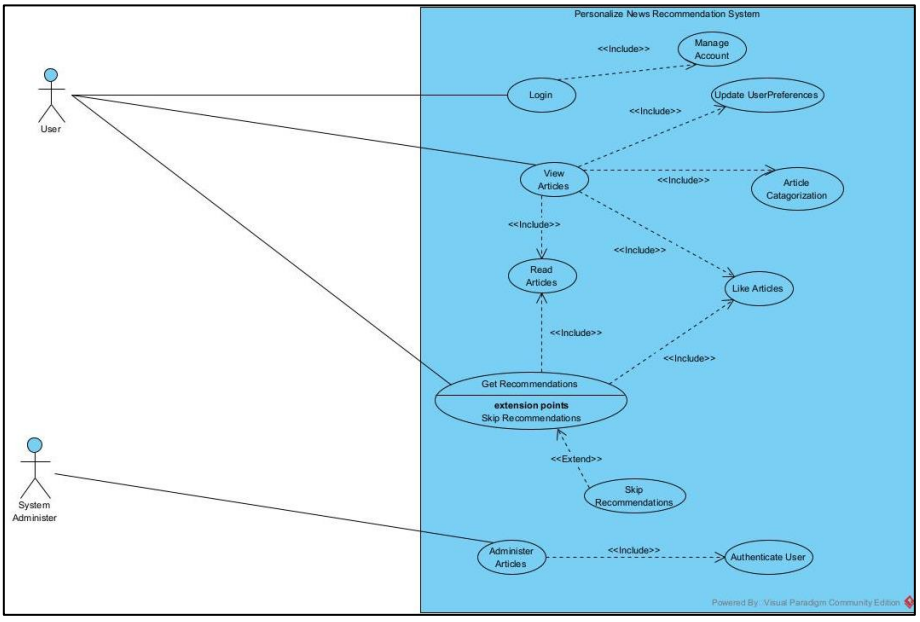


Figure 1: Use Case Diagram

Use Case Description

Use Case 1: Login

- Actor: User, System Administrator
- Description: Enables users and administrators to authenticate and access the system.
- Preconditions: The actor must have a registered account.
- Postconditions: The actor is logged into the system.
- Main Flow:
  - ❖ The actor enters their username and password.
  - ❖ The system validates the credentials.
  - ❖ If valid, access is granted.
- Alternative Flow:
  - ❖ If credentials are invalid, an error message is displayed, and the actor can retry.

(Boehm, 1988)

Use Case 2: View Articles

- Actor: User
- Description: Users can browse categorized articles in the system.
- Preconditions: The user must be logged in.
- Postconditions: Articles are displayed based on the user's preferences or categories.
- Main Flow:
  - ❖ The user selects a category or a trending tab.
  - ❖ The system fetches and displays articles from the relevant sources.

Use Case 3: Like Articles

- Actor: User
- Description: Users can rate articles based on their reading experience.
- Preconditions: The user must be logged in and have selected an article to read.
- Postconditions: The rating is recorded and stored in the system.
- Main Flow:
  - ❖ The user reads an article.
  - ❖ The user submits a like (e.g. there is a Like button to click).

(Unified Modeling Language (UML), n.d.)

Use Case 4: Get Recommendations

- Actor: User
- Description: Users receive personalized article recommendations.
- Preconditions: The user must be logged in.
- Postconditions: Recommendations are displayed on the user's homepage or a separate tab.
- Main Flow:

- ❖ The user selects the "Recommendations" option.
- ❖ The system fetches recommendations based on the user's reading history and ratings.
- ❖ Articles are displayed for the user.

Use Case 5: Manage Profile

- Actor: User
- Description: Users can update their personal information and preferences.
- Preconditions: The user must be logged in.
- Postconditions: The updated information is saved in the system.
- Main Flow:
  - ❖ The user accesses their profile page.
  - ❖ The user updates information such as name, password, or preferences.
  - ❖ The system saves the changes and confirms the update.

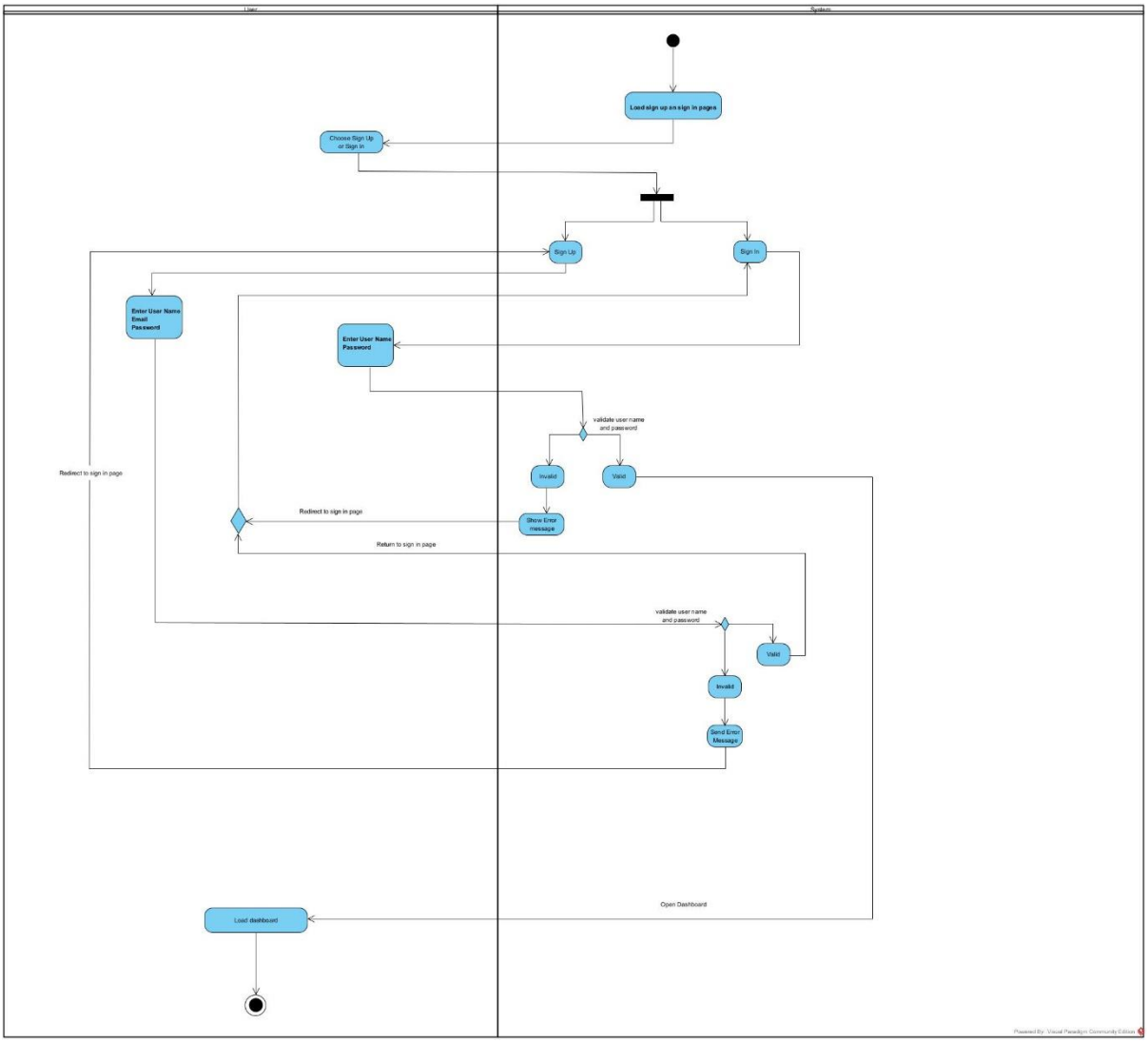
Use Case 6: Administer Articles

- Actor: System Administrator
- Description: Allows administrators to manage articles and add new sources to the system.
- Preconditions: The administrator must be logged in.
- Postconditions: The new articles or sources are added to the system.
- Main Flow:
  - ❖ The administrator selects the "Administer Articles" option.
  - ❖ The administrator uploads articles or links to new sources.
  - ❖ The system validates and stores the new content.

(Introduction to the Unified Modeling Language (UML), n.d.)

Activity Diagrams

Login



View Articles

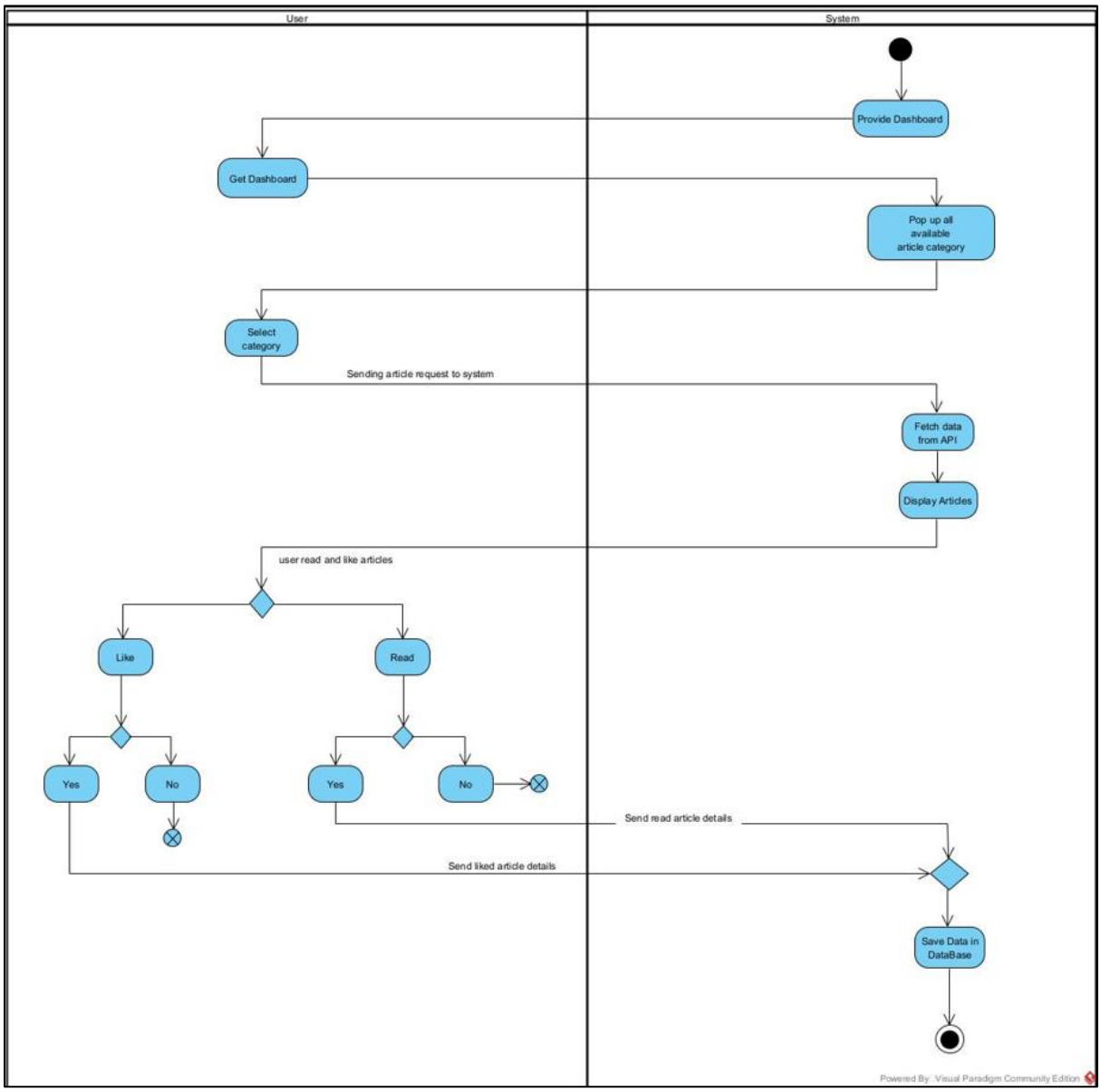


Figure 2: Article Activity Diagram

(Unified Modeling Language (UML) Specification, 2021)

Recommendation

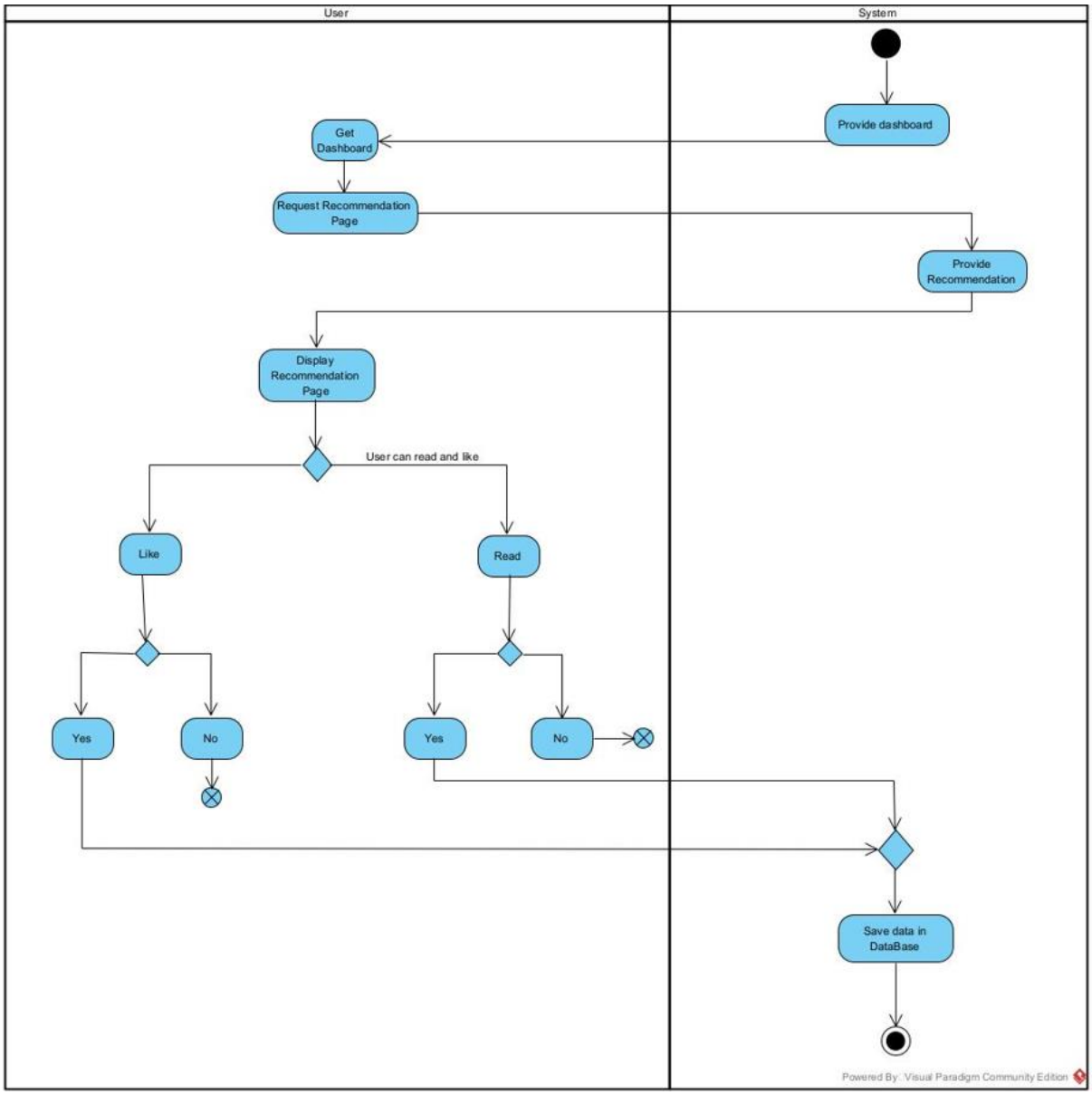


Figure 3: Recommendation Activity Diagram

Class diagram

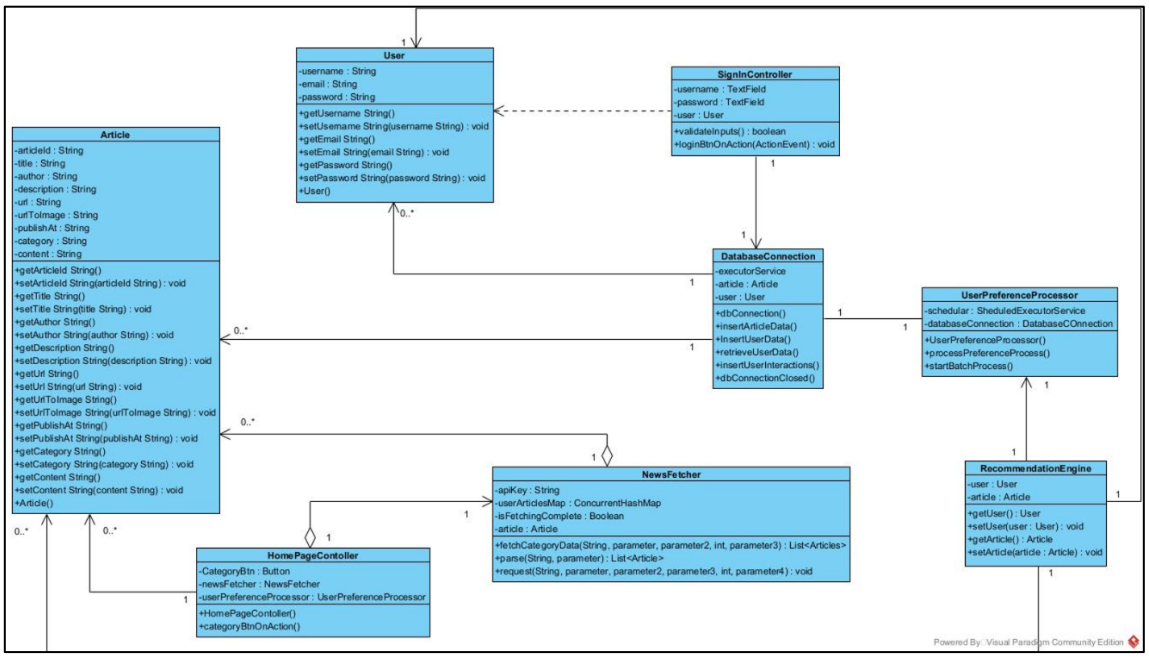


Figure 4: Single Class Diagram

Sequence Diagrams

Login

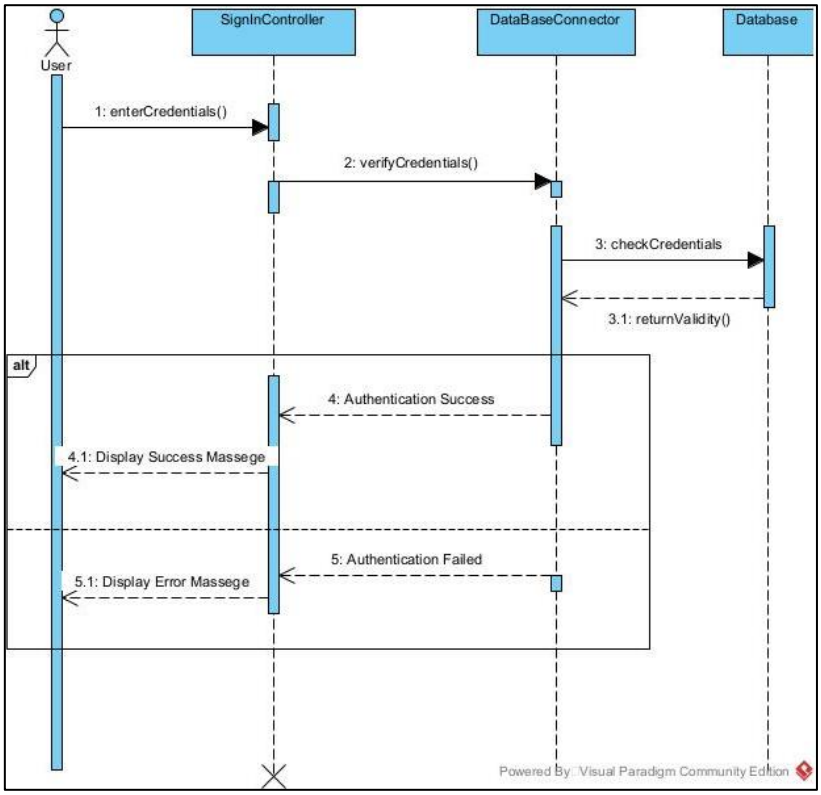


Figure 5: Login Sequence Diagram

Article Read

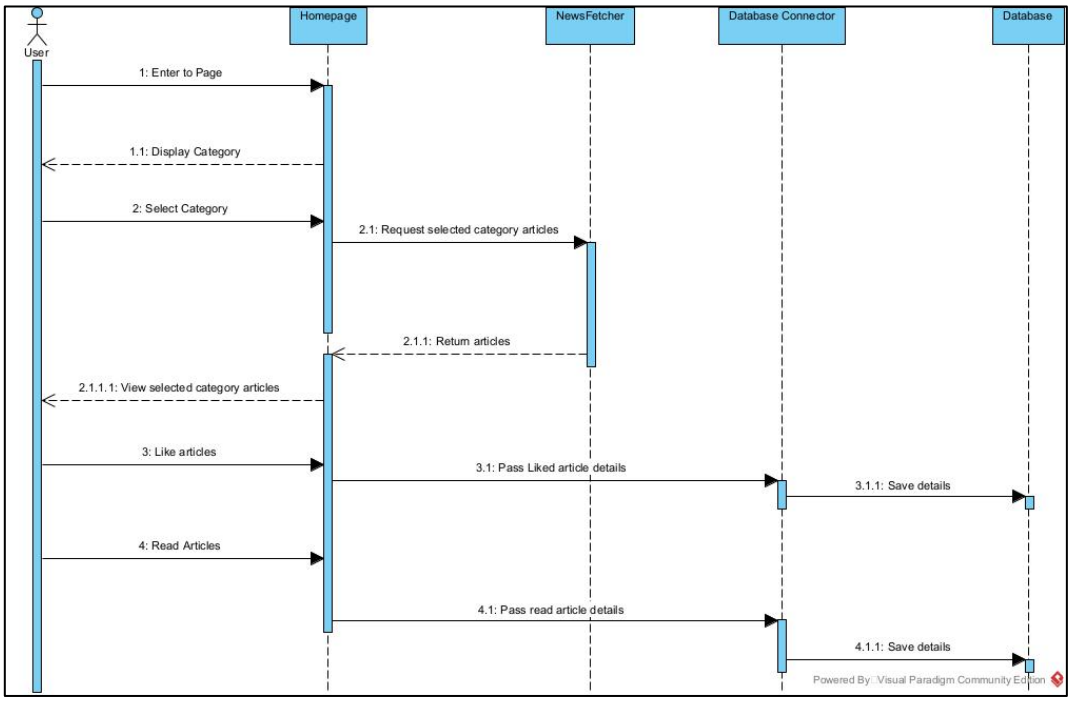


Figure 6: Article read Sequence Diagram

Admin Login

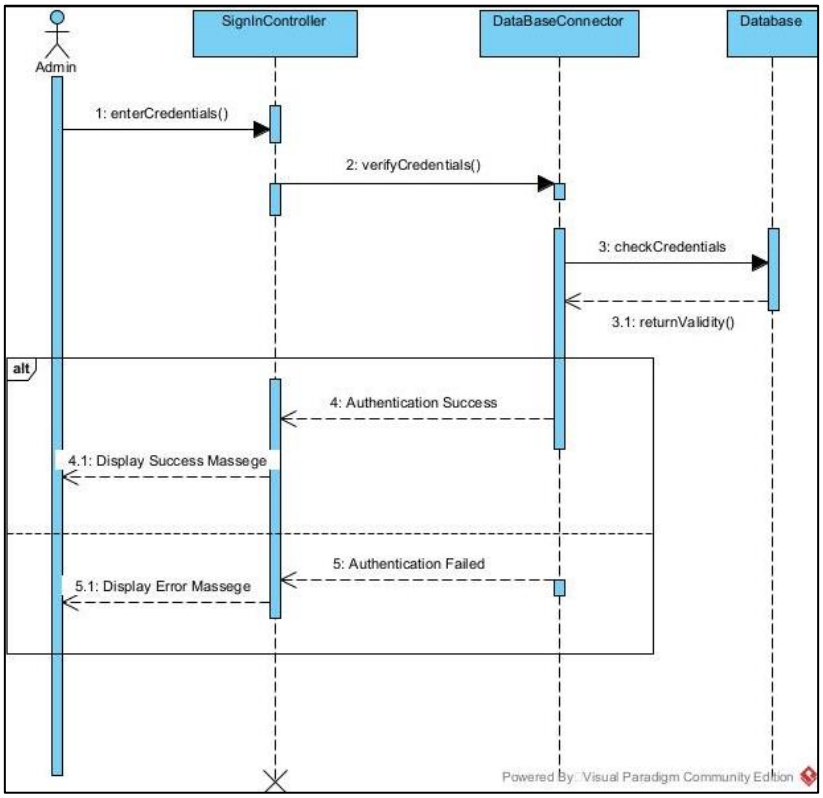


Figure 7: Admin Login Sequence Diagram

User Signup

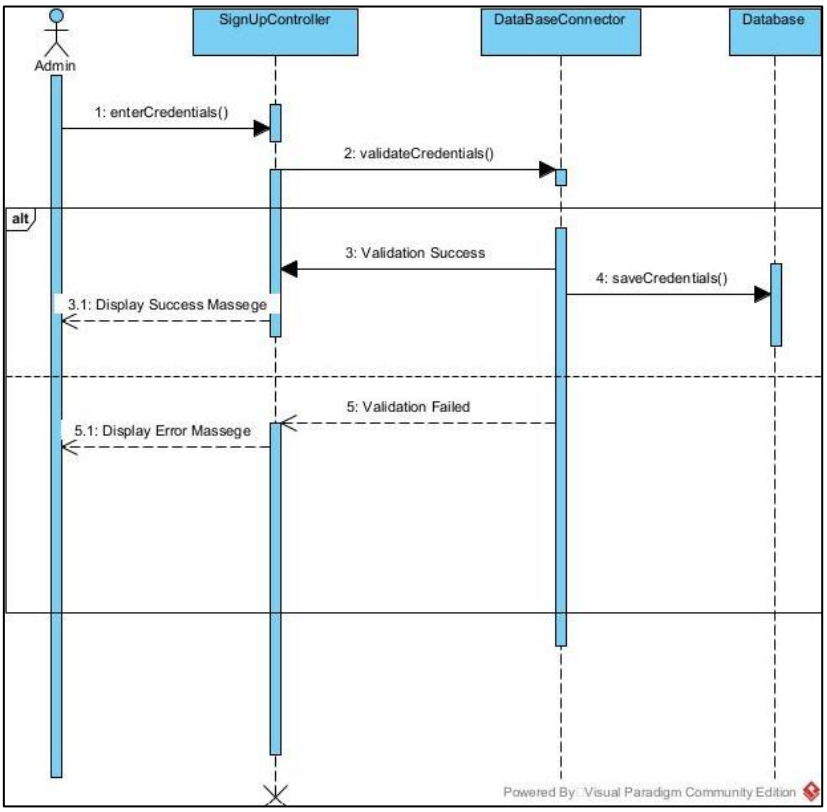


Figure 8: User Signup Sequence Diagram

Recommendation

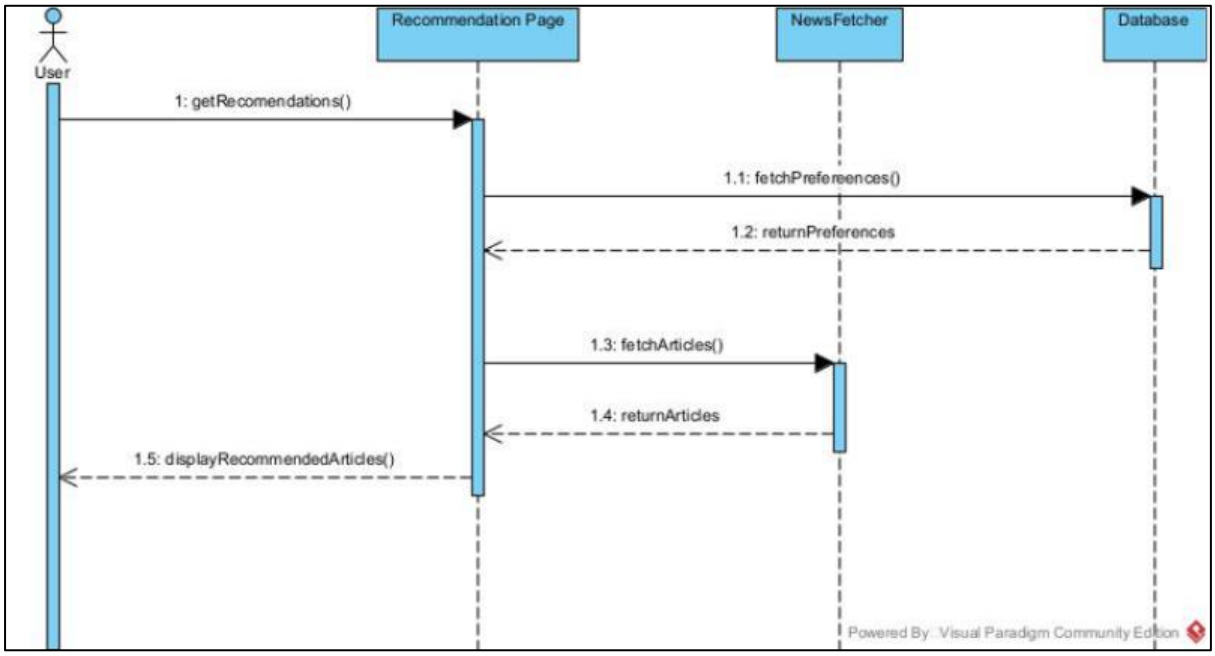


Figure 9: Recommendation Sequence Diagram

(Programming Tutorials and Resources, n.d.)

Testing and evaluation

Use Case 1: Login

- Test invalid credentials.
- Test valid credentials.
- Test account lockout after multiple failed attempts.

Use Case 2: View Articles

- Validate articles display correctly.
- Ensure articles load according to user preferences.
- Check for performance when loading many articles.

Use Case 3: Like Articles

- Verify the like button functions correctly.
- Ensure invalid inputs are handled.
- Confirm the user's like update the recommendation system.

Use Case 4: Get Recommendations

- Validate the recommendations match user preferences and history.
- Test recommendations for a new user (cold start problem).
- Verify response time under high user load.

Use Case 5: Manage Profile

- Test editing profile information.
- Verify password change functionality.
- Confirm error handling for invalid inputs.

Evaluation Metrics

1. Functionality

- Percentage of test cases passed.
- Critical bug count.

2. Performance

- System response time under normal and peak loads.
- System uptime percentage.

3. User Satisfaction

- Feedback collected during UAT.
- Average time taken to complete key actions (e.g., getting recommendations).

4. Scalability

- The number of concurrent users supported without significant performance degradation.

(Community for Developers, n.d.)

References

1. *Programming Tutorials and Resources*. (n.d.). Retrieved from W3Schools: https://www.w3schools.com/
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4. Fowler, M. (2003). *UML Distilled: A Brief Guide to the Standard Object Modeling Language (3rd ed.).* Addison-Wesley.
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6. Sommerville, I. (2015). *Software Engineering (10th ed.).* Pearson Education.
7. *Unified Modeling Language (UML)*. (n.d.). Retrieved from GeeksforGeeks: https://www.geeksforgeeks.org/
8. *Unified Modeling Language (UML) Specification.* (2021). Retrieved from Object Management Group (OMG): https://www.omg.org/spec/UML/

Appendix

Used Tool Details

Java IDE

- Name - intellij IDEA
- Version - 2024.1.1

Database

- Name – phpmyadmin
- Version – 5.2.1

Application GUIs

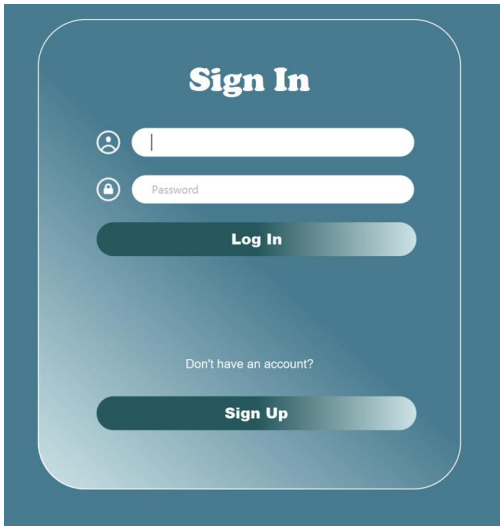

Figure 11: Sign in

Figure 10: Sign up

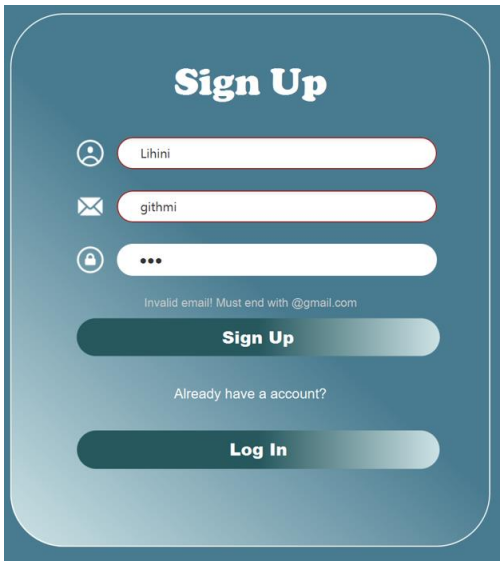

Figure 13: E-mail format Verification

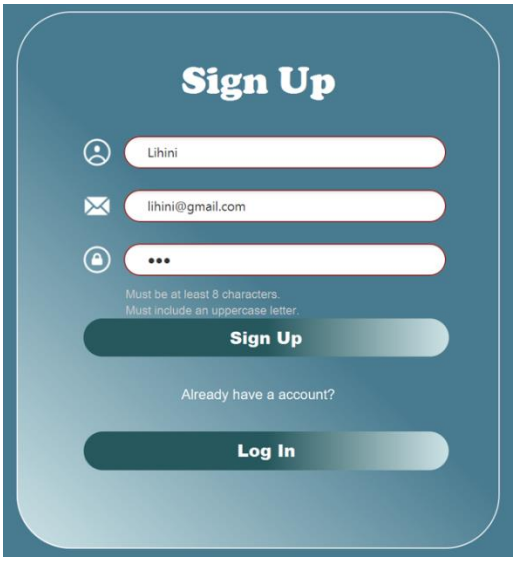

Figure 12: Password format Verification

Figure 14: Sign in exist user verification

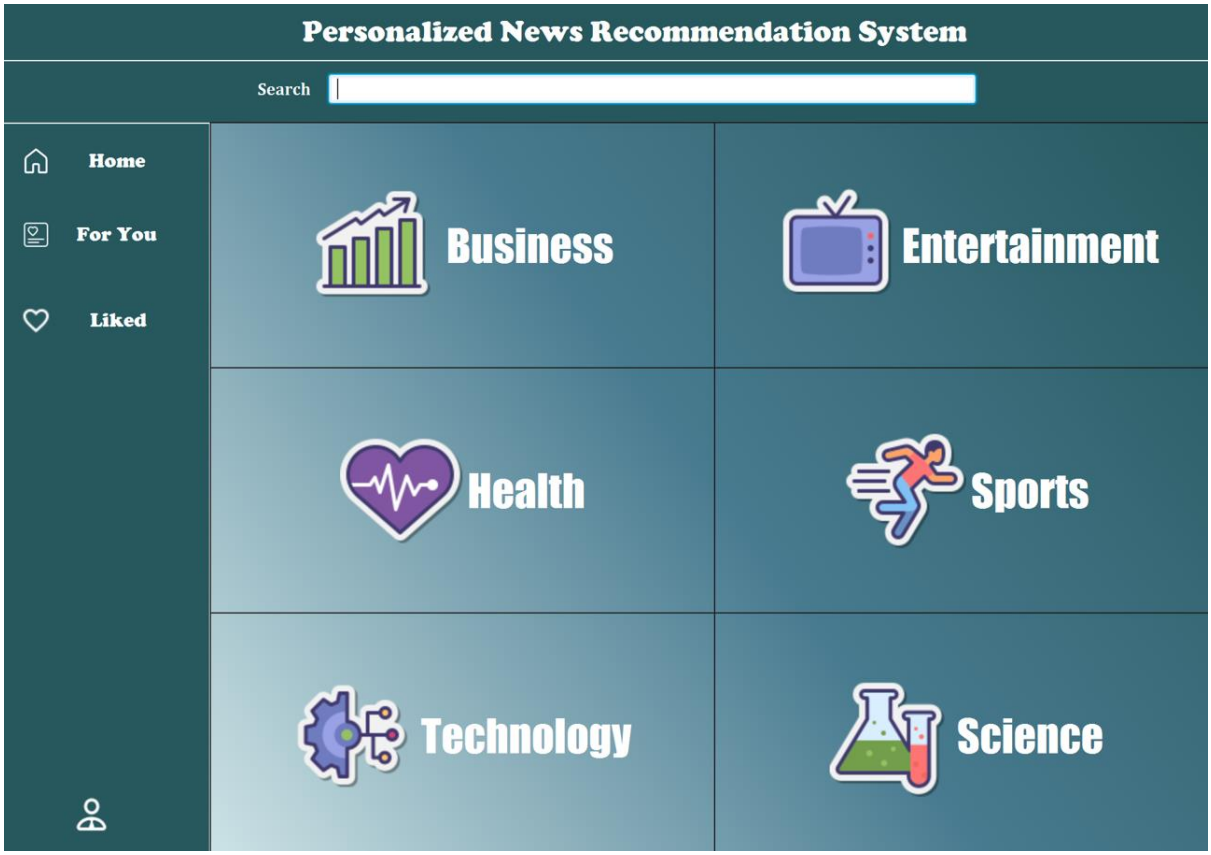

Figure 15: News Recommendation Engine in Home page

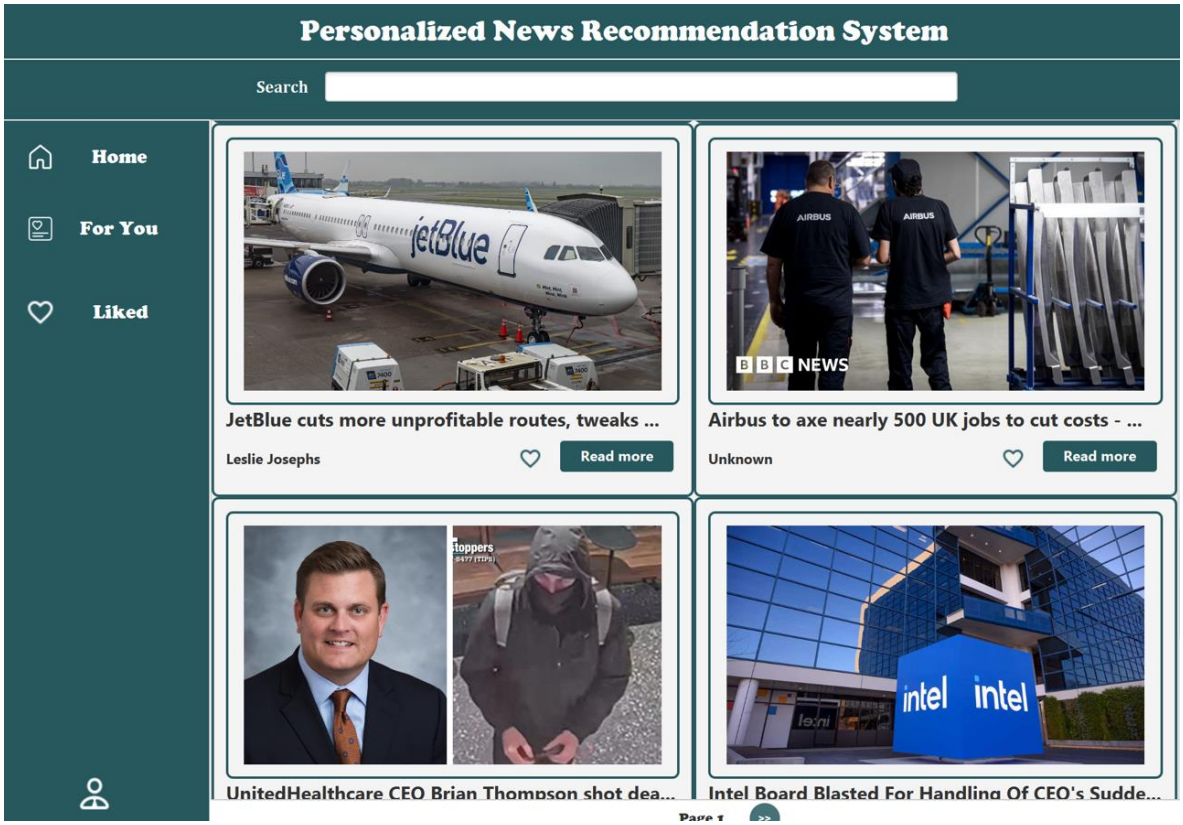

Figure 16: Categorized Articles view for one category

Figure 17: For You Page (Recommendation Engine)

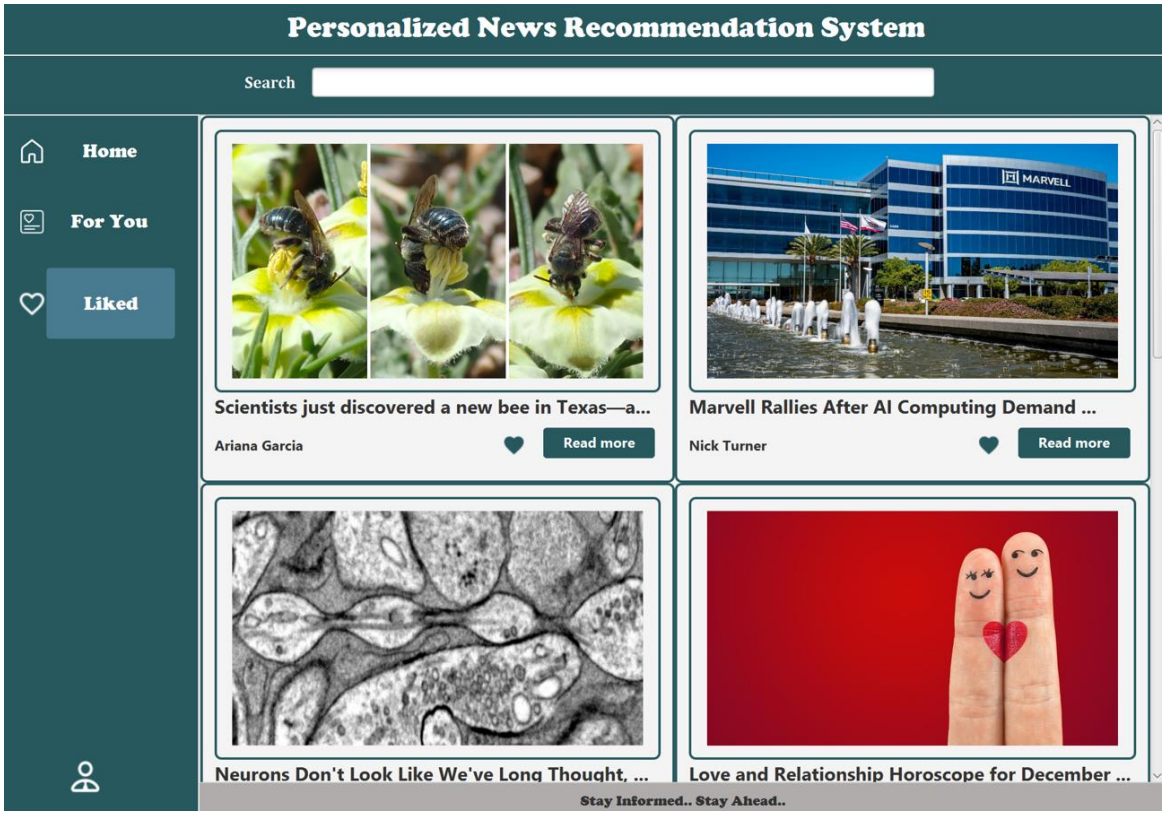

Figure 18: Liked Page

Database Table Details

Table	Action	Rows	Type	Collation	Size	Overhead
articles	Browse Structure Search Insert Empty Drop	42	InnoDB	utf8mb4_general_ci	48.0 KiB	-
preferences	Browse Structure Search Insert Empty Drop	9	InnoDB	utf8mb4_general_ci	32.0 KiB	-
users	Browse Structure Search Insert Empty Drop	6	InnoDB	utf8mb4_general_ci	48.0 KiB	-
user_interactions	Browse Structure Search Insert Empty Drop	44	InnoDB	utf8mb4_general_ci	48.0 KiB	-
4 tables	Sum	101	InnoDB	utf8mb4_general_ci	176.0 KiB	0 B

Figure 19: All Table details

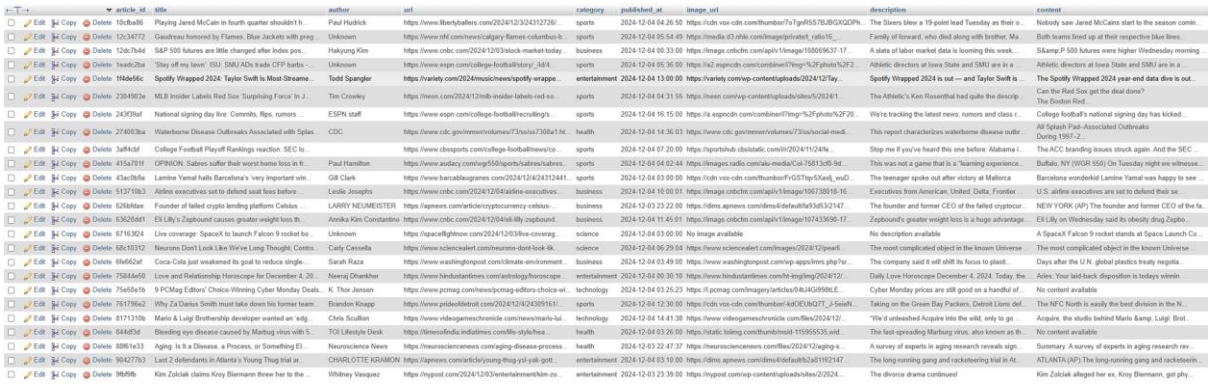

Figure 20: Article Table

	user_id	username	email	password	created_at
Edit Copy Delete	1	gimu	githmirajapakshe2020@gmail.com	123	2024-12-03 23:32:58
Edit Copy Delete	2	chamo	chamodirajapakshe@gmail.com	1234	2024-12-04 07:49:46
Edit Copy Delete	4	dinesh	dinesh@gmail.com	Dinesh@123	2024-12-04 08:41:49
Edit Copy Delete	8	dammi	dammi@gmail.com	Dammi@123	2024-12-04 09:27:22
Edit Copy Delete	9	fara	farhaan@gmail.com	Fara@123	2024-12-04 09:44:28
Edit Copy Delete	10	vinu	vinu@gmail.com	Vinu@123	2024-12-05 21:54:20

Figure 21: User Table

	interaction_id	user_id	article_id	interaction_type	timestamp
Edit Copy Delete	1	1	904277b3	read	2024-12-05 11:35:04
Edit Copy Delete	3	1	d73339a3	read	2024-12-05 11:48:51
Edit Copy Delete	6	1	88f61e33	read	2024-12-05 12:37:15
Edit Copy Delete	8	1	f080b94a	read	2024-12-05 12:42:00
Edit Copy Delete	10	1	dcb54612	read	2024-12-05 12:47:52
Edit Copy Delete	11	1	43ac0b9a	read	2024-12-05 12:51:08
Edit Copy Delete	13	1	75e50e1b	read	2024-12-05 12:56:13
Edit Copy Delete	16	1	bf589d8b	read	2024-12-05 13:00:10
Edit Copy Delete	19	1	ed6236e4	read	2024-12-05 13:06:07
Edit Copy Delete	21	1	67163f24	read	2024-12-05 13:06:21
Edit Copy Delete	23	1	b784d46f	liked	2024-12-05 13:06:35
Edit Copy Delete	26	1	e90d1bac	liked	2024-12-05 15:31:59
Edit Copy Delete	30	1	1eadc2ba	read	2024-12-05 15:43:33
Edit Copy Delete	31	1	dd254388	read	2024-12-05 15:47:49
Edit Copy Delete	32	1	68c10312	read	2024-12-05 15:59:49
Edit Copy Delete	34	1	68c10312	liked	2024-12-05 16:02:39
Edit Copy Delete	36	1	75844e50	read	2024-12-05 16:18:50
Edit Copy Delete	38	1	75844e50	liked	2024-12-05 16:19:21
Edit Copy Delete	39	1	9fbf9fb	read	2024-12-05 16:19:26
Edit Copy Delete	41	1	b784d46f	read	2024-12-05 17:45:20
Edit Copy Delete	42	2	63628dd1	read	2024-12-05 19:59:42
Edit Copy Delete	43	2	63628dd1	liked	2024-12-05 19:59:48
Edit Copy Delete	44	2	12c34772	liked	2024-12-05 20:00:25
Edit Copy Delete	45	2	10cfba86	liked	2024-12-05 20:00:33
Edit Copy Delete	46	2	415a701f	read	2024-12-05 20:00:40

Figure 22: User preference Table

←T→	preference_id	user_id	category	score
Edit Copy Delete	14	1	sports	20
Edit Copy Delete	15	1	business	40
Edit Copy Delete	16	1	entertainment	30
Edit Copy Delete	17	1	science	50
Edit Copy Delete	18	1	health	35
Edit Copy Delete	19	1	technology	10
Edit Copy Delete	32	10	business	15
Edit Copy Delete	34	10	sports	35
Edit Copy Delete	35	10	entertainment	15

Figure 23: User Interaction Table