**Route Optimization Model (with React Native Maps)**

**Model Name:**

**Reinforcement Learning-based Route Optimization with React Native Maps Integration (Q-Learning)**

**1. Problem Definition:**

* **Objective**: Optimize walking routes for users in the app.
* **Environment**: A **map** represented by **GPS coordinates** and **possible paths** (via **React Native Maps**).
* **Actions**: The agent can make decisions to move in different directions on the map (up, down, left, right), or choose routes between available points.
* **Rewards**:
  + Positive rewards for **shorter, faster paths**.
  + Negative rewards for **longer, inefficient paths**.

**2. Data Requirements:**

* **State Space**: The agent's **current GPS location** or **map position**.
* **Action Space**: Possible **movements** (up, down, left, right) or **path choices**.
* **Reward System**:
  + Positive reward for efficient paths (shortest distance, fastest walking time).
  + Negative reward for taking **longer routes** or **paths with obstacles** (e.g., traffic).
* **Environment Setup**:
  + **React Native Maps** will be used for rendering the environment (map with routes).
  + Routes can be represented as **nodes/edges** (e.g., **streets, pathways**) within the map.
  + **Optional data**: Elevation and terrain data (optional, but useful for walking routes).

**3. Key Components:**

1. **Q-Learning Algorithm**:
   * The agent will use a **Q-table** to store the **state-action values**.
   * **Epsilon-greedy policy** to decide between exploring new routes and exploiting the known best routes.
   * Update Q-values based on **rewards** for each route taken.
2. **Training Process**:
   * The agent will start at a **random position** on the map and attempt to find the **optimal path** based on rewards and penalties.
   * The training involves **multiple episodes** where the agent learns to optimize the walking route based on feedback.
3. **Route Evaluation**:
   * After training, the agent will use its learned **Q-values** to evaluate and choose the best walking route from a starting point to a destination.