



## MediCar – How vehicles can navigate around using LLMs

**1) Starting Point**

**2) Progress**

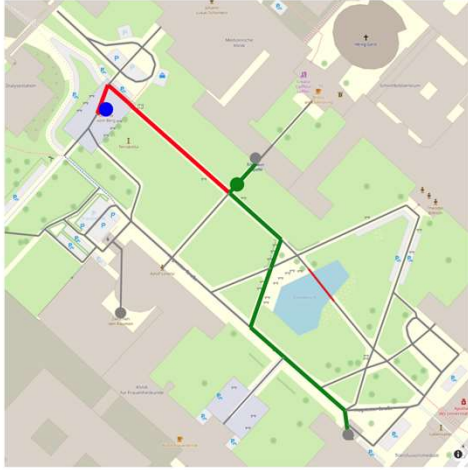
**3) Results / Demo**

# STARTING POINT

## Visualization with vehicles and routes

## LLM generates incidents based on human prompt

**Intelligent Hospital Logistics**



**LLM**

Many ducks from the nearby duck pond are blocking the road on edge\_245004115\_313158259

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.

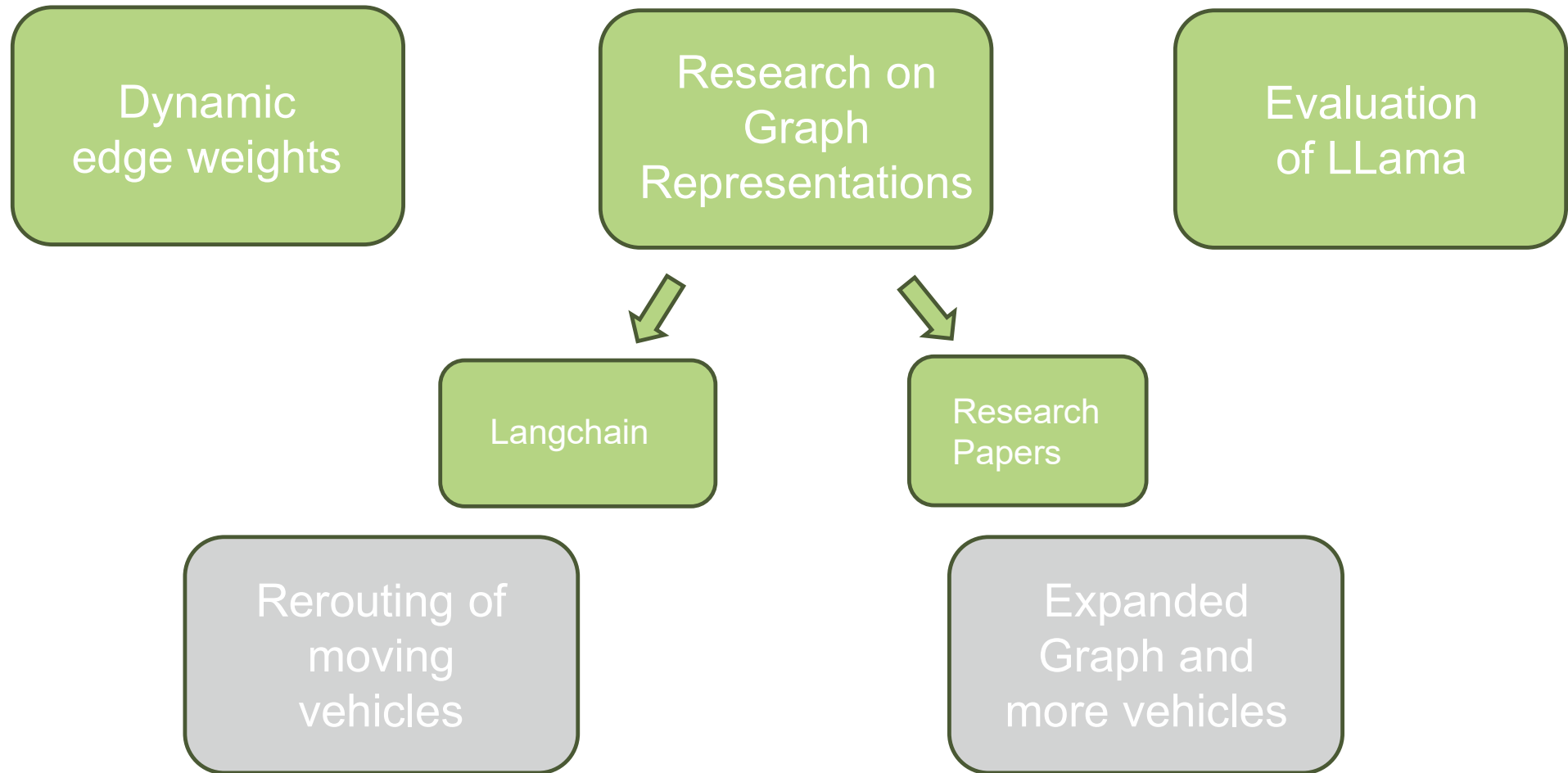
**Orders**

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

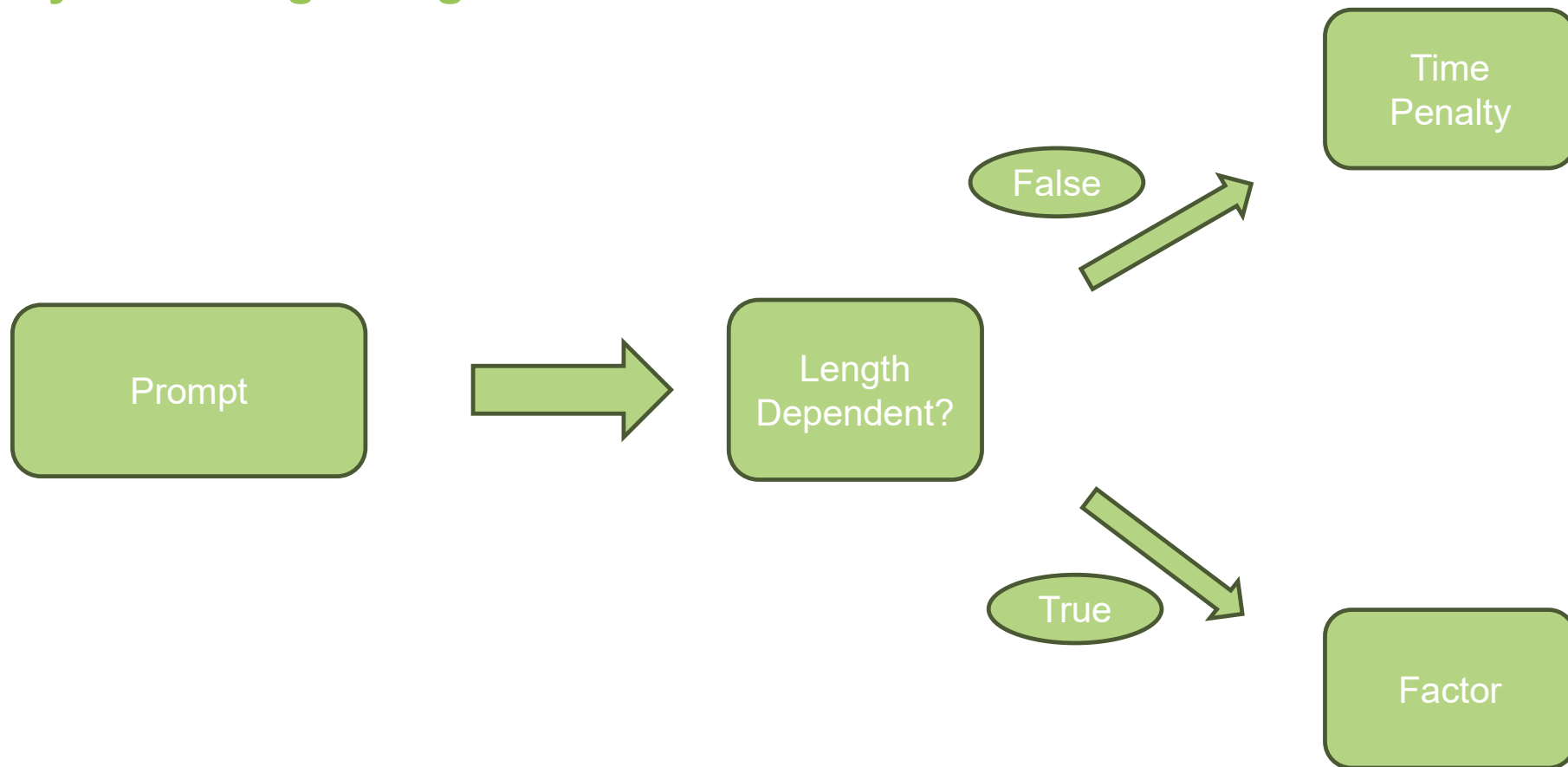
## Reroute incoming orders

## Accuracy for different openai Few-Shot and Zero-Shot

# PROGRESS



## Dynamic edge weights



## Research on graph representations

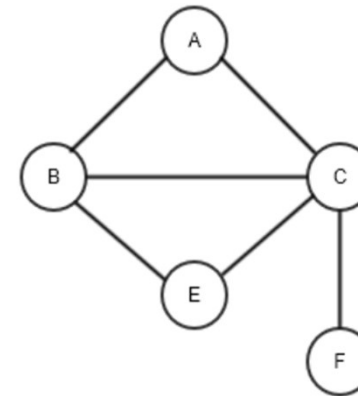
### GraphLLM: Boosting Graph Reasoning Ability of Large Language Model

- Chai, Ziwei, et al. "Graphllm: Boosting graph reasoning ability of large language model." *arXiv preprint arXiv:2310.05845* (2023).



### Let Your Graph Do the Talking: Encoding Structured Data for LLMs

- Perozzi, Bryan, et al. "Let Your Graph Do the Talking: Encoding Structured Data for LLMs." *arXiv preprint arXiv:2402.05862* (2024).



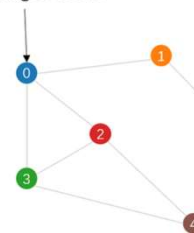
Adjacency Matrix

	A	B	C	E	F
A	0	1	1	0	0
B	1	0	1	1	0
C	1	1	0	1	1
E	0	1	1	0	0
F	0	0	1	0	0



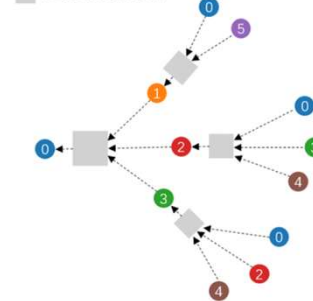
### Graph Neural Network

Target node



(a) Input graph

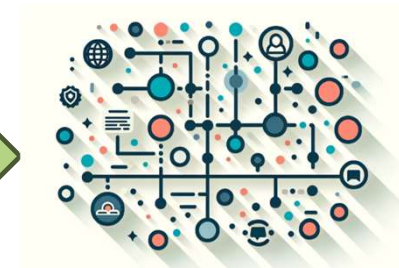
Neural Network



(b) Neighborhood aggregation



### LLM





## Geographic node presentation

**Action:** "There is a radiation leak at Klinik für Strahlenheilkunde."

**Context:** List of nodes with (x,y)-coordinates

### Output ▾

The radiation leak at Klinik für Strahlenheilkunde will directly affect the following nodes:

1. Klinik für Frauenheilkunde

Explanation: Close proximity to Klinik für Strahlenheilkunde, likely to experience increased traffic due to emergency response or evacuation procedures.

2. Dialysestation

Explanation: Close proximity to Klinik für Strahlenheilkunde, likely to experience increased traffic due to emergency response or evacuation procedures.

...

# RESULTS

## LLaMA @ DWS

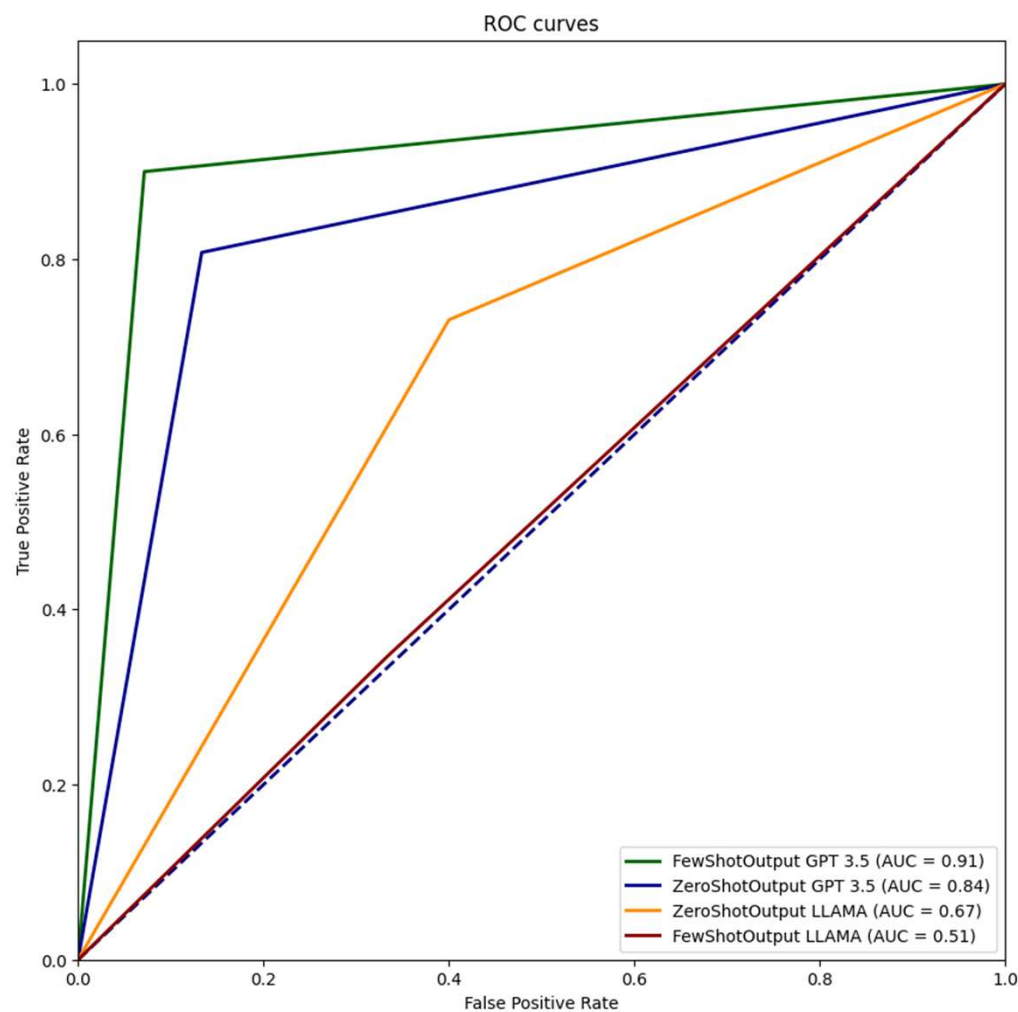
- Meta Model
- Open-Source
- Running on Uni-Server has much lower latency
- Improvement in performance

## 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

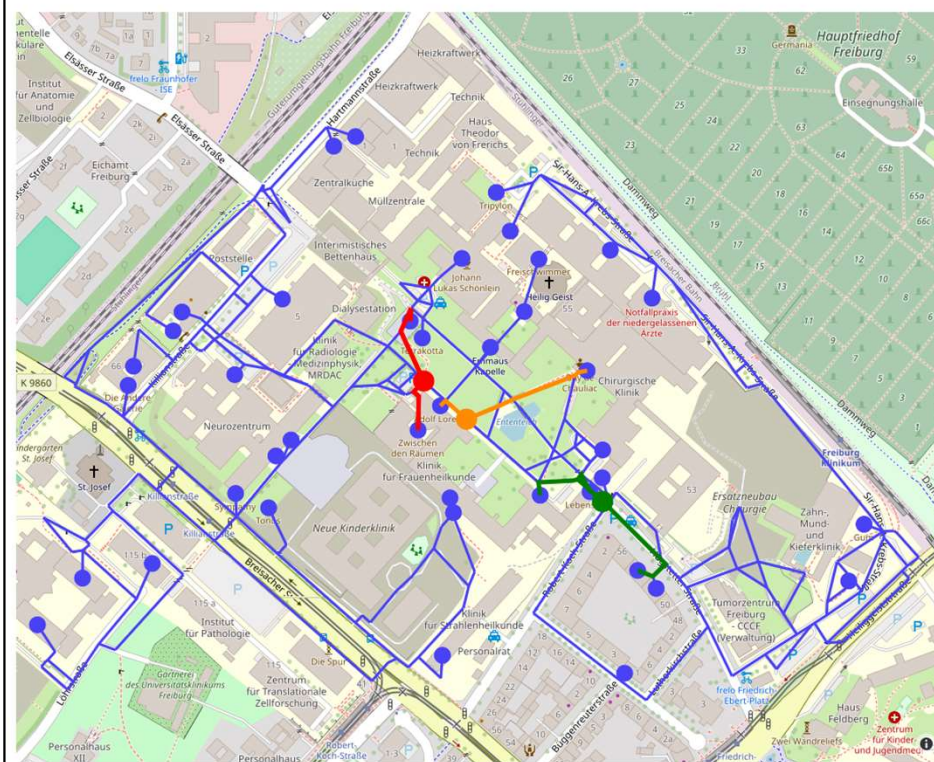


Ranking	Model	Accuracy
1	OpenAI Few Shot	0.9151
2	OpenAI Zero Shot	0.8393
3	LLama2 Zero Shot	0.6607
4	LLama2 Few Shot	0.5179



LLama2 Few Shot like a coinflip

## Intelligent Hospital Logistics



### Incidents

### Status

### Orders

order_id	source	target	items	status	Vehicle
0	Lebensalter	Luther Kindergarten	Coffee	in progress...	green
1	Emmaus Kapelle	Adolf Lorenz	Breakfast	completed	darkorange
2	Zwischen den Räumen	Stimme vom Berg	Blood	in progress...	red
3	Adolf Lorenz	Theodor Billroth	Breakfast	in progress...	darkorange
4	Zwischen den Räumen	Stimme vom Berg	Palenka	waiting...	None
5	Apotheke des Universitätsklinikums	Bistro am Lorenzring	Palenka	waiting...	None

### Vehicles

vehicleId	position	speed	status	targetNode	currentSequenceId	Vehicle
1	(48.00637390, 7.83730620)	0.00005	moving	6185709507	9	red
2	(48.00606360, 7.83782430)	0.00005	moving	9622545345	3	darkorange
3	(48.00539483, 7.83947340)	0.00005	moving	3378944507	8	green

# DEMO

# NEXT STEPS



Implement better graph  
tokenization



LLM decides affected edges



LLM Finetuning



Geographic node  
representation





# Thank You For Your Attention!

## Do You Have Any Questions?

