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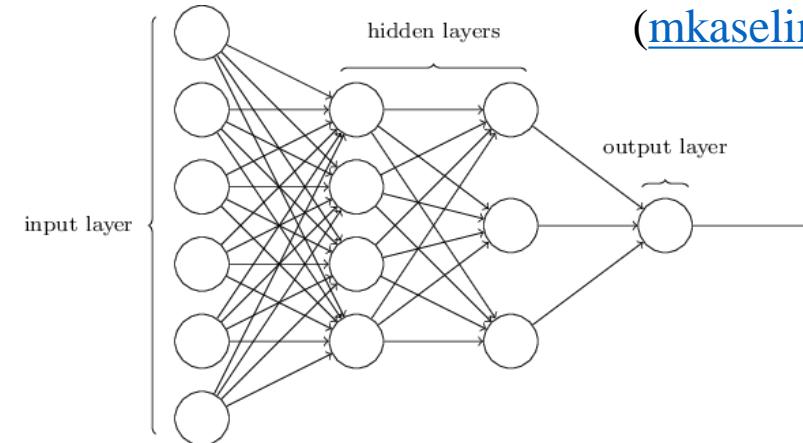


AN ADAPTIVE CONVOLUTIONAL NEURAL NETWORK MODEL FOR IONOSPHERE PREDICTION

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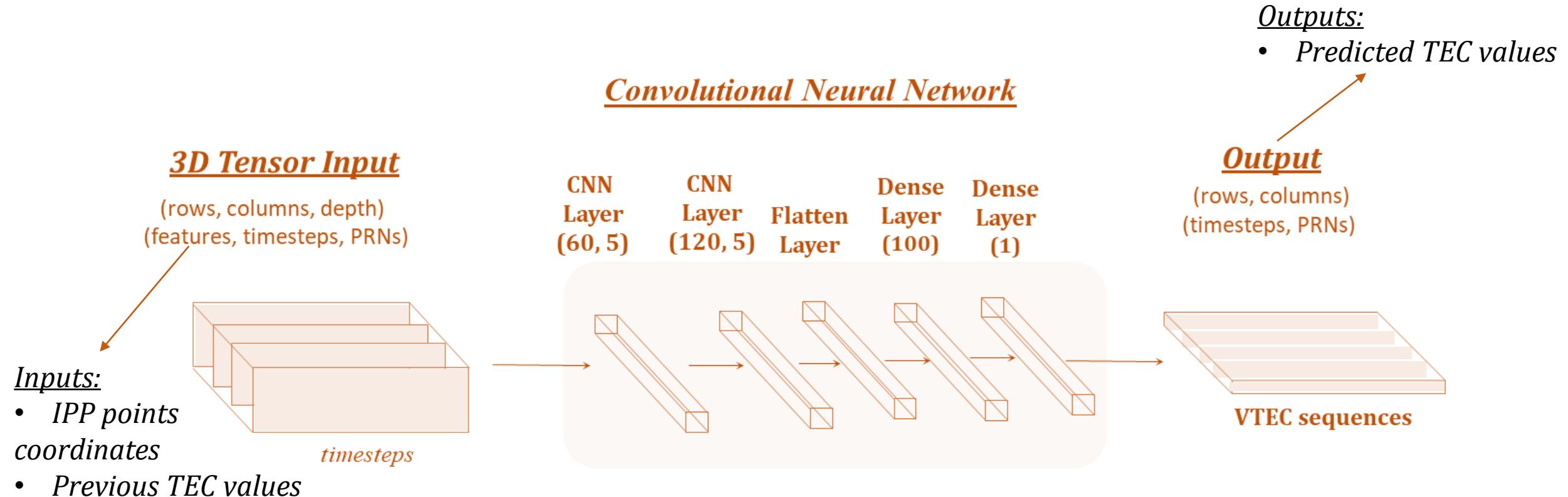
(mkaselimi@mail.ntua.gr, ndoulam@cs.ntua.gr, ddeli@mail.ntua.gr)



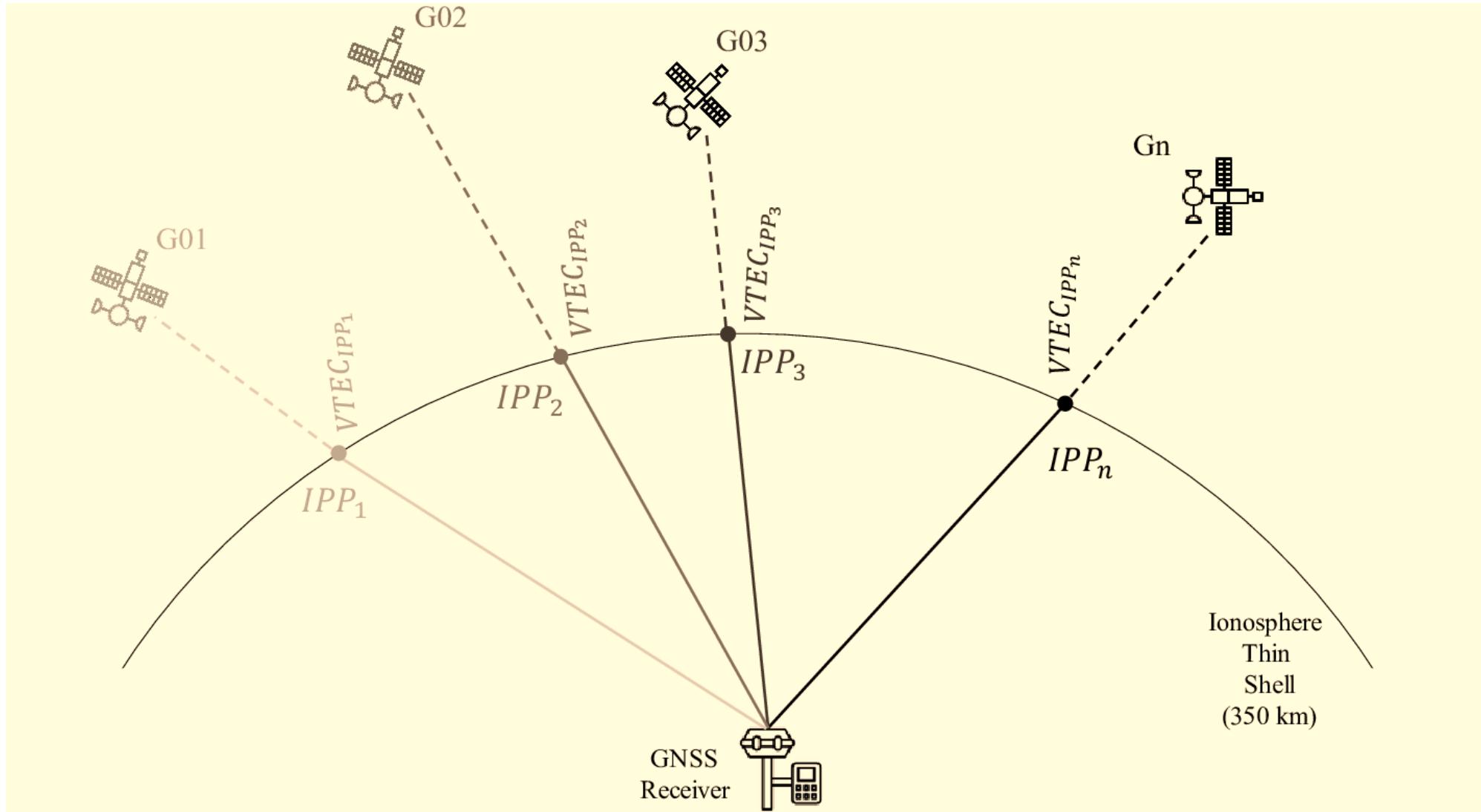
4 May 2020



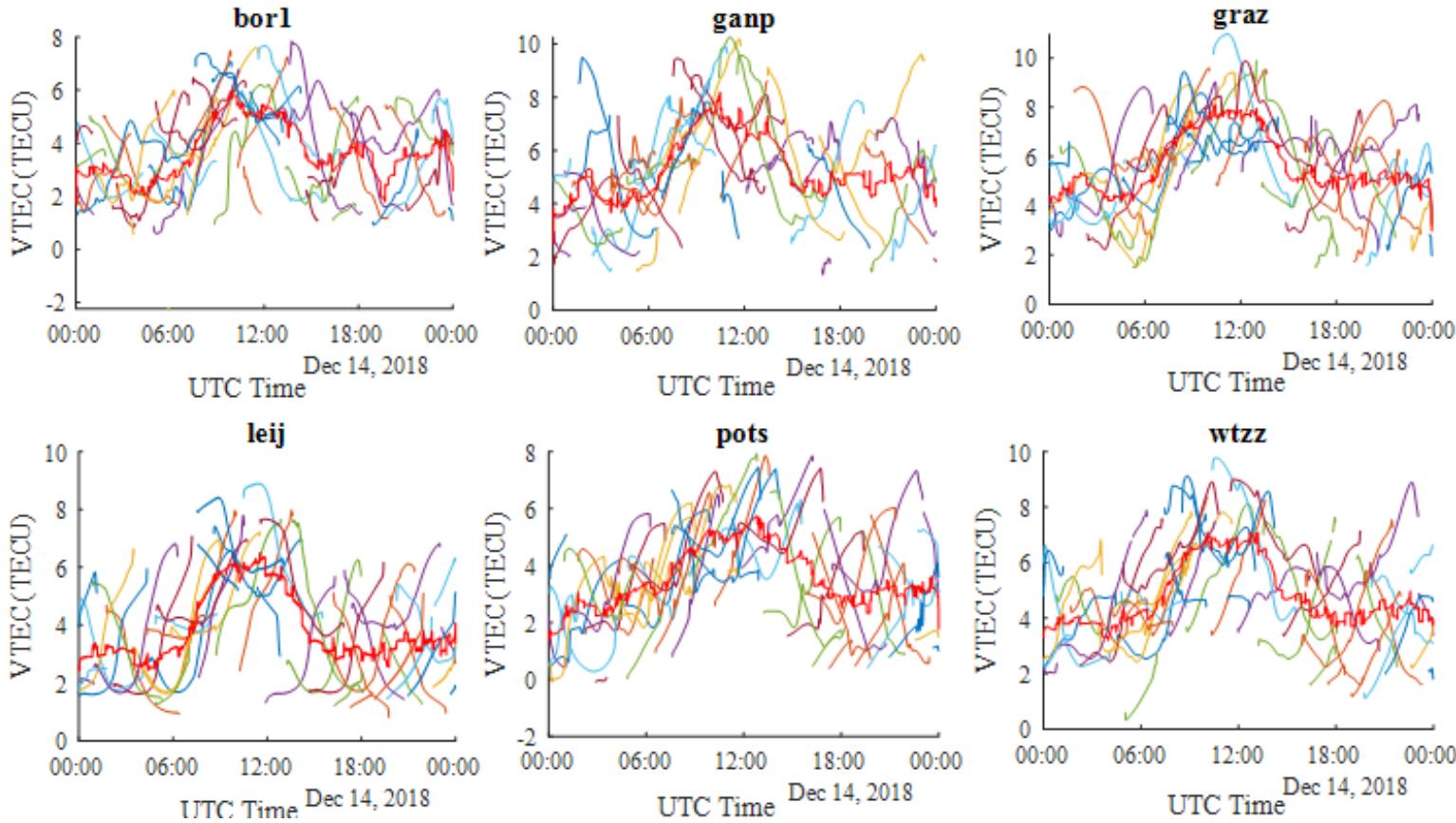
CONVOLUTIONAL NEURAL NETWORK (CNN) FOR TEC ESTIMATION



IONOSPHERE PIERCE POINT (IPP)

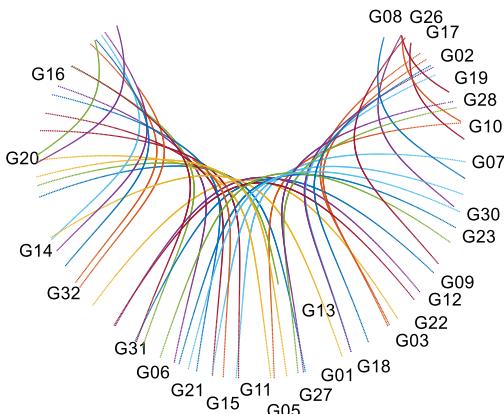


PREDICTED VTEC VALUES PER SATELLITE

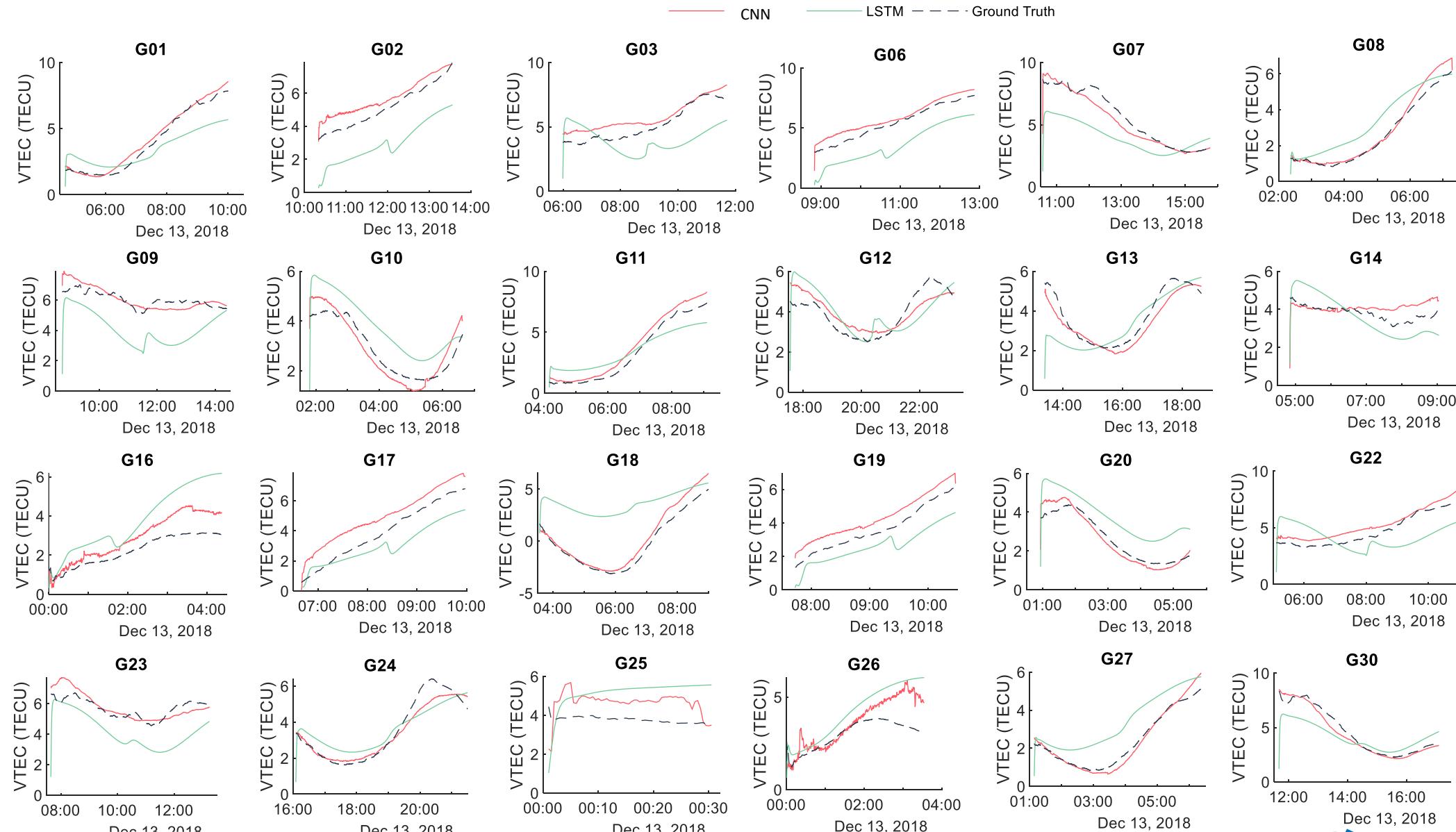


Satellite
Trajectories
G01,...,G32

Mean VTEC
Values per Station



PREDICTED VERTICAL TOTAL ELECTRON CONTENT (VTEC) VALUES PER SATELLITE



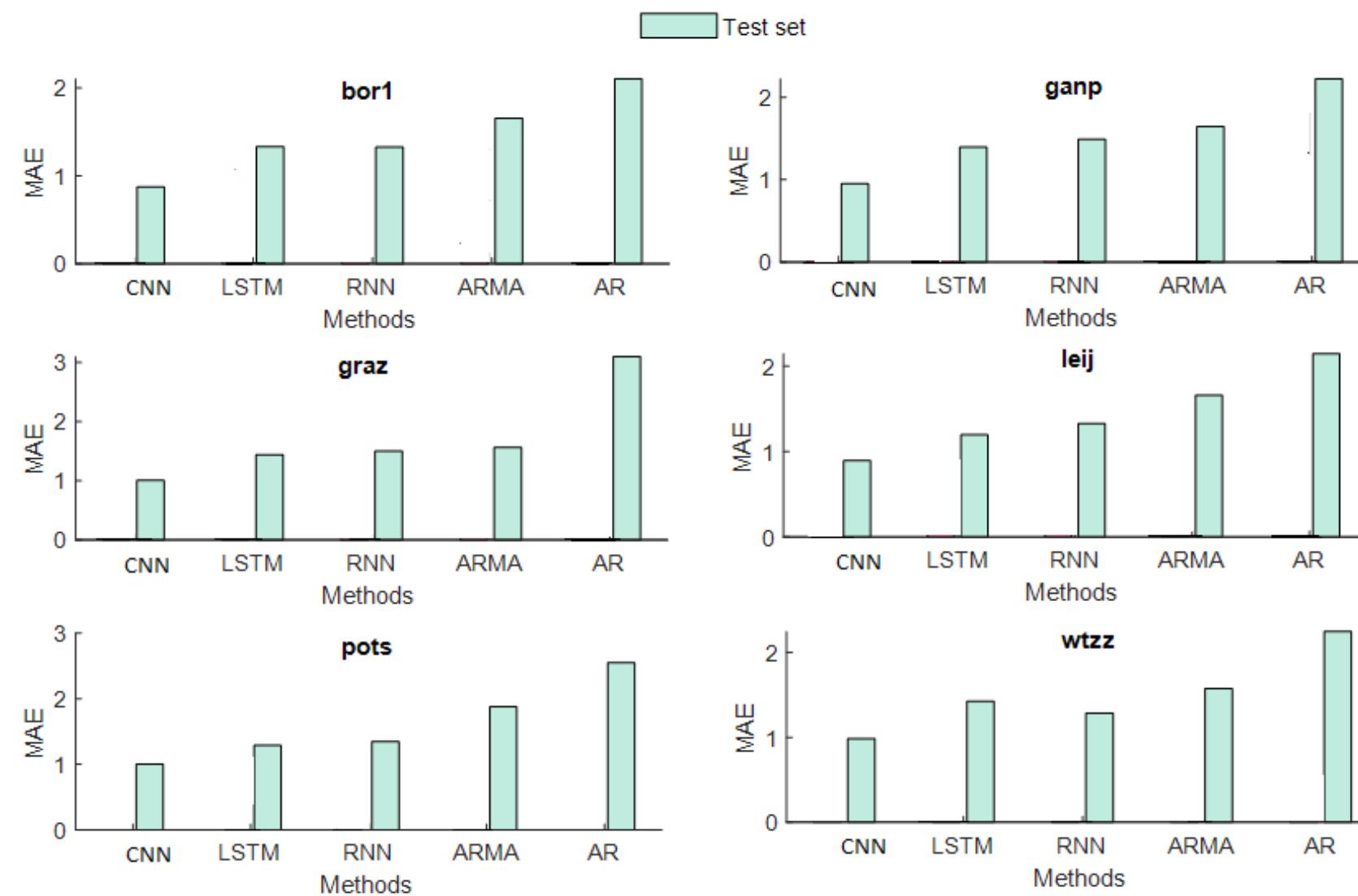
METRICS

$$bias_r^s(t) = vtec_{r,CNN}^s(t) - vtec_{r,GROUND\ TRUTH}^s(t)$$

- s is the GPS satellite in view ($G01, G02, \dots, G32$),
- r is the receiver station (MGEX experiment STATIONS: *bor1, ganp, graz, leij, pots, wtzz*),
- $vtec_{r,CNN}^s(t)$ the predicted TEC value from the CNN model
- $vtec_{r,GROUND\ TRUTH}^s(t)$ the ground truth value (GAMP software)

$$MAE_r^s = \sqrt{\frac{1}{T} \sum_{i=1}^T |vtec_{r,CNN}^s(t) - vtec_{r,GROUND\ TRUTH}^s(t)|}$$

COMPARISONS



Comparison:
LSTM
(Long Short-term Memory Network)

RNN
(Recurrent Neural Network)

ARMA
(Autoregressive Moving Average)

AR
(Autoregressive)

Thank you !

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