CLAIMS

What is claimed is:

1. A system for predicting road traffic speed comprising:

one or more processors; and

a memory having instructions stored therein, the instructions, when executed by the one or more processors, causing the one or more processors to:

receive and process raw trajectory data to determine processed trajectory data;

obtain node features representing information about road segment characteristics;

obtain edge features representing information about interactions between the node features;

perform a node embedding on the node features to learn non-linear mappings of the node features;

perform an edge embedding on the edge features to learn non-linear mappings of the edge features; determine a learned graph representation of a road network based on the node embedding and the edge embedding, wherein the learned graph representation is determined by fusing the learned non-linear mappings of the node features and the learned non-linear mappings of the edge features via an element-wise multiplication;

determine at least one hidden states value based on a graph convolution of the learned graph representation through at least one encoder neural network; and

predict the road traffic speed based on the at least one hidden states value through at least one decoder neural network,

wherein the one or more processors are configured to perform a masking operation using at least one binary adjacent matrix during the graph convolution, to restrict a receptive field of the graph convolution to immediate neighbours.

2. The system of claim 1, wherein the raw trajectory data comprises speed readings of a vehicle matched to respective road segments that the vehicle is travelling on.

3. The system of claim 2, wherein the one or more processors are configured to process the raw trajectory data by at least one of:

removing negative speed readings;

aggregating the speed readings over a predetermined time interval for individual road segments; and

interpolating missing speed data by linear interpolation or replacing the missing speed data with a median speed value.

4. The system of any one of claims 1-3, wherein the node features are features regarding individual road segments, and the edge features are features regarding an intersection of the individual road segments.

5. The system of any one of claims 1-4, wherein the node features comprise at least one of road class, number of lanes and length of road segments, and wherein the edge features comprise at least one of Haversine distances between road segments, change in number of lanes between road segments, and change in road width between road segments.

6. The system of any one of claims 1-5, further comprising an encoder and a decoder;

wherein the encoder comprises the at least one encoder neural network and the decoder comprises the at least one decoder neural network; and

wherein the at least one encoder neural network is a bidirectional neural network, and the at least one decoder neural network is a unidirectional neural network.

7. The system of any one of claims 1-6, wherein the one or more processors are configured to perform the graph convolution of the learned graph representation by using the learned graph representation and a weighing matrix.

8. The system of any one of claims 1-7, wherein the at least one hidden states value comprises a last hidden state value, and the one or more processors are configured to predict the road traffic speed based on the last hidden state value.

9. A method for predicting road traffic speed comprising:

using one or more processors to:

receive and process raw trajectory data to determine processed trajectory data;

obtain node features representing information about road segment characteristics;

obtain edge features representing information about interactions between the node features;

perform a node embedding on the node features to learn non-linear mappings of the node features;

perform an edge embedding on the edge features to learn non-linear mappings of the edge features;

determine a learned graph representation of a road network based on the node embedding and the edge embedding, wherein the learned graph representation is determined by fusing the learned non-linear mappings of the node features and the learned non-linear mappings of the edge features via an element-wise multiplication;

determine at least one hidden states value based on a graph convolution of the learned graph representation through at least one encoder neural network; and

predict the road traffic speed based on the at least one hidden states value through at least one decoder neural network,

wherein the method further comprises: using the one or more processors to perform a masking operation using at least one binary adjacent matrix during the graph convolution, to restrict a receptive field of the graph convolution to immediate neighbours.

10. The method of claim 9, wherein the raw trajectory data comprises speed readings of a vehicle matched to respective road segments that the vehicle is travelling on.

11. The method of claim 9, further comprising using the one or more processors to process the raw trajectory data by at least one of:

removing negative speed readings;

aggregating the speed readings over a predetermined time interval for individual road segments; and

interpolating missing speed data by linear interpolation or replacing the missing speed data with a median speed value.

12. The method of any one of claims 9-11, wherein the node features are features regarding individual road segments, and the edge features are features regarding an intersection of the individual road segments.

13. The method of any one of claims 9-12, wherein the node features comprise at least one of road class, number of lanes and length of road segments, and wherein the edge features comprise at least one of Haversine distances between road segments, change in number of lanes between road segments, and change in road width between road segments.

14. The method of any one of claims 9-13, wherein the at least one encoder neural network is in an encoder, and the at least one decoder neural network is in a decoder, and wherein the at least one encoder neural network is a bidirectional neural network, and the at least one decoder neural network is a unidirectional neural network.

15. The method of any one of claims 9-14, further comprising using the one or more processors to perform the graph convolution of the learned graph representation by using the learned graph representation and a weighing matrix.

16. The method of any one of claims 9-15, further comprising using the one or more processors to predict the road traffic speed based on a last hidden state value, wherein the at least one hidden states value comprises the last hidden state value.

17. A non-transitory computer-readable medium storing computer executable code comprising instructions for predicting the road traffic speed according to any one of claims 9 to 16.

18. A computer executable code comprising instructions for predicting the road traffic speed according to any one of claims 9 to 16.