CLAIMS

1. A computer-implemented method for predicting traffic parameters on a road network comprising the steps of:

loading a spatial data file associated with the road network and a corresponding network profile associated with the road network;

converting the spatial data file to an edge-based graph comprising a plurality of nodes and edges, each node representing a respective road segment of the road network and each edge representing a respective physical location;

extracting a plurality of road attributes associated with the road network and deriving corresponding node features based on the plurality of road attributes;

constructing, based on the plurality of road attributes and the edge-based graph, a regularization and transition penalty matrix for assigning traffic parameters to one or more adjacent road segments associated with each of a plurality of road segments and deriving a smoothening regularizer module based on the regularization and transition penalty matrix; and

inputting the edge-based graph, the smoothening regularizer module, node features and network profile into a machine learning algorithm for predicting network parameters on each respective road segment;

wherein the machine learning algorithm is configured to output a set of traffic parameters corresponding to each of the plurality of nodes, and wherein if the one or more adjacent road segments are of the same road type as the road segment, the regularization and transition penalty matrix includes a transitioning rule stating that a similar range of traffic parameters is to be assigned to the one or more adjacent road segments, and wherein if the one or more adjacent road segments are of a different road type from the road segment, the regularization and transition penalty matrix includes a penalty function to minimize differences in the range of traffic parameters.

2. The method of claim 1, wherein the plurality of road attributes includes at least two of the following: a road length, a road width, a number of lanes, a direction and a road type.

3. The method of claim 1 or claim 2, further comprises pre-processing the extracted plurality of road attributes, wherein the pre-processing includes at least one of the following: binning and one-hot encoding the road-length of each road segment into the plurality of distance brackets, normalization, clustering, and assigning binary values for categorization.

4. The method of any one of the preceding claims, further comprises a step of computing a matrix representation of the edge-based graph, wherein the matrix comprises a normalized Adjacency and Laplacian matrix.

5. The method of any one of the preceding claims, wherein the machine learning algorithm comprises a graph convolutional network (GCN).

6. The method of any one of the preceding claims, further comprising a step of checking the set of output traffic parameters for one or more entries that fall out of range.

7. The method of claim 6, wherein the checking comprises a step of checking if the set of output traffic parameters fall within a predetermined range and a step of checking if the set of output traffic parameters fall within a statistical measure.

8. The method of claim 5, further comprising training the GCN, wherein the GCN is modelled as a two-layer GCN and a fully-connected layer for learning the traffic parameter propagation based on a subset of traffic prior information as a semi-supervised learning task.

9. The method of claim 8, wherein the training comprises defining an objective function to minimize a root-mean-squared error measure associated with incorrect assignment of traffic parameters to one or more road segments.

10. The method of claim 8 or claim 9, wherein the regularization and transition penalty matrix comprises a penalty coefficient derived from the network profile of different road types.

11. A device for predicting traffic parameters on a road network comprising a processor configured to:

receive a spatial data file associated with the road network and a corresponding network profile associated with the road network;

convert the spatial data file to an edge-based graph comprising a plurality of nodes and edges, each node representing a respective road segment of the road network and each edge representing a respective physical location;

extract a plurality of road attributes associated with the road network and derive corresponding node features based on the plurality of road attributes;

construct, based on the plurality of road attributes and the edge-based graph, a regularization and transition penalty matrix for assigning traffic parameters to one or more adjacent road segments associated with each of a plurality of road segments and derive a smoothening regularizer module based on the regularization and transition penalty matrix; and

input the edge-based graph, the smoothening regularizer module, node features and network profile into a machine learning algorithm for predicting network parameters on each respective road segment;

wherein the machine learning algorithm is configured to output a set of traffic parameters corresponding to each of the plurality of nodes, and wherein if the one or more adjacent road segments are of the same road type as the road segment, the regularization and transition penalty matrix includes a transitioning rule stating that a similar range of traffic parameters is to be assigned to the one or more adjacent road segments, and wherein if the one or more adjacent road segments are of a different road type from the road segment, the regularization and transition penalty matrix includes a penalty function to minimize differences in the range of traffic parameters.

12. A system for predicting traffic parameters on a road network comprising the device of claim 11 arranged in data communication with a map service to receive spatial data file from the map service.

13. A non-transitory computer-readable storage medium comprising instructions, which, when executed by one or more processors, cause the execution of the method according to any one of claims 1-10.