The dot product of the two vectors is then calculated using the above-mentioned formula. There are 7 attributes involved in the similarity calculation, so taking n = 7, the formula can be re-written with consideration of the attributes as:

If the 7 attributes of is named as , and and that of is named as , and then the similarity score is computed as:

### Phase 2: Predicted rating generation using weighted average

The second phase is the implementation of the predicted rating calculation to find which charging station is to be recommended. The system calculates the weighted average using the method as mentioned in [section 4.2.4](#_Weighted_Average) of this document.

Here, is the weight value, is the item value and is the weight obtained after the computation. For this system, the weight is the similarity score between the charging stations. The item value is the rating provided to the charging station by the user. So, if we consider as the predicted rating of charging station for user , as the similarity score between the charging station and , and as the rating provided by user to charging station then we can rewrite the formula as:

## Testing

Testing is the process subjecting the system to various conditions, scenarios, or constraints so as to find whether the system performs correctly and desirably. Testing is performed parallelly to coding. If any bugs or errors are found during the testing phase, it is fixed via editing the code or re-coding.

Validation ensures that the software satisfies the user requirements. If the software matches the user requirements, it is said to be validated.

Verification makes sure that the system is developed following the proper specifications and methodologies. If the software matches the development criteria it is said o be verified.

This system was subject to various scenarios and the outcome was noted. The system was tested using test cases which have been documented as:

Table .2: Test case for signup

|  |  |
| --- | --- |
| **Test Case ID** | TC-1 |
| **Test Scenario** | Register new user |
| **Actions** | 1. Open Register page 2. Input the name, email, and password. 3. Click “Register” button. |
| **Input** | Name: Ram Dhami  Email: ramdhami@gmail.com  Password: 23morang@33  Confirm password: 23morang@33 |
| **Expected Results** | * Redirected to recommendations page. * Ram Dhami is displayed on top right of screen. |
| **Observed Results** | As expected |
| **Assertation** | Pass |

Table .3: Test case for login

|  |  |
| --- | --- |
| **Test Case ID** | TC-2 |
| **Test Scenario** | Login existing user |
| **Actions** | 1. Open Login page 2. Input the email and password. 3. Click “Login” button. |
| **Input** | Email: ramdhami@gmail.com  Password: 23morang@33 |
| **Expected Results** | * Redirected to recommendations page. * Ram Dhami is displayed on top right of screen. |
| **Observed Results** | As expected |
| **Assertation** | Pass |

Table .4: Test case for addition of rating with valid data

|  |  |
| --- | --- |
| **Test Case ID** | TC-3 |
| **Test Scenario** | Addition of rating using valid data. |
| **Actions** | 1. Open rate page. 2. Input the location, the charging station, and rating. 3. Press “Add Rating” button. |
| **Input** | Province: Bagmati  District: Kathmandu  Metropolitan: Kathmandu  Ward: 22  Charging Station: Jagat Charging Station  Rating: 4 |
| **Expected Results** | * Success message is displayed. * “ratings” table is updated. |
| **Observed Results** | As expected |
| **Assertation** | Pass |

Table .5: Test case for addition of charging station with valid data

|  |  |
| --- | --- |
| **Test Case ID** | TC-4 |
| **Test Scenario** | Addition of charging station with valid data. |
| **Actions** | 1. Open Add Charging Station page. 2. Input the locations and the charging station details. 3. Press “Add Charging Station” |
| **Input** | Name: Shiva Shakti Charging Station  Province: Bagmati  District: Kathmandu  Metropolitan: Kathmandu  Ward: 30  Fast Charging AC Ports: 2  Fast Charging DC Ports: 3  Regular AC Ports: 4  Regular DC Ports: 4  Nearest Restaurant: 312  Nearest Shopping Mall: 569  Nearest Cinema Hall: 452 |
| **Expected Results** | * Success message is displayed * “charging\_stations” table has a new entry with the columns having the values as inputted.s * Redirect to index page. |
| **Observed Results** | As expected |
| **Assertation** | Pass |

Table .6: Test case for addition of charging station with invalid data

|  |  |
| --- | --- |
| **Test Case ID** | TC-5 |
| **Test Scenario** | Addition of charging station using invalid data. |
| **Actions** | 1. Open Add Charging Station page. 2. Input the locations and the charging station details. 3. Press “Add Charging Station” button. |
| **Input** | Name: Jagat Charging Station  Province: Bagmati  District: Kathmandu  Metropolitan: Kathmandu  Ward: 22  Fast Charging AC Ports: 2  Fast Charging DC Ports: 3  Regular AC Ports: 4  Regular DC Ports: 4  Nearest Restaurant: 312  Nearest Shopping Mall: 569  Nearest Cinema Hall: -1 |
| **Expected Results** | * System does not allow the invalid data and error message is displayed |
| **Observed Results** | As expected |
| **Assertation** | Pass |

Table .7: Test case for getting recommendation without ward

|  |  |
| --- | --- |
| **Test Case ID** | TC-6 |
| **Test Scenario** | Get recommendation of charging station without inputting ward. |
| **Actions** | 1. Open Recommendations page. 2. Input the location and check the Exclude Ward checkbox. 3. Press “Get recommendation” button. |
| **Input** | Province: Bagmati  District: Kathmandu  Metropolitan: Kathmandu |
| **Expected Results** | * Top 3 charging stations displayed. |
| **Observed Results** | As expected |
| **Assertation** | Pass |

Table .8: Test case for getting recommendation with ward

|  |  |
| --- | --- |
| **Test Case ID** | TC-7 |
| **Test Scenario** | Get recommendation of charging station. |
| **Actions** | 1. Open Recommendations page. 2. Uncheck the Exclude Ward checkbox. 3. Input the location. 4. Press “Get recommendation” button. |
| **Input** | Province: Bagmati  District: Kathmandu  Metropolitan: Kathmandu  Ward: 3 |
| **Expected Results** | * Top 3 charging stations displayed. |
| **Observed Results** | As expected |
| **Assertation** | Pass |