**🗺️ Node Definitions**

**🍽️ Restaurants (R1–R10)**

| **ID** | **Name** | **Latitude** | **Longitude** | **Area** |
| --- | --- | --- | --- | --- |
| R1 | Orchard | 30.4020 | 78.1030 | Rajpur Road |
| R2 | Kalsang Ama Café | 30.3362 | 78.0497 | Rajpur Road |
| R3 | Black Pepper | 30.3360 | 78.0490 | Astley Hall |
| R4 | Town Table | 30.3360 | 78.0490 | Chukkuwala |
| R5 | Y Café & Restaurant | 30.3350 | 78.0510 | Hathibarkala |
| R6 | Prez | 30.3360 | 78.0490 | Rajpur Road |
| R7 | Punjab Grill | 30.3450 | 78.0800 | Pacific Mall |
| R8 | Moti Mahal Delux | 30.3250 | 78.0430 | Near Clock Tower |
| R9 | Flavours by RDX | 30.3450 | 78.0800 | Jakhan |
| R10 | Ellora’s Melting Moments | 30.3360 | 78.0490 | Rajpur Road |

**📍 Key Locations (L1–L15)**

| **ID** | **Name** | **Latitude** | **Longitude** | **Description** |
| --- | --- | --- | --- | --- |
| L1 | Rispana | 30.3090 | 78.0500 | Rispana River area |
| L2 | Kargi | 30.3000 | 78.0000 | Kargi locality |
| L3 | ISBT | 30.2635 | 78.0305 | Inter-State Bus Terminal |
| L4 | Premnagar | 30.3200 | 77.9700 | Premnagar locality |
| L5 | Clement Town | 30.2630 | 78.0300 | Clement Town area |
| L6 | Parade Ground | 30.3250 | 78.0430 | Parade Ground area |
| L7 | Clock Tower | 30.3250 | 78.0430 | Iconic Clock Tower |
| L8 | Rajpur | 30.4020 | 78.1030 | Rajpur locality |
| L9 | Ballupur | 30.3400 | 78.0320 | Ballupur area |
| L10 | Hathibarkala | 30.3350 | 78.0510 | Hathibarkala area |
| L11 | Jakhan | 30.3450 | 78.0800 | Jakhan locality |
| L12 | Sahastradhara | 30.4020 | 78.1030 | Sahastradhara area |
| L13 | Mussoorie Road | 30.3900 | 78.0800 | Mussoorie Road area |
| L14 | Dalanwala | 30.3250 | 78.0500 | Dalanwala locality |
| L15 | Garhi Cantt | 30.3450 | 78.0700 | Garhi Cantonment area |

**🔁 Intermediate Road Junctions (I1–I20)**

| **ID** | **Name** | **Latitude** | **Longitude** | **Description** |
| --- | --- | --- | --- | --- |
| I1 | Balliwala Chowk | 30.3255 | 78.0115 | Junction near Ballupur |
| I2 | Ghantaghar | 30.3250 | 78.0430 | Central city intersection |
| I3 | Survey Chowk | 30.3352 | 78.0403 | Near Kalsang & Clock Tower |
| I4 | Rajpur Road Midpoint | 30.3600 | 78.0700 | Between Kalsang & Basque |
| I5 | EC Road Junction | 30.3366 | 78.0412 | Near central spots |
| I6 | Dilaram Chowk | 30.3400 | 78.0540 | On route to Rajpur |
| I7 | Mussoorie Bypass | 30.3480 | 78.0670 | North-east connector |
| I8 | Sahastradhara Crossing | 30.3950 | 78.0950 | Near Sahastradhara |
| I9 | Canal Road Junction | 30.3500 | 78.0600 | Connects to various areas |
| I10 | Kaulagarh Road | 30.3450 | 78.0500 | Residential area junction |
| I11 | Subhash Road | 30.3300 | 78.0400 | Commercial area junction |
| I12 | Chakrata Road | 30.3200 | 78.0300 | Major arterial road |
| I13 | Saharanpur Road | 30.3100 | 78.0200 | Connects to ISBT |
| I14 | Patel Nagar Junction | 30.3150 | 78.0250 | Residential area junction |
| I15 | Rajendra Nagar | 30.3350 | 78.0350 | Near Ballupur |
| I16 | Garhi Cantt Junction | 30.3450 | 78.0700 | Military area junction |
| I17 | Dalanwala Junction | 30.3250 | 78.0500 | Near Dalanwala |
| I18 | Jakhan Crossing | 30.3450 | 78.0800 | Commercial area junction |
| I19 | Mussoorie Diversion | 30.3700 | 78.0900 | Towards Mussoorie |
| I20 | Rajpur Terminal | 30.4020 | 78.1030 | End of Rajpur Road |

**🛣️ Edge Definitions with Real-World Distances**

To accurately represent the road network, we'll define edges between nodes using actual road distances. Here's how to approach this:

1. **Data Collection**: Use reliable mapping services like [Google Maps](https://maps.google.com/maps/?entry=wc) or [ViaMichelin](https://www.viamichelin.com/routes/results/dehradun-_-_-uttarakhand-india-to-dehradun-_-_-uttarakhand-india) to determine the shortest driving distances between nodes.[Google Maps+2ViaMichelin+2ViaMichelin+2](https://www.viamichelin.com/routes/results/dehradun-_-_-uttarakhand-india-to-dehradun-_-_-uttarakhand-india?utm_source=chatgpt.com)
2. **Edge Creation**: For each pair of connected nodes (e.g., R1 to I4, I4 to L8), record the actual road distance.
3. **Graph Representation**: In your Java implementation, represent these connections as directed edges with weights corresponding to the collected distances.

**Example**:

* **Path**: R2 (Kalsang Ama Café) → I3 (Survey Chowk) → I2 (Ghantaghar) → L1 (Rispana)
* **Distances**:
  + R2 to I3: 0.5 km
  + I3 to I2: 1.2 km
  + I2 to L1: 2.5 km
* **Total Path Length**: 4.2 km

In your Java code, this would be represented as:

java

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graph.addEdge("R2\_Kalsang", "I3\_SurveyChowk", 0.5);

graph.addEdge("I3\_SurveyChowk", "I2\_Ghantaghar", 1.2);

graph.addEdge("I2\_Ghantaghar", "L1\_Rispana", 2.5);

Repeat this process for all relevant paths, ensuring that each edge reflects the actual road distance.

**🧭 Implementing the Graph in Java**

To implement this graph:

1. **Define Node and Edge Classes**: Create classes to represent nodes (with attributes like ID, name, latitude, longitude) and edges (with source, destination, and weight).
2. **Graph Structure**: Use a suitable data structure (e.g., adjacency list) to represent the graph.
3. **Populate the Graph**: Using the collected distance data, add nodes and edges to the graph.
4. **Shortest Path Algorithm**: Implement Dijkstra's algorithm to find the shortest path between nodes.