Team Katorthotis

Theme: Deep Tech/Machine Learning
Problem Statement: Route Optimization and Visualization for Sales Vehicles

TEAM KATORTHOTIS| MARCH 2020

Presentation Highlights

Problem Statement

The Team

Project Description

Expected Outcome

Features

Methodologies

Conclusion

GitHub Link

Problem Statement

ROUTE OPTIMIZATION AND VISUALIZATION FOR SALES VEHICLES

- Optimization Mode: To maximize the total potential sales delivered with respect to the input parameters aiming at minimum cost.
- Recommendation Mode: To recommend the optimum option for each input parameter to cover maximum percentage of potential sales at best cost
- Visualization: Displaying the input parameters in image format for better clarity and visual description of the parameters.

The Team

AASTHA BHARATBHAI MERJA

ABIVISHAQ BALASUBRAMANIAN

Project Description

Our approach to this problem statement includes three parts:

- Optimization: This is further divided into four stages distribution and delivery point mapping, vehicle and delivery point mapping, vehicle delivery sequence and vehicle path planning. For first two stages hard coding through python was adopted and for last two stages Reinforcement learning has been applied.
- Recommendation: K-means clustering has been used for recommending the optimized distribution points.
- Visualization: A simple python code for visualizing the path of the vehicle is implemented. This code is helpful to understand the working of the RL agent. The RL training code logs all the actions of the agent. Each episode is stored as an individual text file. By specifying the text file in the visualization code that particular episodes actions would be shown.

Expected Outcome

Considering three major sales transport application of food delivery, ride-hailing or goods transport our project aims to escalating the potential sales per day at budget.

Our project would result in providing an analyzed path connecting the maximum number of delivery points with minimum distance traversed. Furthermore it would suggest the nearest and most appropriate vehicle based upon the input parameters along with recommendation of the nearest distribution point based on the application requirements.

A visual perspective of the result in form a map is also provided for better analysis of the path traversed and traffic analysis with each of the distribution and delivery point clearly marked out. The vehicle details such as vehicle number, model, driver details and so on could also be specified based on user requirement.

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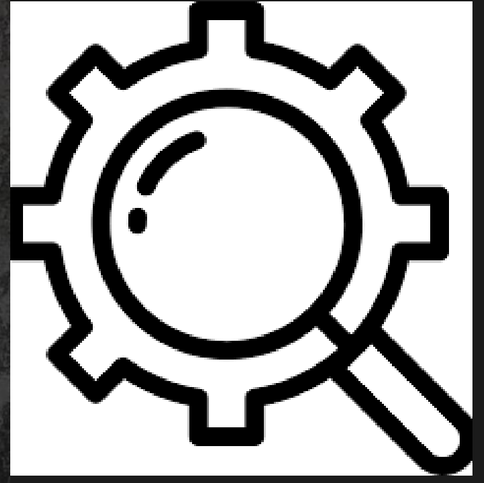
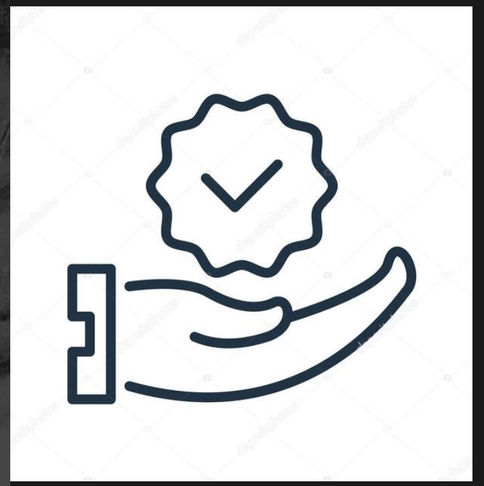
METHODOLOGIES

All the details have been uploaded on the Github link mentioned on the last slide.



OPTIMIZATION

The several stages of optimization state have been explained in detail in the **optimization** document.



RECOMMENDATION

The K-means clustering used for this part is mentioned in the **recommend** document.

VISUALIZATION

The concept used for this state has been mentioned in the **visualization** document.

Features

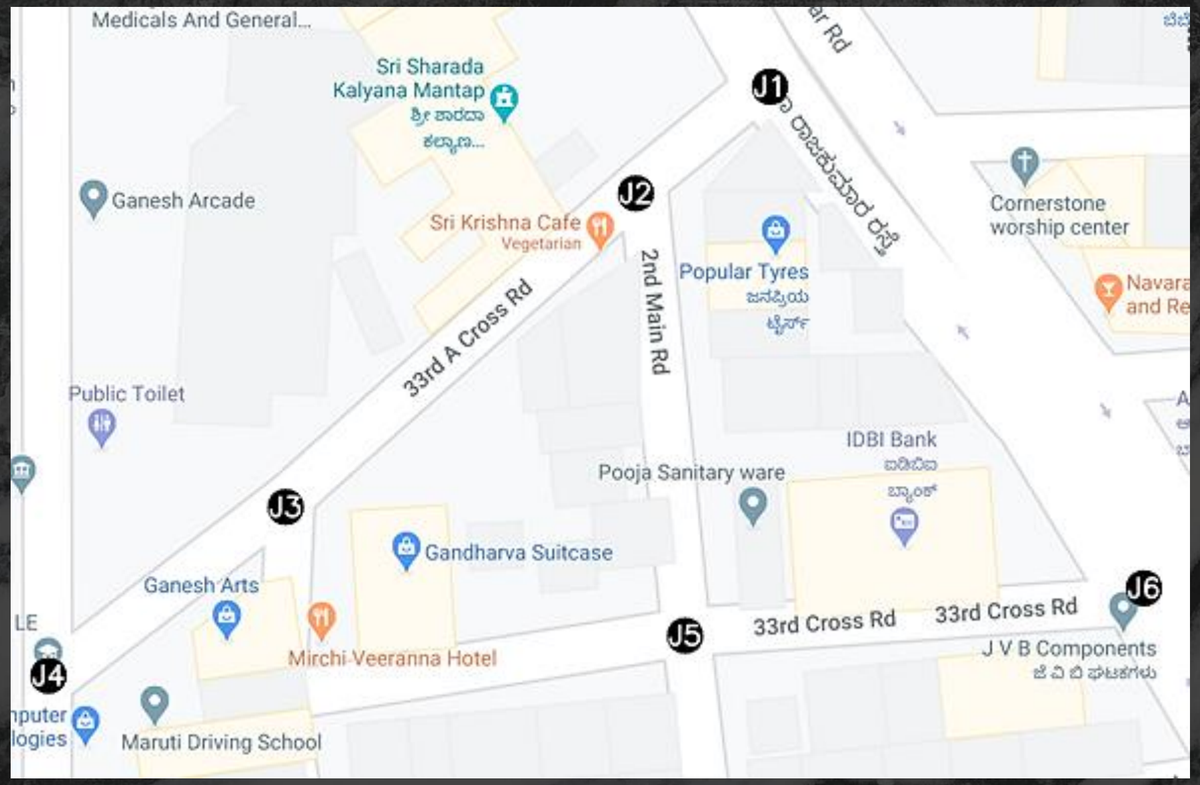
Multi-domain applications with features for each.

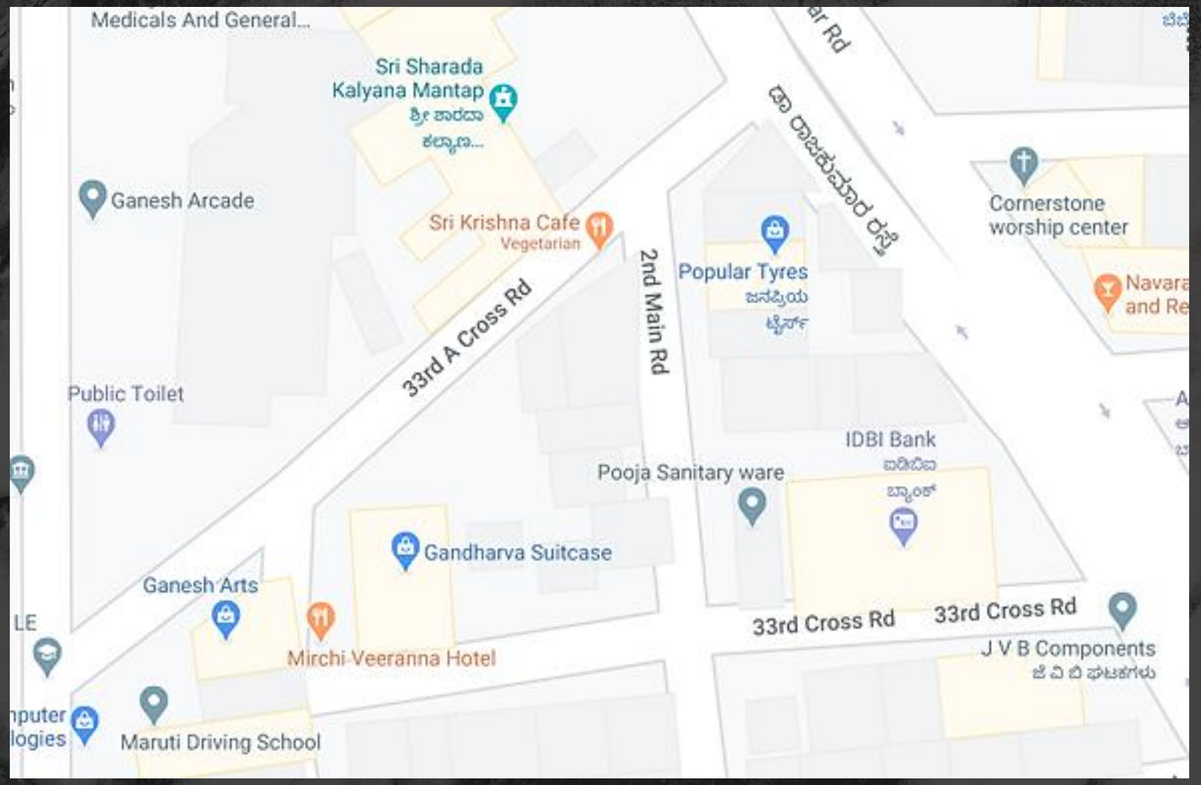
Optimal parameter recommendations for increasing sales

Visualization through maps with distinguished markers.

Uninterrupted tracking of vehicle and identifying potential sales.

Junction Representation of the Map





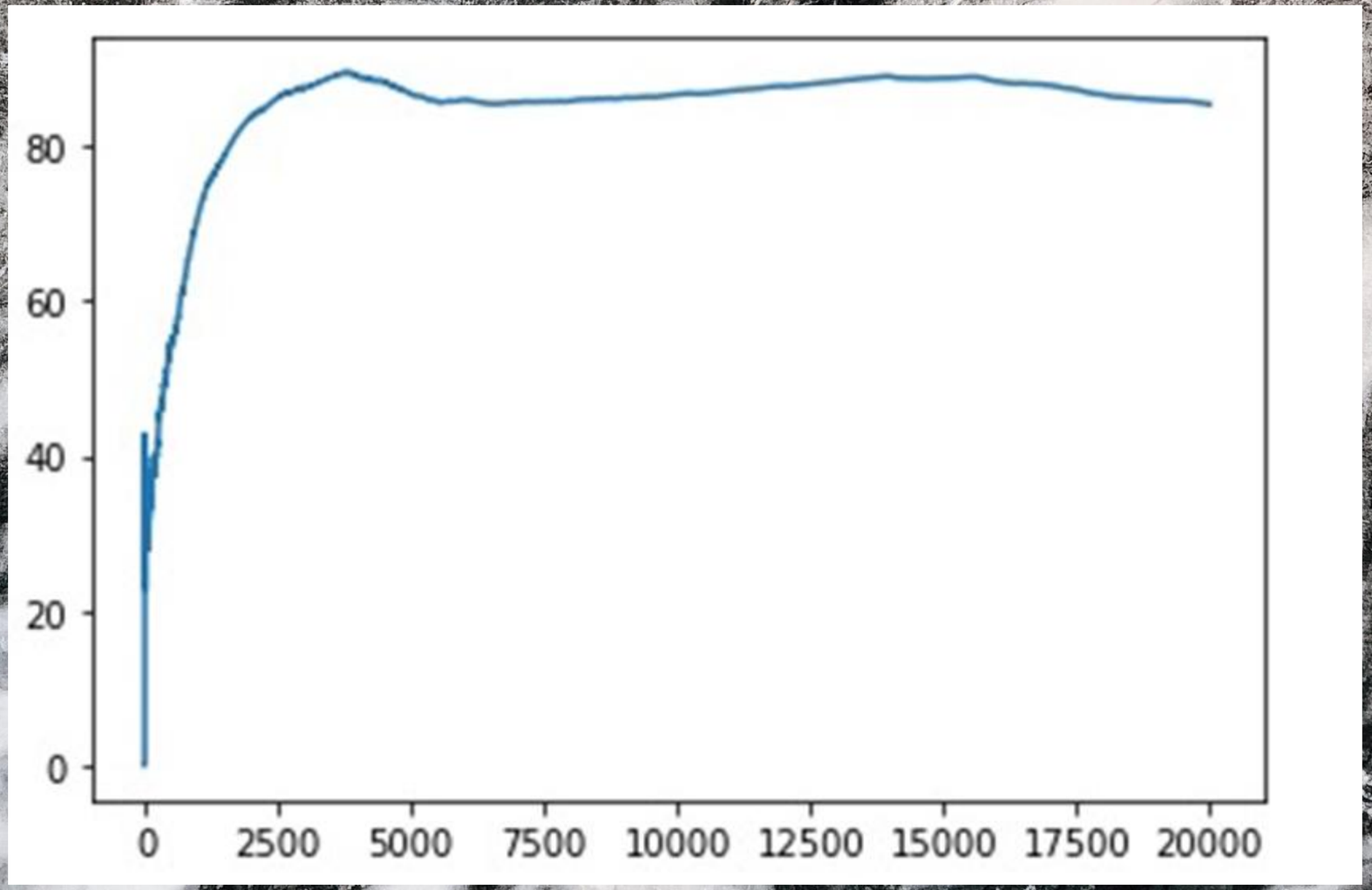
Environment Modelling

- Sales Point: Random from normal distribution
- MDP: no consideration of time
- Sales exhaustion and times regeneration
- Q Table discount factor

Exploration and Exploitation

- Epsilon greedy
- Exploration:
  - Weighted Exploration
  - Upper Confidence Box
- Exploitation:
  - Single agent:
    - Each sales point calculated potential reward accounting for distance loss
  - Multiple agents:
    - Each agent calculate best sales opportunity

Success Rate for Path Finding



CONCLUSION

The Reinforcement Learning based product opens door for new perspectives in this field. The product can be modified based on the user requirements for either transporting goods, food delivery or ride-hailing. The vehicles used for each application are different and have a separate set of parameters. Many new aspects could be added to this product such as privacy of user and customer details. Overall this approach assists the users enhance their business profits by reducing the cost per transport.

GitHub LINK

https://github.com/Aastha-M/Team-Katorthotis-Route-Optimization-and-Visualization-for-Sales-Vehicles-Deep-Tech-Machine-Learning.git