1. Data Preparation

- **Load Datasets**:
  - `books.csv`: Contains book information such as book ID, title, author, genre, etc.
  - `users.csv`: Contains user information such as user ID and location
  - `ratings.csv`: Contains ratings given by users to books, structured as user ID, book ID, and rating.

2. Matrix Creation

- **Create User-Book Ratings Matrix**:
  - Construct a matrix R where rows represent users, columns represent books, and the cells represent ratings. Missing ratings are filled with zeros

3. Matrix Factorization

- **Decompose Ratings Matrix**:
  - Use matrix factorization techniques (Stochastic Gradient Descend (SGD), Alternating Least Squares (ALS)) to decompose matrix R into two lower-dimensional matrices:
    - User-Latent Factor Matrix U (dimension: number of users x latent factors)
    - Book-Latent Factor Matrix V (dimension: number of books x latent factors)
  - $R \approx U \cdot V^T$

4. Predicted Ratings

- **Compute Predicted Ratings**:
  - Compute the dot product of U and V^T to obtain the predicted ratings matrix R^hat = U . V^T

5. User Query

- **User A Requests Recommendations**:
  - User A logs into the system and requests book recommendations.

6. Generate Recommendations

- **Retrieve Predicted Ratings for User A**:
  - Extract the row corresponding to User A from the predicted ratings matrix R^hat. This row contains the predicted ratings for all books for User A.
- **Filter Out Already Rated Books**:
  - Exclude books that User A has already rated to avoid recommending books they are already familiar with.
- **Sort Books by Predicted Rating**:
  - Sort the remaining books by their predicted ratings in descending order.

7. Recommend Top N Books

- **Select Top N Books**:
  - Select the top N books from the sorted list to recommend to User A.

8. Display Recommendations

- **Display to User A**:
    - Present the list of top N recommended books to User A, including relevant book information (e.g., title, author, genre).