STNN-based weighted regression models for the prediction of urban land surface temperature-A study of spatiotemporal association

Supplementary Material

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July 5, 2025

S1 Calculating number of parameters

For each of the proposed spatio-temporal neural network-based weighted regression models, three hidden layers are in the architecture. One hidden layer with h_1 node is in the spatio-temporal coefficient network and the other two layers with nodes h_2 and h_3 are in the regressor network. Assuming that, $h_1, h_2, h_3 \sim O(k)$, where k be the number of attributes present in the dataset $\mathbf{X}$ with n samples and $n = l\tau$ and $n >> k$ as $\tau >> k$.

STNNWR-v1:

$$O((l\tau + 1)k + (k + 1)k + (k + 1)k + (k + 1)k + (k + 1)) \sim O(l\tau k + k^2) \sim O(l\tau k) = O(nk) \tag{1}$$

Since $n >> k$.

STNNWR-v2:

$$O((2l\tau + 1)k + (k + 1)k + (k + 1)k + (k + 1)k + (k + 1)) \sim O(l\tau k + k^2) \sim O(l\tau k) = O(nk) \tag{2}$$

Since $n >> k$.

STNNWR-v3:

$$O((l + \tau + 1)k + (k + 1)k + (k + 1)k + (k + 1)k + (k + 1)) \sim O((l + \tau + 1)k + k^2) \sim O((l + \tau)k) \tag{3}$$

Since $\tau >> k$

GWANN:

$$O((l\tau + 1)k + (k + 1)k + (k + 1)k + (k + 1)k + (k + 1)) \sim O(l\tau k + k^2) \sim O(l\tau k) = O(nk) \tag{4}$$

Since $n >> k$.

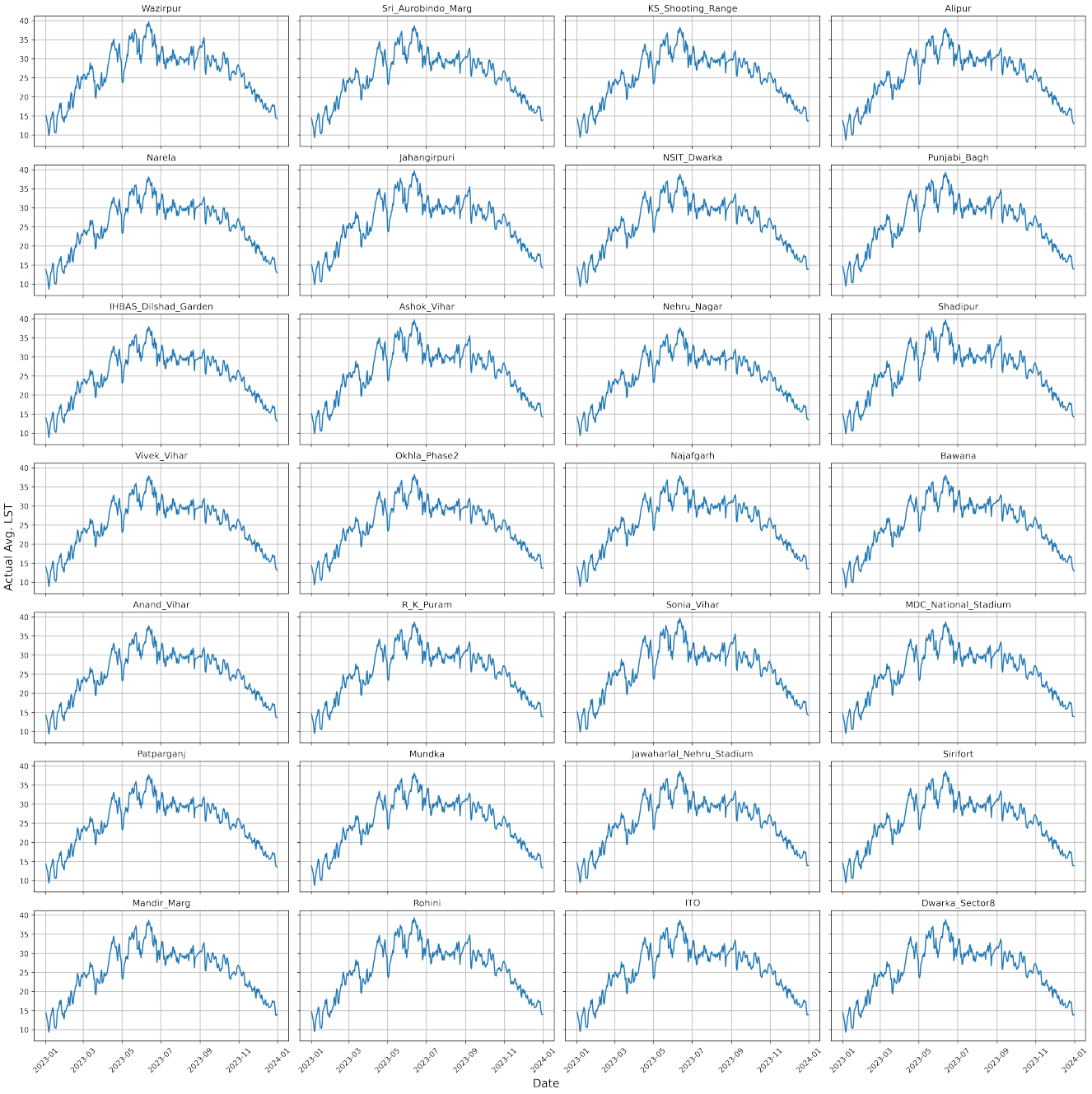

Figure S1: Temporal pattern of avg. LST for each of the 28 air quality monitoring stations of Delhi over the period.

Table S1: Performance metrics in terms of (mean ± std) reported for 30 independent trials for each neural network-based regression model. The values in bold characters represent the best performances.

Model name	R^2	Adj. R^2	EVS	MSE	MAE	MAPE
STNNWR-v1	0.753 ± 0.013	0.751 ± 0.013	0.756 ± 0.012	10.376 ± 0.526	2.46 ± 0.063	0.111 ± 0.003
STNNWR-v2	0.925 ± 0.005	0.925 ± 0.005	0.927 ± 0.004	3.145 ± 0.198	1.388 ± 0.044	0.062 ± 0.002
STNNWR-v3	$\mathbf{0.931 \pm 0.003}$	$\mathbf{0.931 \pm 0.003}$	$\mathbf{0.933 \pm 0.002}$	$\mathbf{2.886 \pm 0.118}$	$\mathbf{1.329 \pm 0.027}$	$\mathbf{0.058 \pm 0.001}$
GWANN	0.755 ± 0.011	0.753 ± 0.011	0.756 ± 0.011	10.305 ± 0.451	2.447 ± 0.061	0.111 ± 0.003