Institute for Enterprise Systems
Empowering Digital Transformation

UNIVERSITY OF MANNHEIM

MediCar – How vehicles can navigate around using LLMs

Agenda

1) Project Description

2) Approach

3) Results

PROJECT DESCRIPTION

Intelligent Hospital Logistics

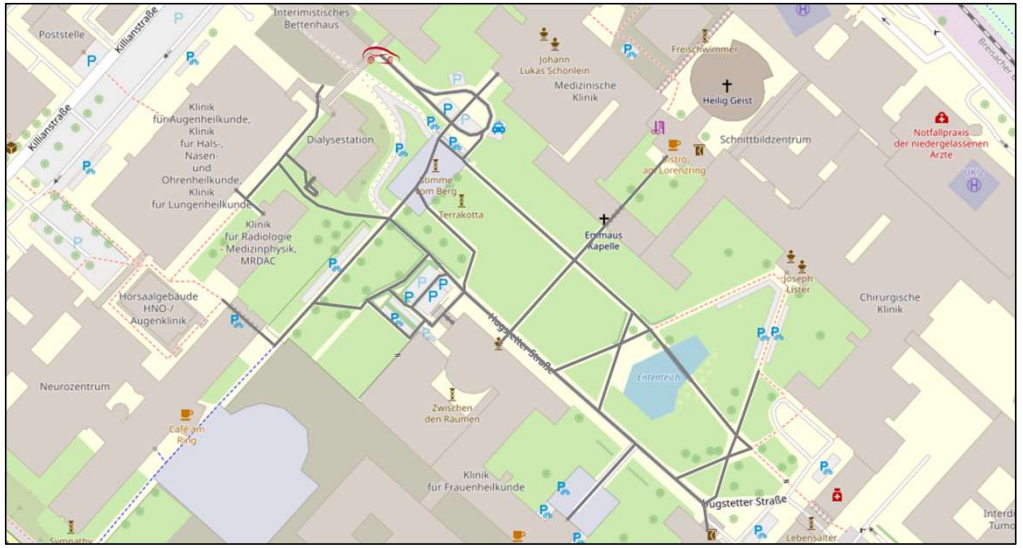
- Advanced transport logistics platform for vehicles on clinic premises
- Handling of demands and unpredictable events
- Simulation environment – University Hospital in Freiburg
- AI based routing algorithms + integration of Large Language Models

Goal

- Contribution to the future of Hospital Logistics
- Improvement of self-learning routing systems

Visualization with moving vehicles

Connection of LLM and Graph

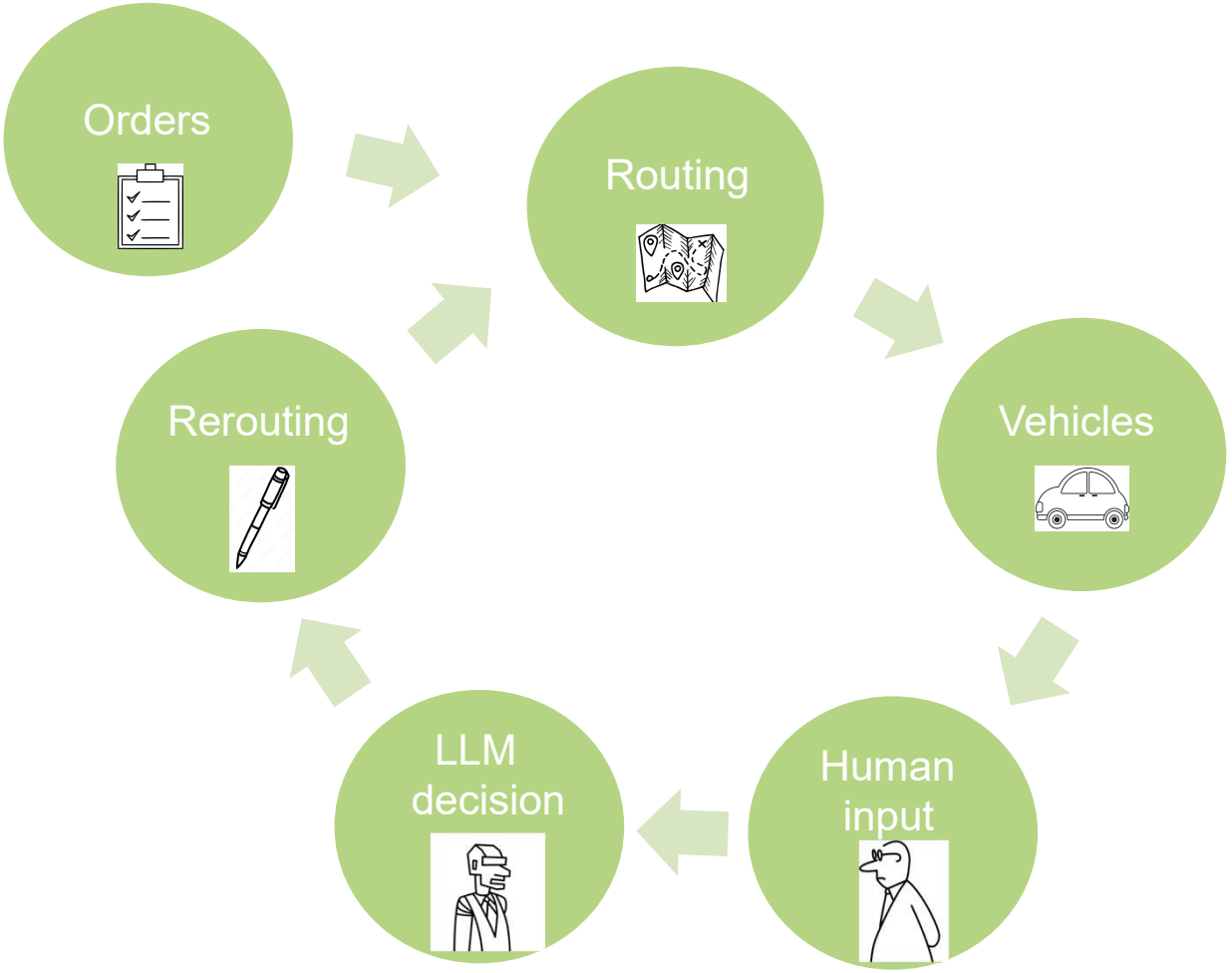


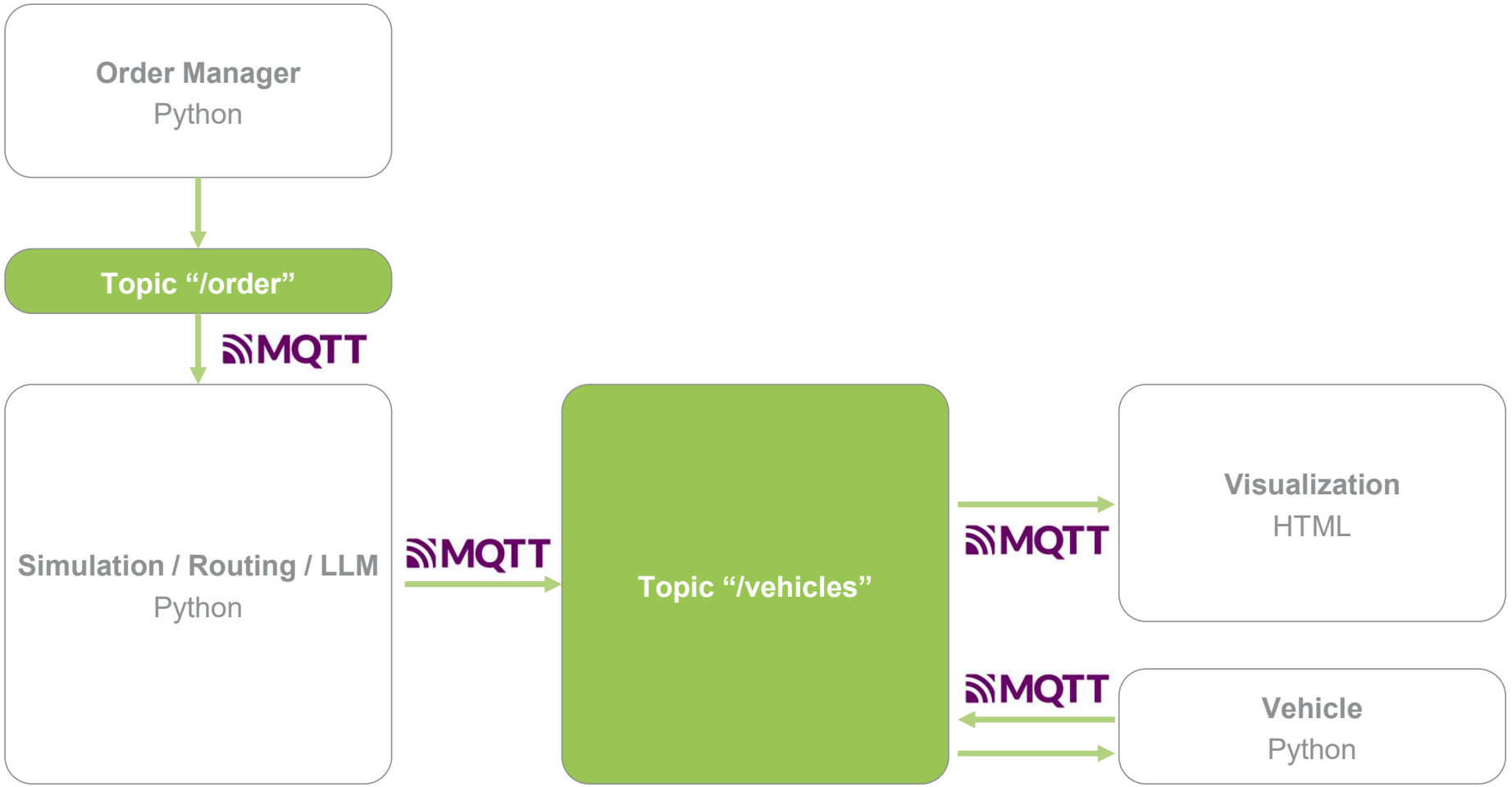
Compared different shortest path algorithms (a*, Dijkstra, Bellman-Ford)

Evaluation Metric: Euclidean Distance => Comparison of Algorithms

APPROACH

Workflow


Orders
Routing
Vehicles
Human input
LLM decision
Rerouting


Order Manager
Python
Topic “/order”
MQTT
Simulation / Routing / LLM
Python
MQTT
Topic “/vehicles”
MQTT
Visualization
HTML
MQTT
Vehicle
Python

RESULTS

LLaMA2

- Meta Model
- Open-Source
- Very high latency
- Has difficulty in understanding prompts with a large number of tokens

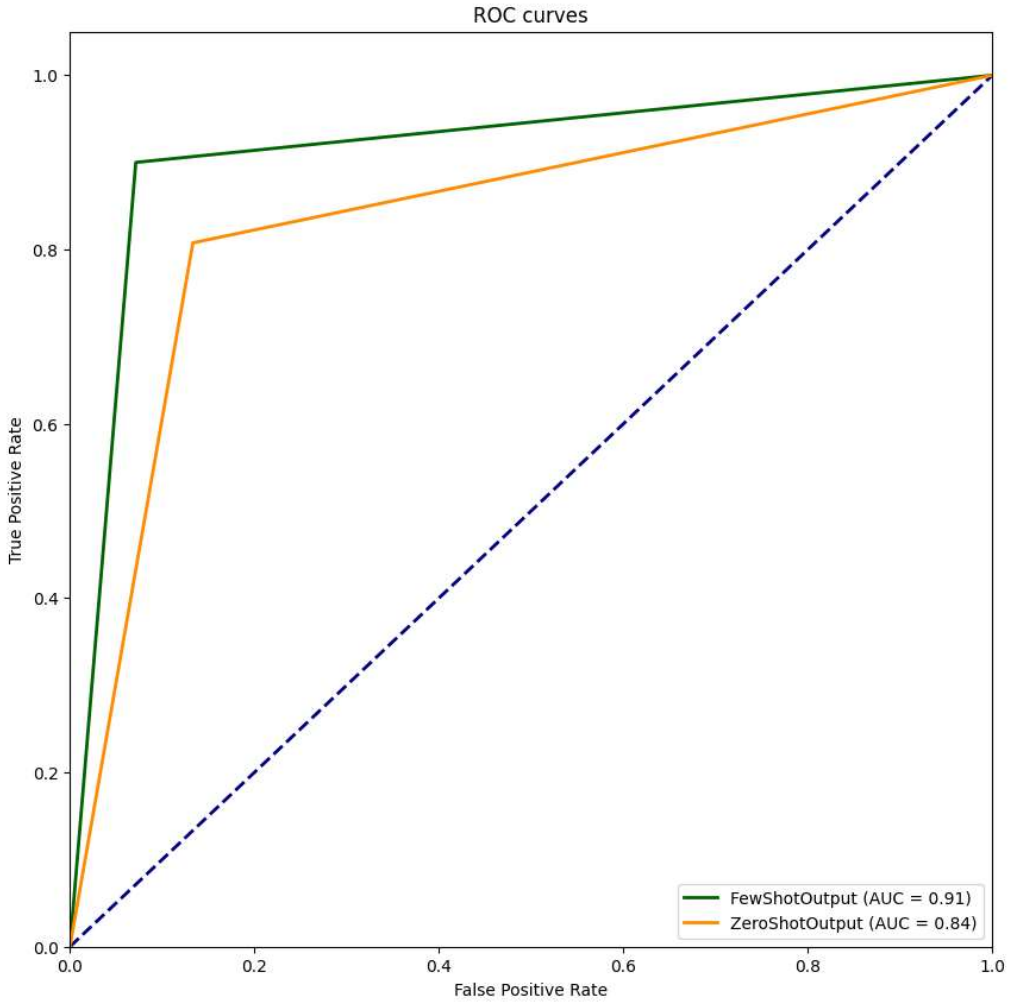
OpenAI Zero Shot

- OpenAI Model
- Relies on pre-existing knowledge and only the context is given
- Task-diverse
- A small number of tokens is used

OpenAI Few Shot

- OpenAI Model
- Giving context and a few examples of expected output to certain inputs
- More fine-tuned for certain Tasks
- Larger amount of tokens used

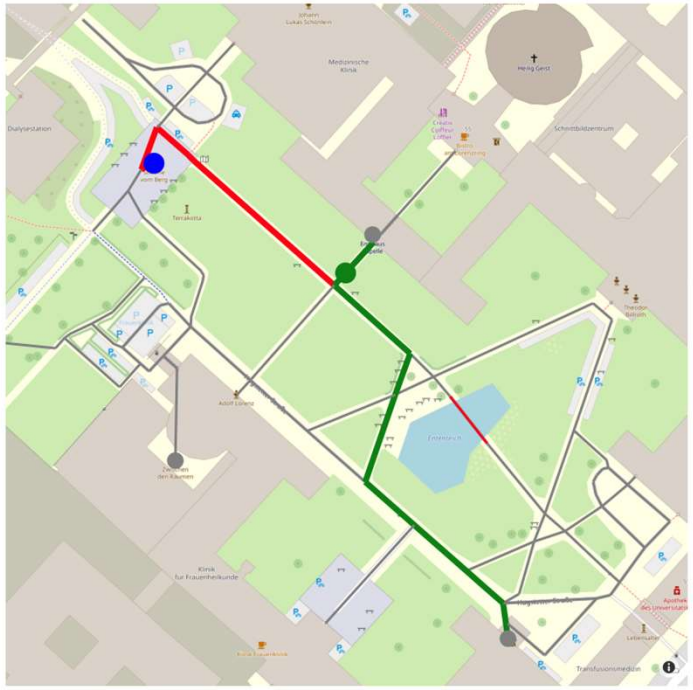
Model comparison



Ranking	Model	Accuracy
1	OpenAI Few Shot	0.9151
2	OpenAI Zero Shot	0.8393
3	LLama2	-

LLama2 not sufficient for our task

Intelligent Hospital Logistics



LLM

Many ducks from the nearby duck pond are blocking the road on edge_245004115_313158259

Submit

Are follow up questions needed here: Yes.
Follow up: Is the event important enough so that the edge_245004115_313158259 is not usable?
Intermediate answer: Yes, the ducks blocking the road would make edge_245004115_313158259 not usable.
So the final answer is: List of edges that have to be removed: edge_245004115_313158259. False the edge is not usable.

Orders

order_id	source	target	items	Vehicle
0	Zwischen den Räumen	Stimme vom Berg	Blood	red
1	Emmaus Kapelle	Klinik für Frauenheilkunde	Breakfast	green
2	Stimme vom Berg	Emmaus Kapelle	Blood	red
3	Klinik für Frauenheilkunde	Emmaus Kapelle	Palenka	blue
4	Emmaus Kapelle	Stimme vom Berg	Vaccines	blue
5	Klinik für Frauenheilkunde	Emmaus Kapelle	Dishes	green

DEMO

NEXT STEPS

Next Steps

Reroute moving vehicles too

Expand current map

LLM Finetuning & try LLAMA again

Setup open source models on Uni server

Different vehicle/ order priorities

Dynamic edge weights

Prompt input from Vehicles

Thank You For Your Attention!

Do You Have Any Questions?