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• **Supplementary File** •

Deep amended COPERT model for regional vehicle emission prediction

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Appendix A COPERT Model Parameters

Table A1 Pollution emission parameters of COPERT model

	a	*b*	c	d	e
CO	71.7	35.4	11.4	-0.248	0
HC	5.57×10^{-2}	3.65×10^{-2}	-1.1×10^{-3}	-1.88×10^{-4}	1.25×10^{-5}
NO_x	9.29×10^{-2}	-1.22×10^{-2}	-1.49×10^{-3}	3.97×10^{-5}	6.53×10^{-6}
Fuel	217	9.6×10^{-2}	0.253	-4.21×10^{-4}	9.65×10^{-3}

Appendix B Experiment Environment

Table B1 Experiment settings

Settings	Details
Operating System	Ubuntu 16.04.3 LTS
Memory	32GB
CPU	Intel(R) Core(TM) i7-7700K CPU @ 4.20GHz
GPU	GeForce GTX 1080Ti
Number of GPU cards	2
CUDA version	8.0
cuDNN version	6.0
Keras version	1.1.1
Theano version	0.9.0

Appendix C Datasets and Experiment Results

We utilize the following four real datasets for evaluation, which are detailed in Table C1. The real world data set size is 1464, and we select 90% of the training dataset for training, and the remaining 10% is chosen as the testing set.
1) Meteorological data: We collect fine-grained meteorological data, consisting of weather, temperature, humidity, barometer

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pressure, wind strength, from a public web site every hour.
2) Remote sensing records: We collect both real valued and labeled values of CO and NO_x, collected by ground-based remote sensing devices of monitor stations in Hefei. As a station may not have records sometimes, we present the number of effective records in Table C1.
3) POIs: We employ a POI database from Baidu Maps to extract the POIs information of Hefei.
4) Road networks: The road network data is also from Baidu Maps.

Table C1 Experimental datasets of Hefei

Dataset	Details
Location	Hefei
Time Span	2017/5/1-2017/6/30
Time interval	1 hour
Grid map size	(12,12)
Humidity	[0,100]
Device Temperature	[0,60]
Wind Speed	[0,10]
Pressure	[0,1000]
Available time interval	1464

Table C2 Comparisons with baselines

Models	CO	NO_x
ANN	0.067	0.017
RNN	0.062	0.015
DeepST	**0.045**	**0.011**

Appendix D Feature Influence

Table D1 Results related to features

Features	CO	NO_x
None	0.045460	0.011184
$F_{weekend}(F_1)$	0.037197	0.010855
$F_{traffic}(F_2)$	0.008499	0.010496
$F_{wind}(F_3)$	0.035870	0.013145
$F_{tempera}(F_4)$	0.037425	0.011693
$F_{humidility}(F_5)$	0.035901	0.011752
$F_{pressure}(F_6)$	0.036233	0.012241
$F_{npoi}(F_7)$	0.036246	0.010912
$F_{roadlength}(F_8)$	0.036645	0.044110
$F_1 + F_2 + F_3$	0.006405	0.008787
$F_1 + F_2 + F_4$	0.007078	0.008794
$F_1 + F_2 + F_5$	0.006818	0.008477
$F_1 + F_2 + F_8$	0.007011	0.009029

Appendix E Details of DeepST Model

The DeepST model consists of 2 convolution layers and 4 residual units, each residual unit contains two convolution layers and 2 ReLU units. The shape of convolution lays is a tensor of $(64, 3 \times 3)$ and the residual units' shape is two stack tensors of $(64, 3 \times 3)$. Figure E1 shows the framework of our deep spatiotemporal network.

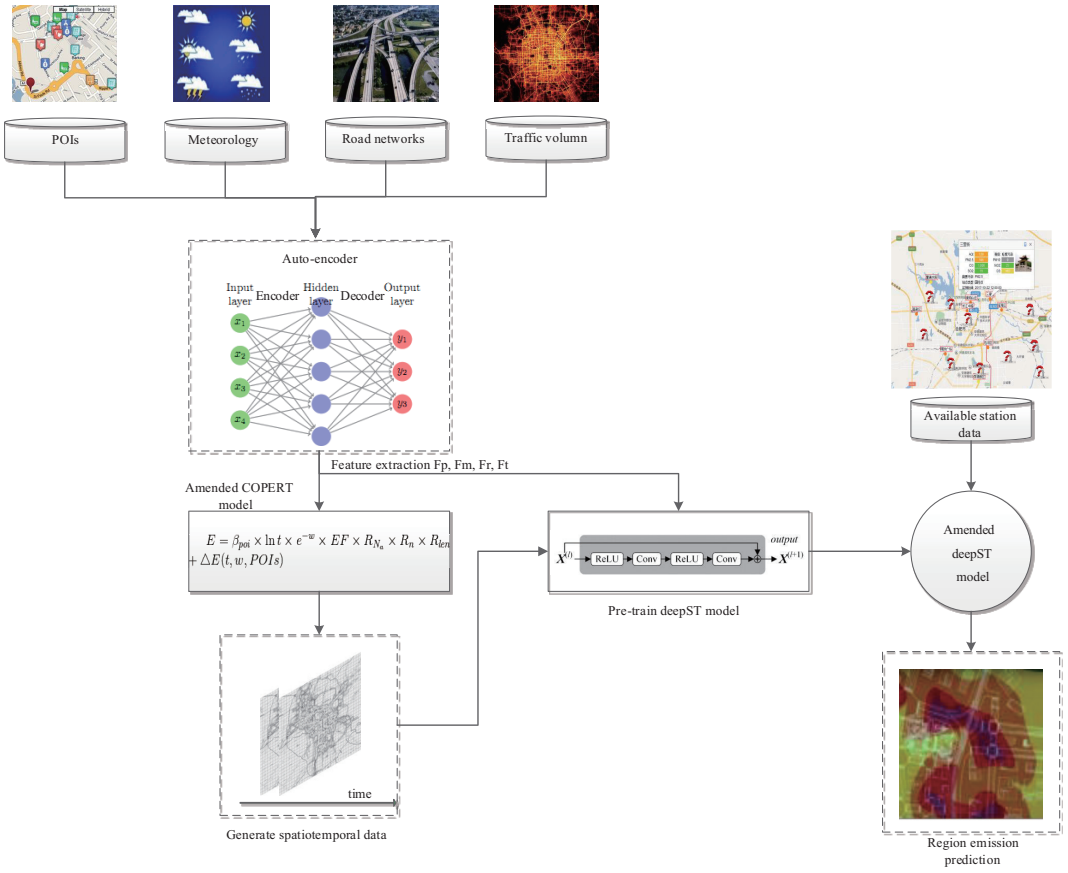

Figure E1 The approach framework.