Data structures used

1. User Management Functions:

- add_user:

Data Structure Used: user structure, Hash table (array of pointers uTable[100]).

Reason: A user is created using the user structure, which stores user data like ID, name, and pointers to the browsing and purchase histories. The uTable hash table allows efficient access and storage of users using their IDs. The hash function ensures that the users are distributed across the hash table for quick retrieval.

- deleteuser:

Data Structure Used: Hash table (uTable[100]).

Reason: The user is deleted by accessing the uTable using the hash of the user ID. This provides efficient deletion (constant-time complexity, O(1)) based on the user's unique ID.

- showusers:

Data Structure Used: Hash table (uTable[100]).

Reason: The function iterates over the uTable hash table to print the information of all users stored in the system. Since it's an array-based hash table, the lookup of users is efficient, but the iteration requires checking every entry in the table.

2. Item Management Functions:

- additem:

Data Structure Used: item structure, Hash table (iTable[100]).

Reason: A new item is added using the item structure, which holds the item's ID, name, price, stock, and view count. The hash table (iTable[100]) provides efficient storage and retrieval of items using the item's ID.

- deleteitem:

Data Structure Used: Hash table (iTable[100]).

Reason: The item is deleted using its ID, which is hashed to an index in the iTable hash table. This ensures that items can be deleted efficiently based on their unique IDs.

- showitems:

Data Structure Used: Hash table (iTable[100]).

Reason: This function iterates over the iTable hash table to show all available items. It is an efficient way to store and manage items by their unique IDs, but requires iterating over all elements in the hash table to display them.

3. Browsing and Purchase History Management:

- addhistNode:

Data Structure Used: Linked list (histNode).

Reason: A linked list is used to store the browsing or purchase history of a user. Each node in the linked list contains the ID of an item. This structure allows for dynamic memory allocation and efficient insertion of new items at the head of the list. The function ensures that duplicate item IDs are not added to the history.

- browseHistory:

Data Structure Used: Linked list (histNode).

Reason: The function traverses the linked list of browsing history to display all the items that the user has previously browsed. The linked list is a natural fit for this use case, as it allows easy traversal and can dynamically grow as the user browses more items.

- purchaseHistory:

Data Structure Used: Linked list (histNode).

Reason: Similar to browseHistory, the purchase history is stored as a linked list. Each node represents an item ID that the user has purchased. Linked lists are well-suited for this task as they efficiently handle dynamic insertions.

4. Graph-Based Functions (Recommendation System):

- addEdge:

Data Structure Used: Adjacency list (array of Gnode pointers, part of Graph structure).

Reason: The graph is represented as an adjacency list, where each item or user is connected to other items or users they interacted with. This structure allows efficient management of the relationships (edges) between users and items. By using a hash table for fast access and linked nodes for each edge, it becomes efficient to represent interactions like browsing or purchasing.

- recommenditems:

Data Structure Used: Linked list (histNode), Adjacency list (Graph).

Reason: The recommendations are based on a user's browsing history (stored in a linked list). The graph helps in determining the relationships between users and items. The function

recommends items that a user has previously browsed, and it uses the adjacency list to efficiently represent these relationships.

5. Item Viewing and Purchasing Functions:

- viewitems:

Data Structure Used: Hash table (iTable[100]).

Reason: The viewitems function displays available items by iterating over the hash table (iTable[100]). It uses the hash table to store and retrieve items efficiently, and it updates the view count for each item when a user views an item.

6. General Purpose:

- hashing:

Data Structure Used: Hash table.

Reason: The hash function ensures that users and items are distributed evenly across the hash table, minimizing collisions and allowing for constant-time (O(1)) access and storage based on unique IDs.

Summary of Data Structures:

Hash table: Used for storing users (uTable) and items (iTable). It allows for quick access and management based on unique IDs (user ID, item ID).

Linked list: Used for storing the browsing and purchase history (histNode). It allows for dynamic addition and traversal of items that the user has interacted with.

Graph (adjacency list): Used to represent interactions between users and items. It models relationships (edges) efficiently, helping in recommendation generation and tracking user-item interactions.

Each data structure is chosen based on the need for efficient access, dynamic growth, and the relationships between the entities being managed.

OUTPUT

```
rtk5@penguin:~/PES/DSA-sem-3/JAckfruit prob (hackathon)/jack$ gcc jack.c
rtk5@penguin:~/PES/DSA-sem-3/JAckfruit prob (hackathon)/jack$ ./a.out

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 1

user Management:
1. Add user
2. Delete user
3. Show users
Enter your choice: 1
Enter user ID: u1
Enter user Name: sam
User added successfully.

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 1

user Management:
1. Add user
2. Delete user
3. Show users
Enter your choice: 1
Enter user ID: u2
Enter user Name: john
User added successfully.

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
```

```

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 1

user Management:
1. Add user
2. Delete user
3. Show users
Enter your choice: 3

All users:
User ID: u1, Name: sam
User ID: u2, Name: john

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 2

item Management:
1. Add item
2. Delete item
3. Show items
Enter your choice: 1
Enter item ID: p1
Enter item Name: laptop
Enter item Price: 200
Enter item Stock: 3
Item added successfully.

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
```

```
==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 2

item Management:
1. Add item
2. Delete item
3. Show items
Enter your choice: 1
Enter item ID: p2
Enter item Name: phone
Enter item Price: 50
Enter item Stock: 3
Item added successfully.

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 3

Available items:
Item ID: p1, Name: laptop, Price: $200.00, Stock: 3, Views: 0
Item ID: p2, Name: phone, Price: $50.00, Stock: 3, Views: 0

Enter item ID to view details (or type 'exit' to return): p1
Item Details:
ID: p1, Name: laptop, Price: $200.00, Stock: 3

Enter your user ID to log this view: u1

Do you want to buy this item? (yes/no): yes
Purchase successful!

==== Main Menu ====
1. User Management
```

```
==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 2

item Management:
1. Add item
2. Delete item
3. Show items
Enter your choice: 3

All items:
Item ID: p1, Name: laptop, Price: $200.00, Stock: 2, Views: 1
Item ID: p2, Name: phone, Price: $50.00, Stock: 3, Views: 0

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 3

Available items:
Item ID: p1, Name: laptop, Price: $200.00, Stock: 2, Views: 1
Item ID: p2, Name: phone, Price: $50.00, Stock: 3, Views: 0

Enter item ID to view details (or type 'exit' to return): p1
Item Details:
ID: p1, Name: laptop, Price: $200.00, Stock: 2

Enter your user ID to log this view: u2

Do you want to buy this item? (yes/no): yes
Purchase successful!

==== Main Menu ====
1. User Management
```

```
==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 3

Available items:
Item ID: p1, Name: laptop, Price: $200.00, Stock: 1, Views: 2
Item ID: p2, Name: phone, Price: $50.00, Stock: 3, Views: 0

Enter item ID to view details (or type 'exit' to return): p2
Item Details:
ID: p2, Name: phone, Price: $50.00, Stock: 3

Enter your user ID to log this view: u2

Do you want to buy this item? (yes/no): yes
Purchase successful!

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 3

Available items:
Item ID: p1, Name: laptop, Price: $200.00, Stock: 1, Views: 2
Item ID: p2, Name: phone, Price: $50.00, Stock: 2, Views: 1

Enter item ID to view details (or type 'exit' to return): exit

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
```

```
==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 4
Enter user ID to view browsing history: 1
User not found!

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 1

user Management:
1. Add user
2. Delete user
3. Show users
Enter your choice: 3

All users:
User ID: u1, Name: sam
User ID: u2, Name: john

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 3

Available items:
Item ID: p1, Name: laptop, Price: $200.00, Stock: 1, Views: 2
Item ID: p2, Name: phone, Price: $50.00, Stock: 2, Views: 1
```

```
Available items:
Item ID: p1, Name: laptop, Price: $200.00, Stock: 1, Views: 2
Item ID: p2, Name: phone, Price: $50.00, Stock: 2, Views: 1

Enter item ID to view details (or type 'exit' to return): p2
Item Details:
ID: p2, Name: phone, Price: $50.00, Stock: 2

Enter your user ID to log this view: u1

Do you want to buy this item? (yes/no): no

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 4
Enter user ID to view browsing history: u1
Browsing History for sam:
p2 -> p1 -> END

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 5
Enter user ID to view purchase history: u2
Purchase History for john:
p2 -> p1 -> END

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
```

```
7. Exit
Enter your choice: 4
Enter user ID to view browsing history: u1
Browsing History for sam:
p2 -> p1 -> END

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 5
Enter user ID to view purchase history: u2
Purchase History for john:
p2 -> p1 -> END

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 6

Enter user ID for recommendations: u1
Recommendations:
Item: p2 | Name: phone
Item: p1 | Name: laptop
End of recommendations.

==== Main Menu ====
1. User Management
2. Item Management
3. Purchase items
4. View Browsing History
5. View Purchase History
6. Recommend items
7. Exit
Enter your choice: 7
Exiting...
rtk5@penguin:~/PES/DSA-sem-3/JAckfruit prob (hackathon)/jack$
```