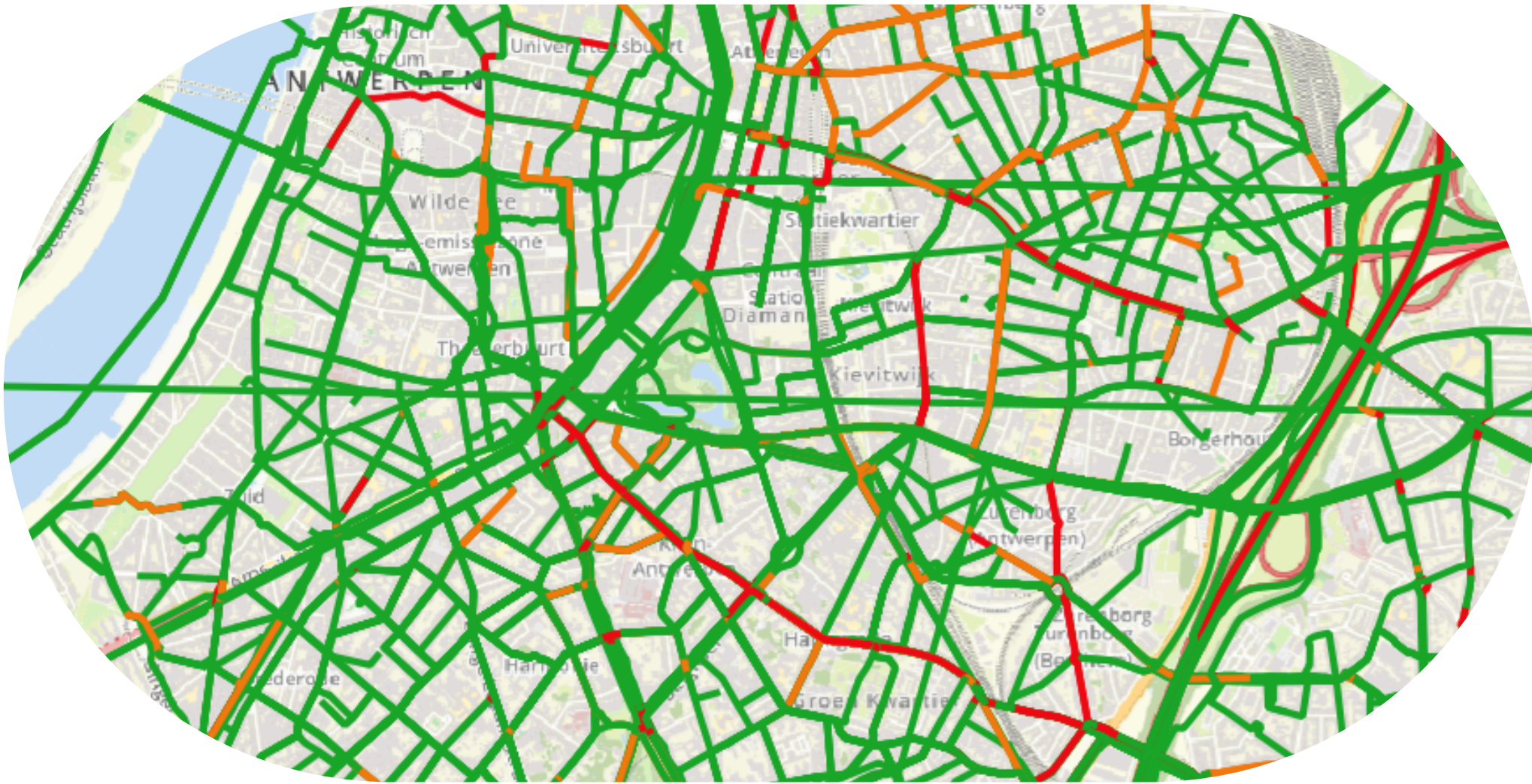


Introduction

- The **Route2School Project** gathers subjective safety perceptions related to home-school journeys, collecting data from over 80 cities and more than 1,000 schools across Flanders, Belgium.



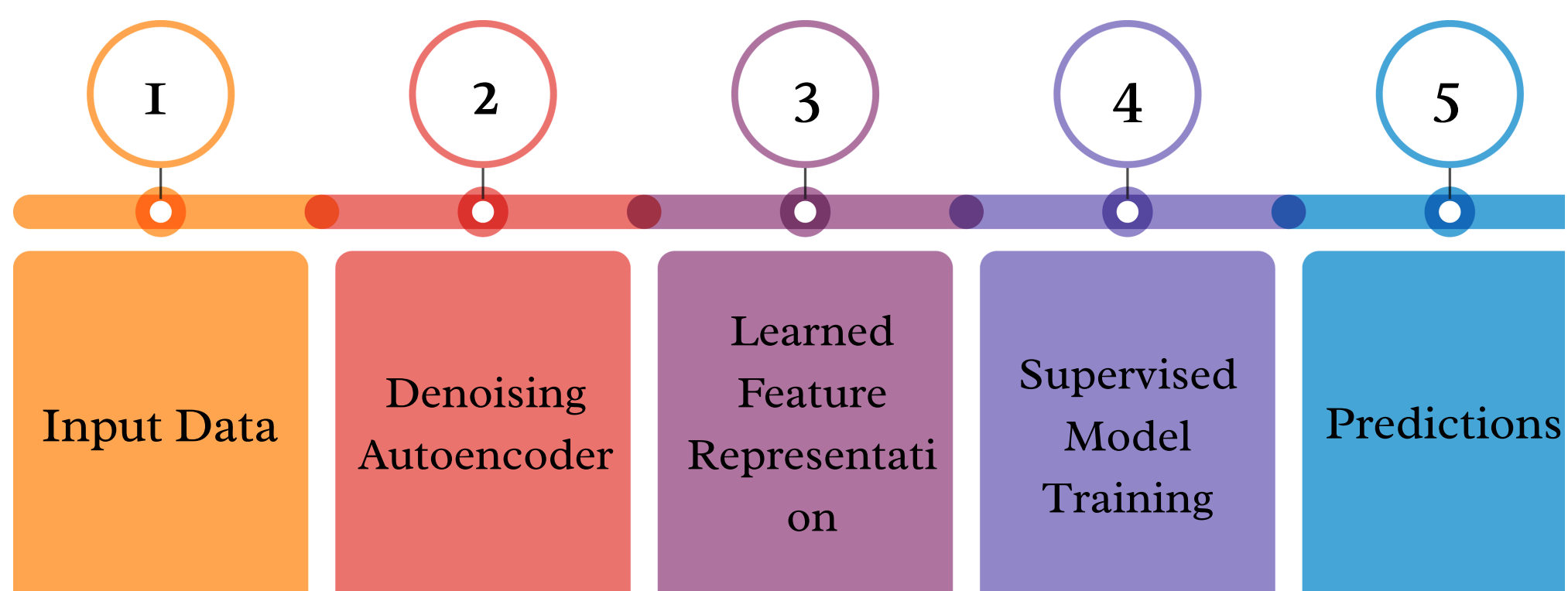
Snapshot of the R2S data

Objective

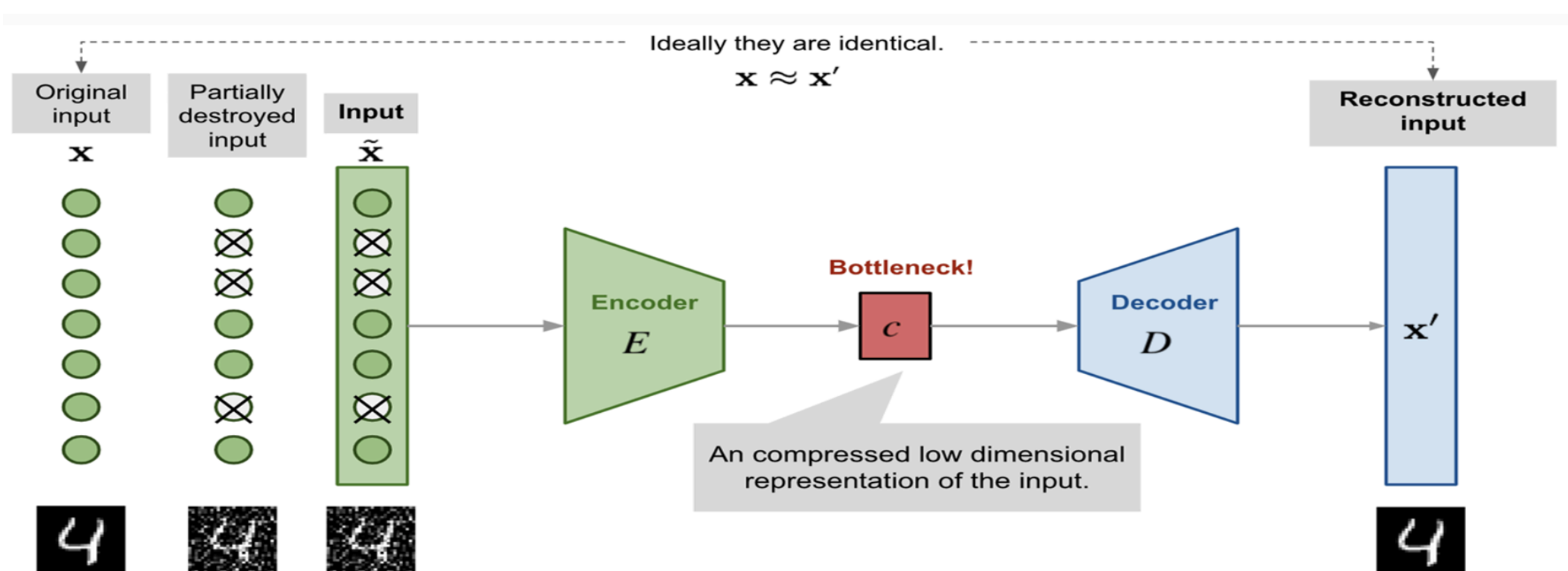
The primary research question guiding this study is: **Can subjective safety be quantified through the attributes of a road network?**

Methodology

Semi-supervised framework leveraging a special type of Autoencoders called Denoising Autoencoders (DAE).



Denoising Autoencoder: Overview



Source: towardsdatascience.com (https://towardsdatascience.com/autoencoders-and-the-denoising-feature-from-theory-to-practice-db717ad8fc78/)

Experimental Setup

- Bottleneck Layer Dimension – 16
- Hidden Layers – One hidden layer with dimension 100
- Input Corruption – Corrupt only observed values to make the model aware of missingness
- Loss Function – Combination of Mean Squared Error and Cross-Entropy loss
- Downstream Supervised Model – Gradient Boost

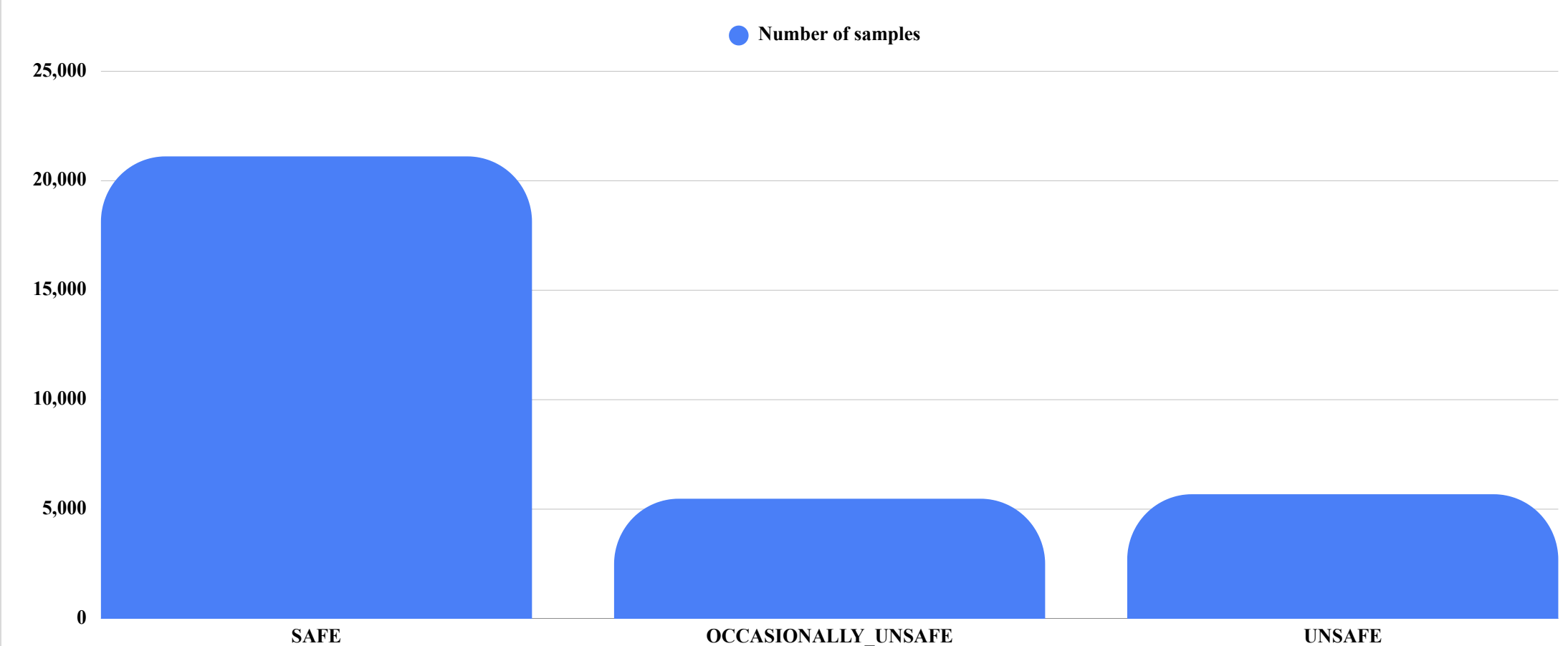
Results

Evaluation Metrics	Weighted	Macro
Accuracy	0.77	-
Precision	0.76	0.73
Recall	0.77	0.56
F1 Score	0.74	0.61

Evaluation Metrics	Safe	Occasionally_Unsafe	Unsafe
Precision	0.78	0.70	0.70
Recall	0.95	0.34	0.40
F1 Score	0.86	0.46	0.51

Challenges

- Extensive Missingness in OSM Data
- Unequal Representation of Safety Categories



Conclusion

- Accurately classified unsafe areas 73% of the time, aiding road safety engineers in minimizing resources spent on false positives.
- Utilizes OpenStreetMap (OSM) data for easy adaptation in different regions, needing only local safety labels for calibration.
- Can assess safety in areas with limited crash data and integrate with routing systems to assist vulnerable road users.
- Limitations include the need for further optimization and challenges in interpreting specific OSM attributes related to safety

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