Learning to Rank Paths in Spatial Networks

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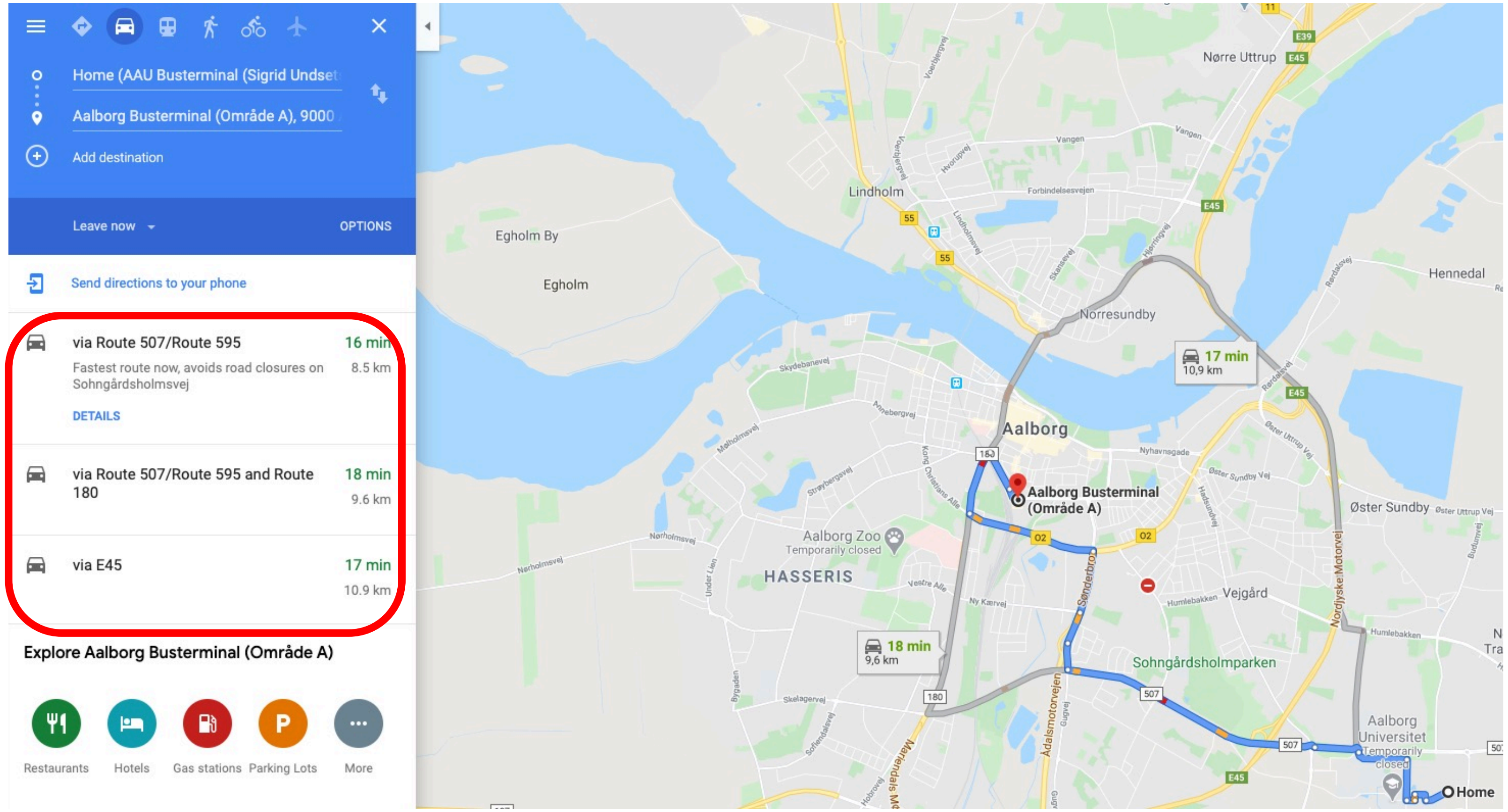
Introduction

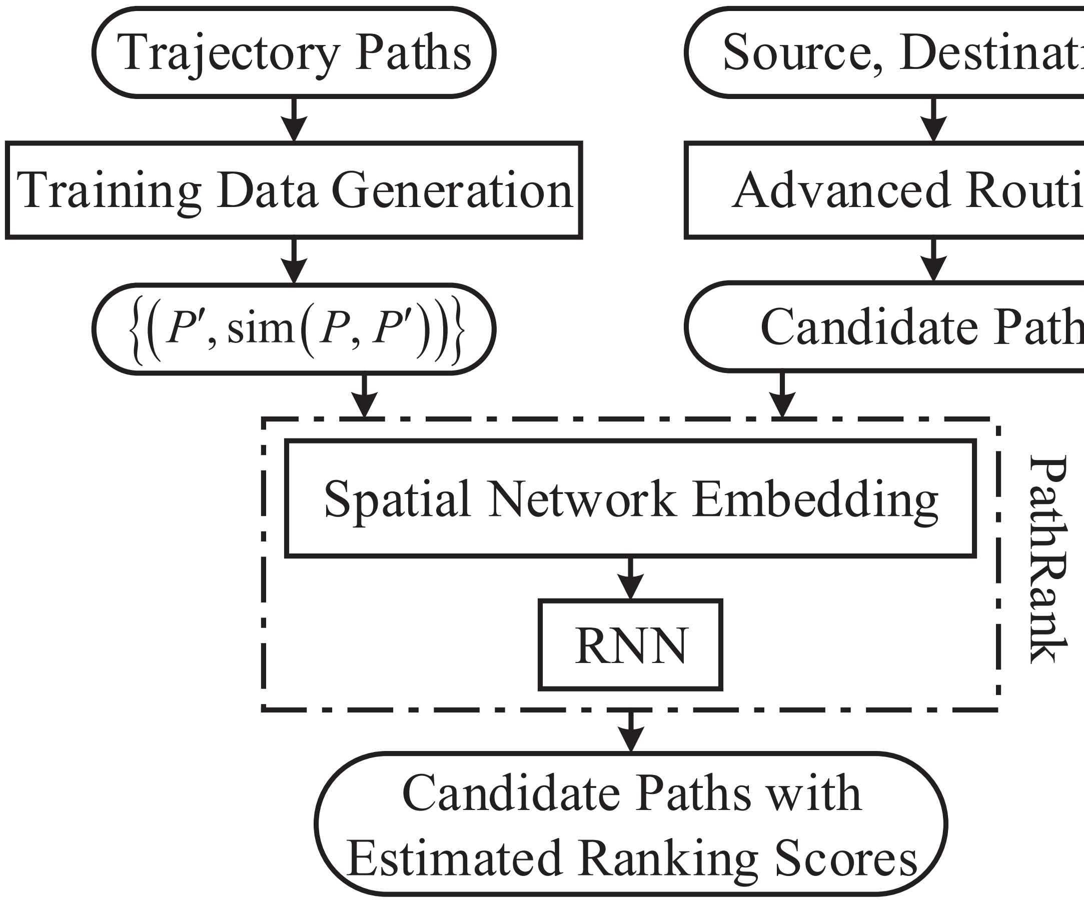
- Local Drivers often choose path that are neither shortest nor fastest.
- Commercial navigation systems, such are Google Maps ang TomTom, often follows a similar strategy by suggesting multiple candidate paths to drivers.



V. Ceikute and C. S. Jensen, "Routing service quality - local driverbehavior versus routing services," in2013 IEEE 14th InternationalConference on Mobile Data Management, Milan, Italy, June 3-6, 2013 -Volume 1, 2013, pp. 97–106.

Solutions Overview

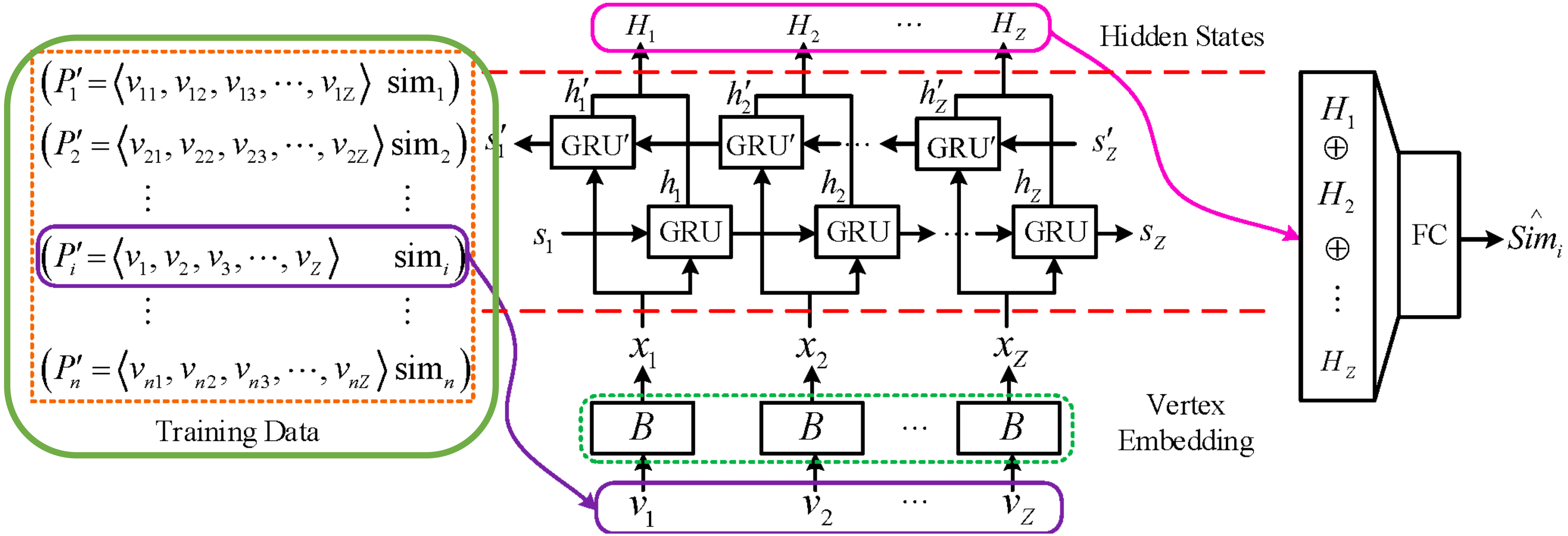
- We propose a data-driven ranking framework ***PathRank***, which ranks candidate paths by taking into account the paths used by local driver in their historical trajectories.



Learning to Rank Paths

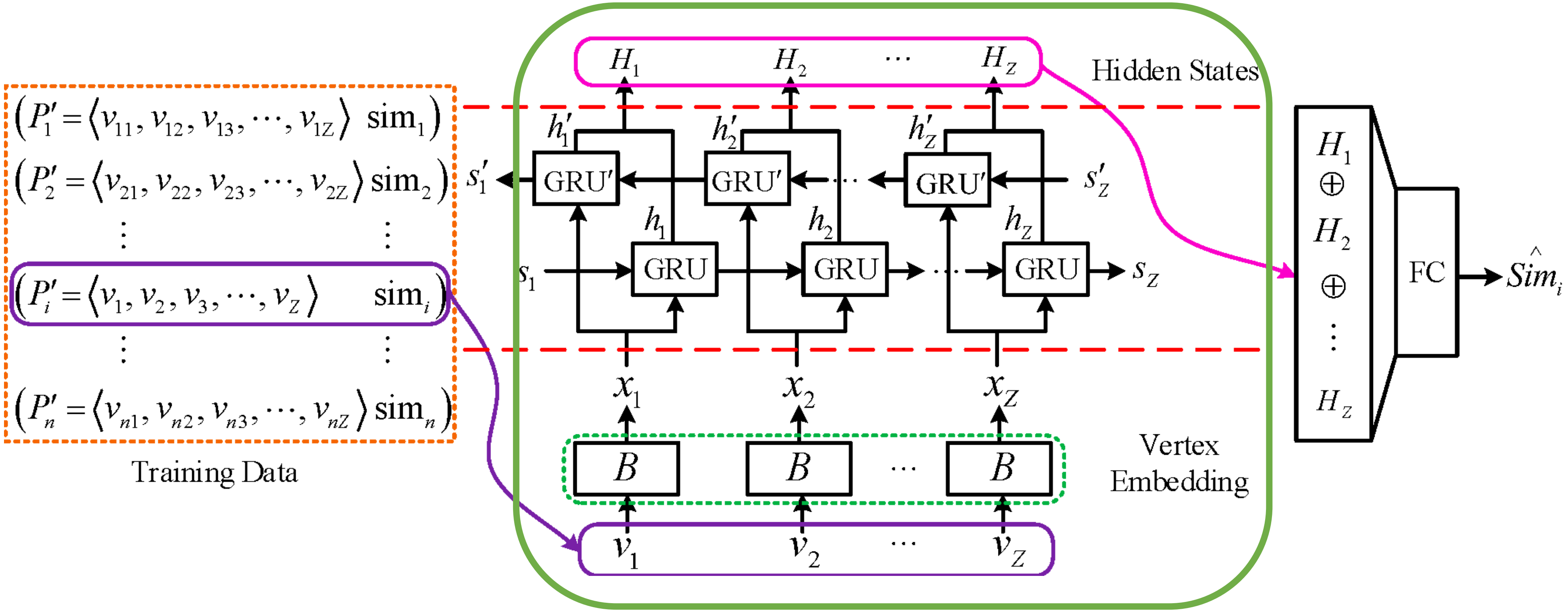
***PathRank*:**

- Data Generation



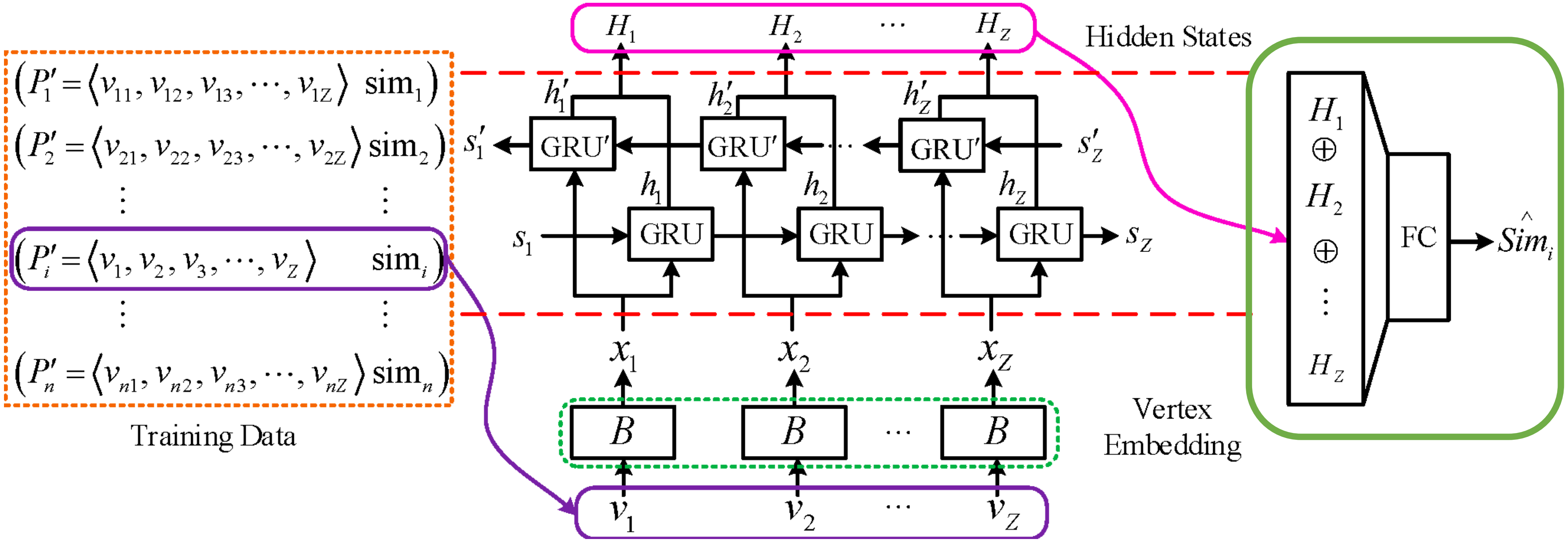
PathRank:

- Path Embedding



PathRank:

- Similarity Prediction



Experiments

- Datasets
  - ✓ Aalborg, Denmark
    - 180 million GPS records
- Ground Truth Data
  - ✓ For each trajectory P_T, we generate two sets of training paths: Top-k shortest paths (TkDI), and Diversified top-k shortest paths (D-TkDI).
  - ✓ For each training path, we employ weighted Jaccard similarity (WeightedJaccard (P, P_T)) as P's ground truth ranking score.
- Evaluation Metrics
  - ✓ Mean Absolute Error (MAE) and Mean Absolute Relative Error(MARE)
  - ✓ Kendall Rank Correlation Coefficient (τ) and Spearman's Rank Correlation Coefficient (ρ)
- Settings
  - ✓ PR-A1: Keep the graph embedding static
  - ✓ PR-A2: Keep updating the graph embedding

Experiments

- Training Data Generation Strategies

Table 1 PR-A1

Strategies	M	MAE	MARE	τ	ρ
TkDI	64	0.1433	0.2300	0.6638	0.7044
	128	<u>0.1168</u>	<u>0.1875</u>	<u>0.6913</u>	<u>0.7330</u>
D-TkDI	64	0.1140	0.1830	0.6959	0.7346
	128	<u>**0.0955**</u>	<u>**0.1533**</u>	<u>**0.7077**</u>	<u>**0.7492**</u>

Table 2 PR-A2

Strategies	M	MAE	MARE	τ	ρ
TkDI	64	0.1163	0.1868	0.6835	0.7256
	128	<u>0.1130</u>	<u>0.1814</u>	<u>0.7082</u>	<u>0.7481</u>
D-TkDI	64	0.0940	0.1509	0.7144	0.7532
	128	<u>**0.0855**</u>	<u>**0.1373**</u>	<u>**0.7339**</u>	<u>**0.7731**</u>

THANK YOU

daisy
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