**How I tested various class:**

1. **TreeMultiMap class:**

I used this test case:

TreeMultimap<std::string, int> tmm;

tmm.insert("carey", 5);

tmm.insert("carey", 6);

tmm.insert("carey", 7);

tmm.insert("david", 25);

tmm.insert("david", 425);

TreeMultimap<double, std::string> tmm2;

tmm2.insert(“1.1”, “carey);

tmm2.insert(“1.5”, “bergberg”);

tmm2.insert(“2.1”, “nachensmall”);

**`I searched with key “carey” and “1.5” for each tree to see if the information is properly recorded. And test if the template works well by constructing two tree of different valuetype.**

1. **User class:**

I used the test case:

Carey Nachenberg

climberkip@gmail.com

2

ID00001

ID00003

**I inserted this user to User class and asked it to return the user’s name, email and watch history to see if all information was properly recorded.**

1. **UserDatabase class:**

I used the test case:

Carey Nachenberg

climberkip@gmail.com

2

ID00001

ID00003

Small Nachenberg

smallnachen@gmail.com

2

ID00002

ID00004

**It’s a database of two users, I asked it to return all information of the two users to check if each user is add to the TreeMultiMap. Also I searched the user with email:** [Climberkip@gmail.com](mailto:Climberkip@gmail.com), **which is supposed to be a wrong email because of the “C” in upper case, to check if the database is case sensitive.**

1. **Movie class:**

I used the test case:

ID00001

Back to The Future

1985

Robert Zemeckis

Michael J. Fox,Christopher Lloyd,Lea Thompson,Crispin Glover

Action,Adventure,Sci-Fi

4.25

**I inserted this movie to Movie class and asked it to return the movie’s title, ID, release year, directors, actors, genres, and rating to see if all information was properly recorded.**

1. **MovieDatabase class:**

I used the test case:

ID00001

Back to The Future

1985

Robert Zemeckis

Michael J. Fox,Christopher Lloyd,Lea Thompson,Crispin Glover

Action,Adventure,Sci-Fi

4.25

ID00002

Rocky Horror Picture Show

1975

Jim Sharman

Tim Curry,Richard O'Brien,Susan Sarandon,Meat Loaf

Horror,Comedy

3.7

ID00003

The Matrix

1999

Andy Wachowski,Larry Wachowski

Laurence Fishburne,Keanu Reeves,Hugo Weaving,Carrie-Anne Moss

Action,Sci-Fi,Thriller

4.15952

ID00004

The Matrix Reloaded

2003

Andy Wachowski,Larry Wachowski

Keanu Reeves,Laurence Fishburne,Carrie-Anne Moss,Hugo Weaving

Action,Adventure,Sci-Fi,Thriller,IMAX

3.36812

ID00005

Collider

2018

Justin Lewis

Christine Mascolo,Jude Moran,Conner Greenhalgh,Heath C. Heine

Sci-Fi

3

ID00006

The Psychotronic Man

1980

Jack M. Sell

Peter Spelson,Chris Carbis,Curt Colbert,Robin Newton

Horror,Sci-Fi

2

ID00007

Alien Outlaw

1985

Phil Smoot

Stephen Winegard,Kimberly Mauldin,Stuart Watson,Sunset Carson,Kari Anderson

Comedy,Horror,Mystery,Sci-Fi,Western

3

ID00008

Running with the Devil

2019

Jason Cabell

Nicolas Cage,Leslie Bibb,Clifton Collins Jr.,Barry Pepper,Laurence Fishburne

Crime,Drama,Thriller,Adventure

2.93182

**It’s a database of eeight movies, I asked it to return information of the movie *Back to the future* by searching for it’s ID, director, actors, and genre, to see if all functions work well and all information properly recorded. Also, I searched the movie with ID:** id00003, andy Wachowski, Laurence FishBURNE, and ACTION. **All these keys are to check if the database is case insensitive.**

1. **Recommender class:**

I inserted the test case with UserDatabase and MovieDatabase above. I asked the class to return 10 recommendations for [climberkip@gmail.com](mailto:climberkip@gmail.com), who watched ID00001 and ID00003. The class returned a vector of 5 movies whose compatibility score ranked in descendent order.

1. The Matrix Reloaded (2003)

Rating: 3.36812

Compatibility Score: 166

2. Running with the Devil (2019)

Rating: 2.93182

Compatibility Score: 32

3. Alien Outlaw (1985)

Rating: 3

Compatibility Score: 2

4. Collider (2018)

Rating: 3

Compatibility Score: 2

5. The Psychotronic Man (1980)

Rating: 2

Compatibility Score: 2

Noticing *Alien Outlaw, Collider, and The Psychotronic Man* have the same score, this test case all tested if the class can order based on rating and title’s alphabetical order. Also I searched email [CCCberkip@gmail.com](mailto:CCCberkip@gmail.com) and counting\_num “0” to check if the class can return empty vector if it encounters invalid email or number.