

Coupling machine learning with high resolution satellite imagery to estimate spatiotemporal changes of salinity in water bodies

Majid Bayati and Mohammad Danesh-Yazdi

Department of Civil Engineering,
Remote Sensing Research Center (RSRC),
Sharif University of Technology, Tehran, Iran



Aquatic biodiversity and life affected by salinity



Bathymetry change by salt precipitation and dissolution

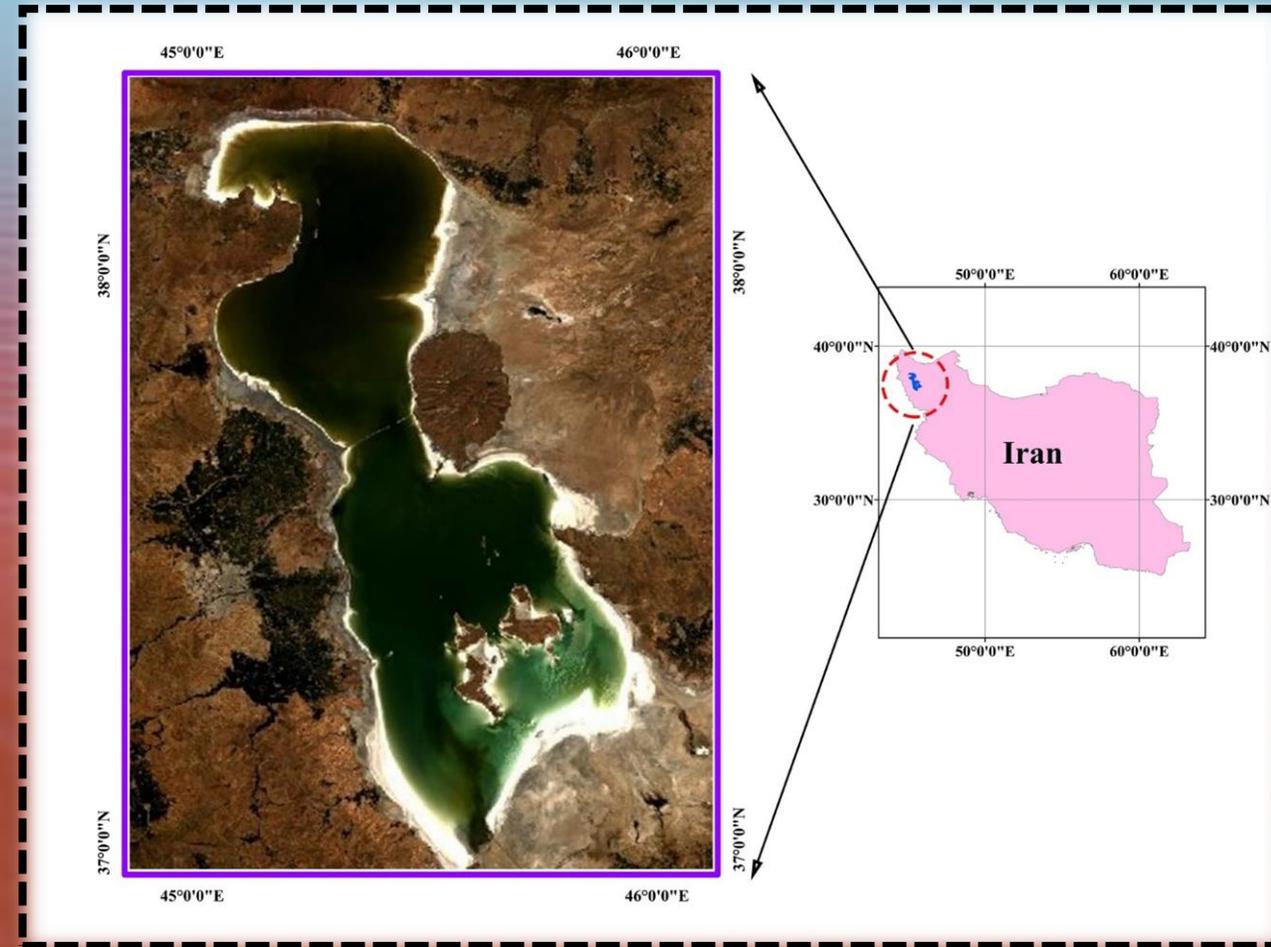


Salinity affecting the rate of water evaporation

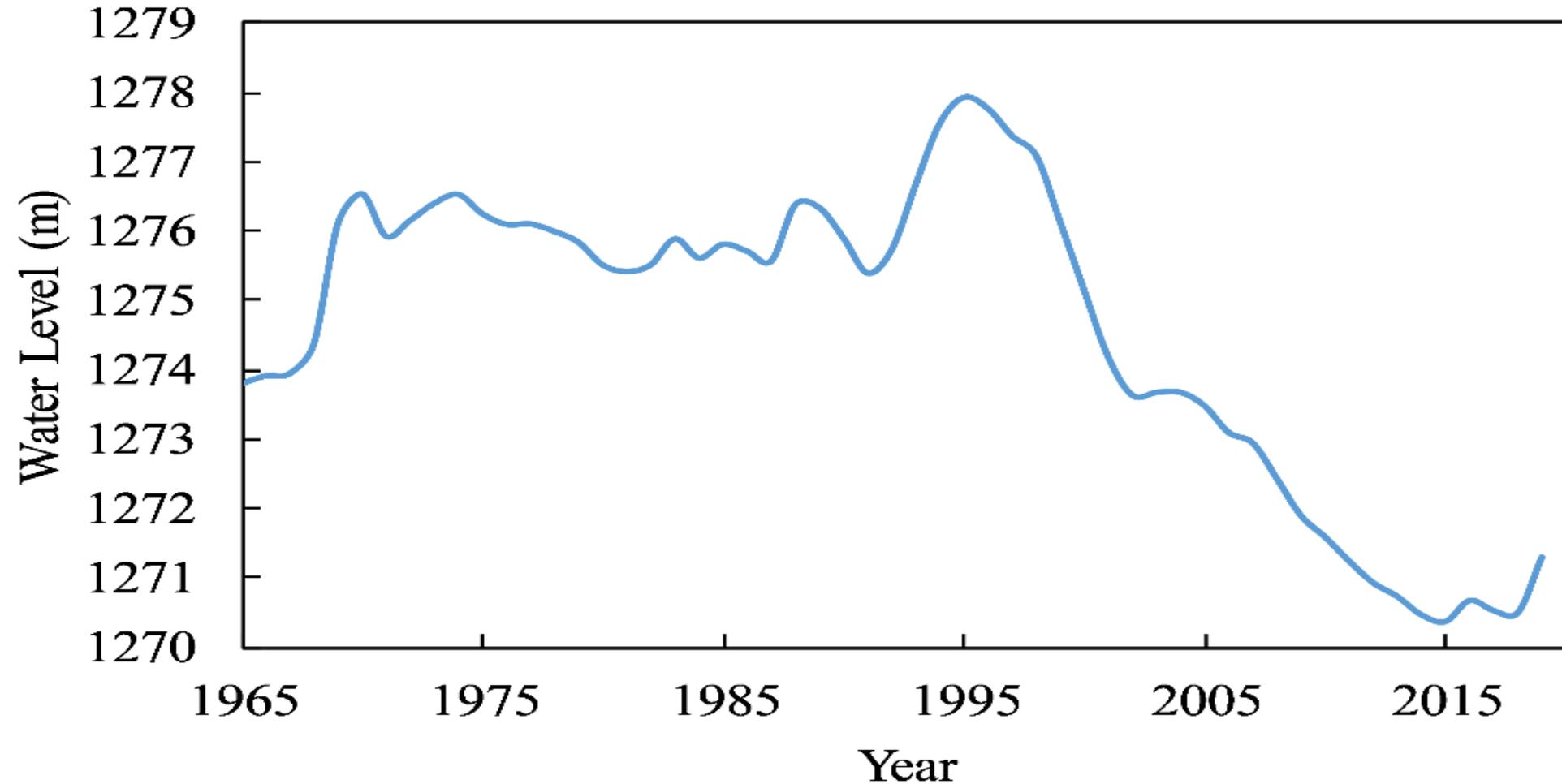


Study Area

- Lake Urmia (LU) located in northwestern, Iran
- The second greatest hypersaline lake in the world
- Habitat of a rare brine shrimp species (*Artemia Urmiana*)



Lake Urmia **Water level** changes





1995



2000



2006



2010



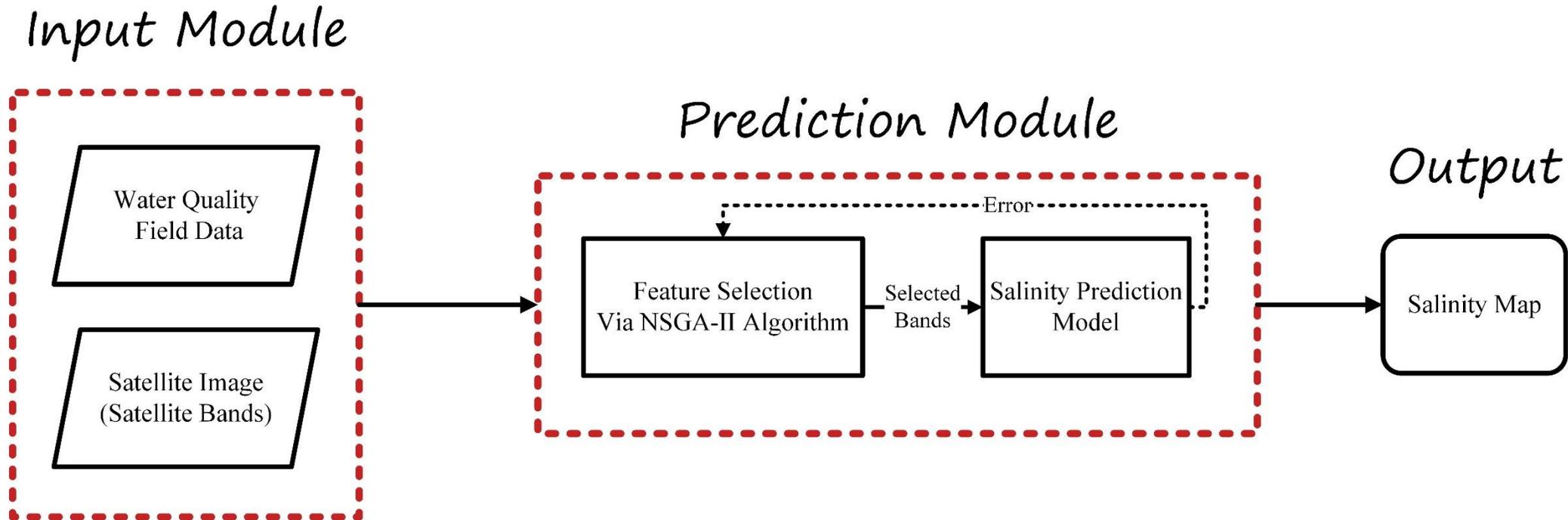
2014



2018

Modeling framework

Adaptive learning framework for surface water salinity prediction

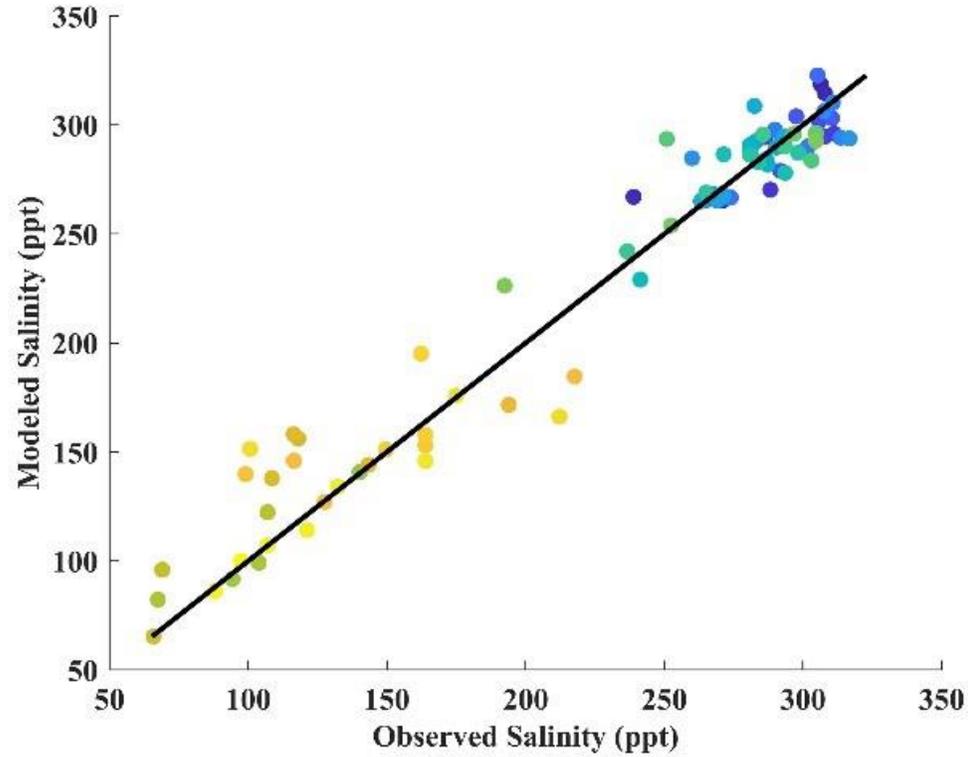


Salinity Sampling on July 16th, 2019

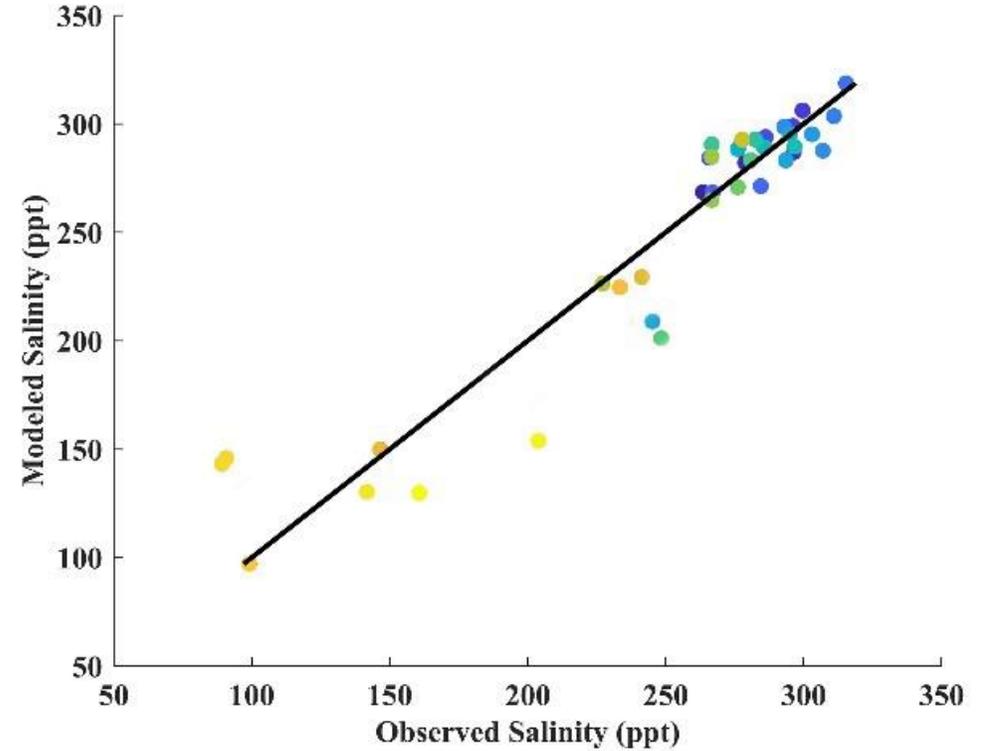


Applying **Artificial Neural Network** (ANN)

Training: $R^2=0.95$

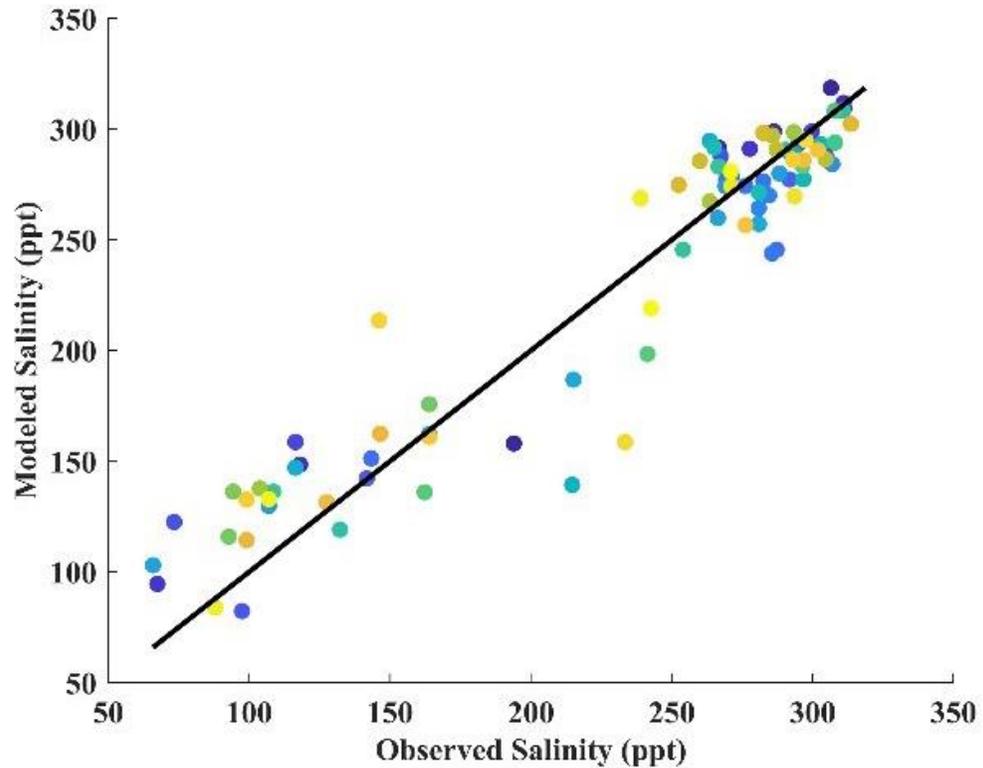


Test: $R^2=0.92$

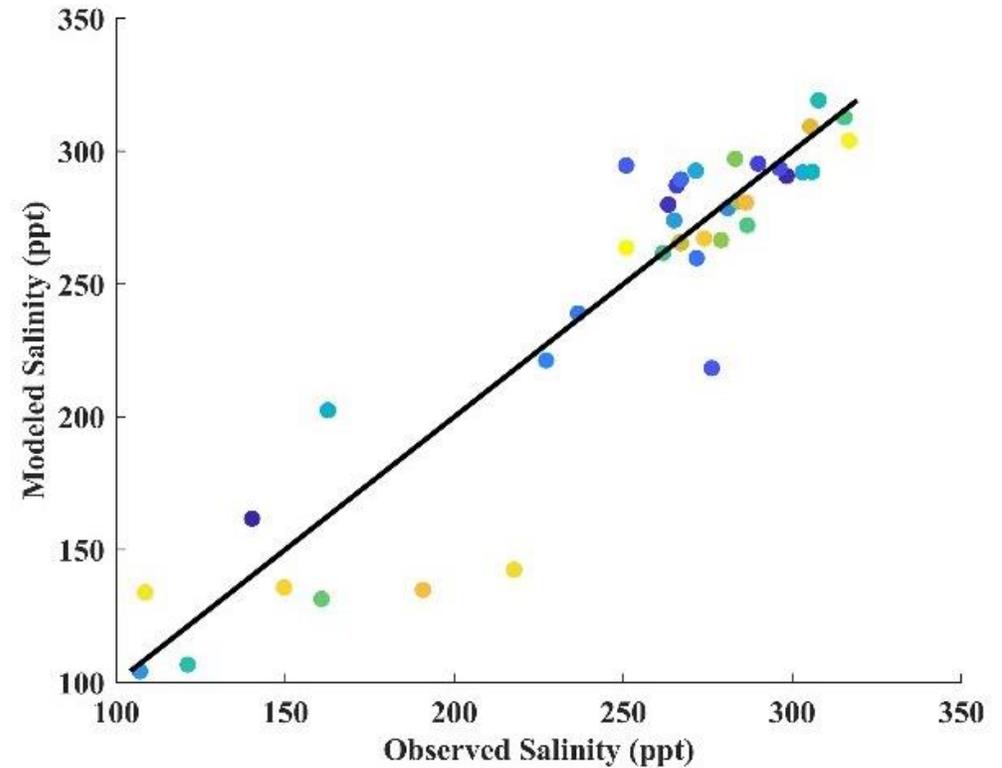


Applying **Adaptive Neuro Fuzzy Inference System (ANFIS)**

Training: $R^2=0.89$

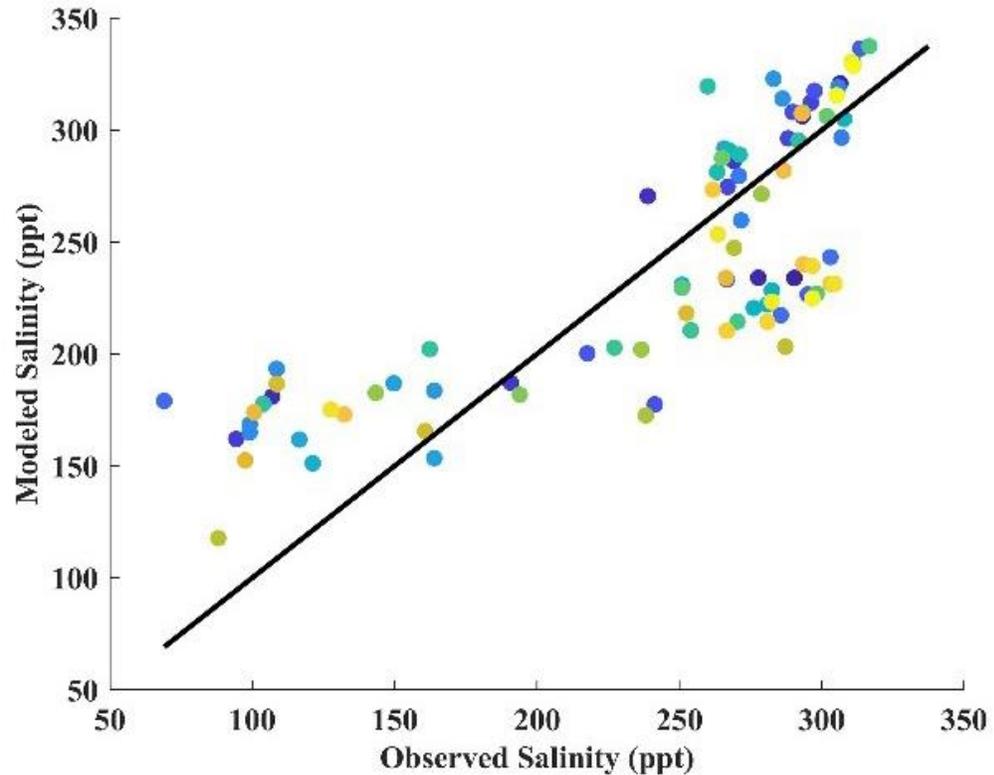


Test: $R^2=0.84$

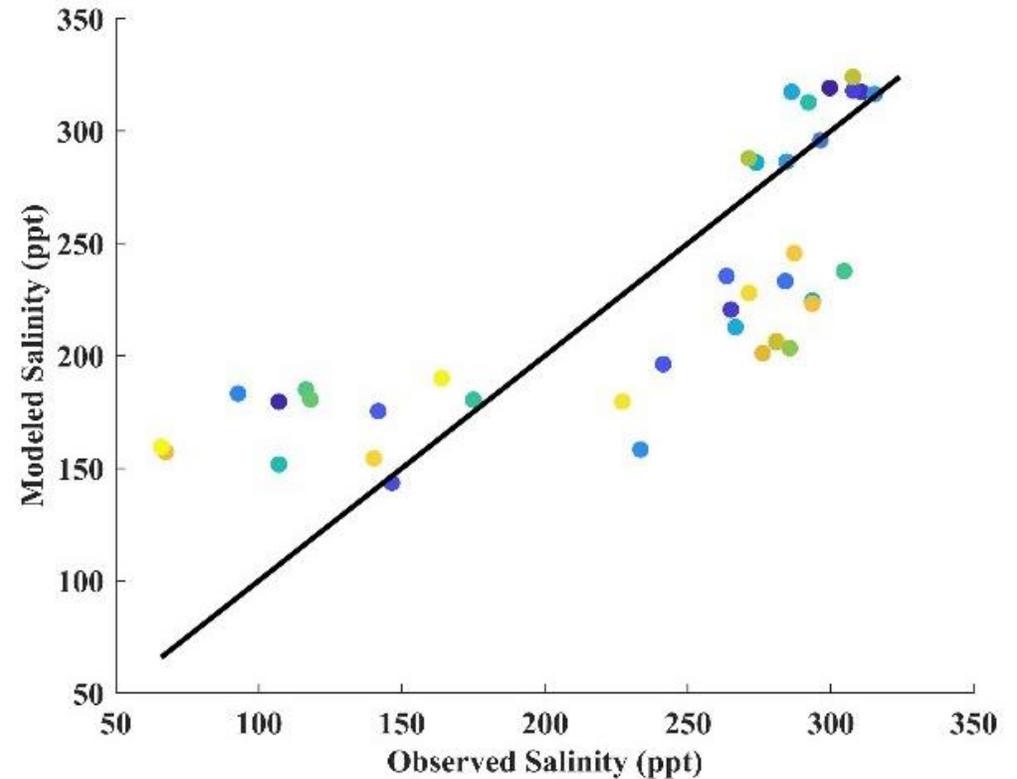


Applying **Multiple Linear Regression** (MLP)

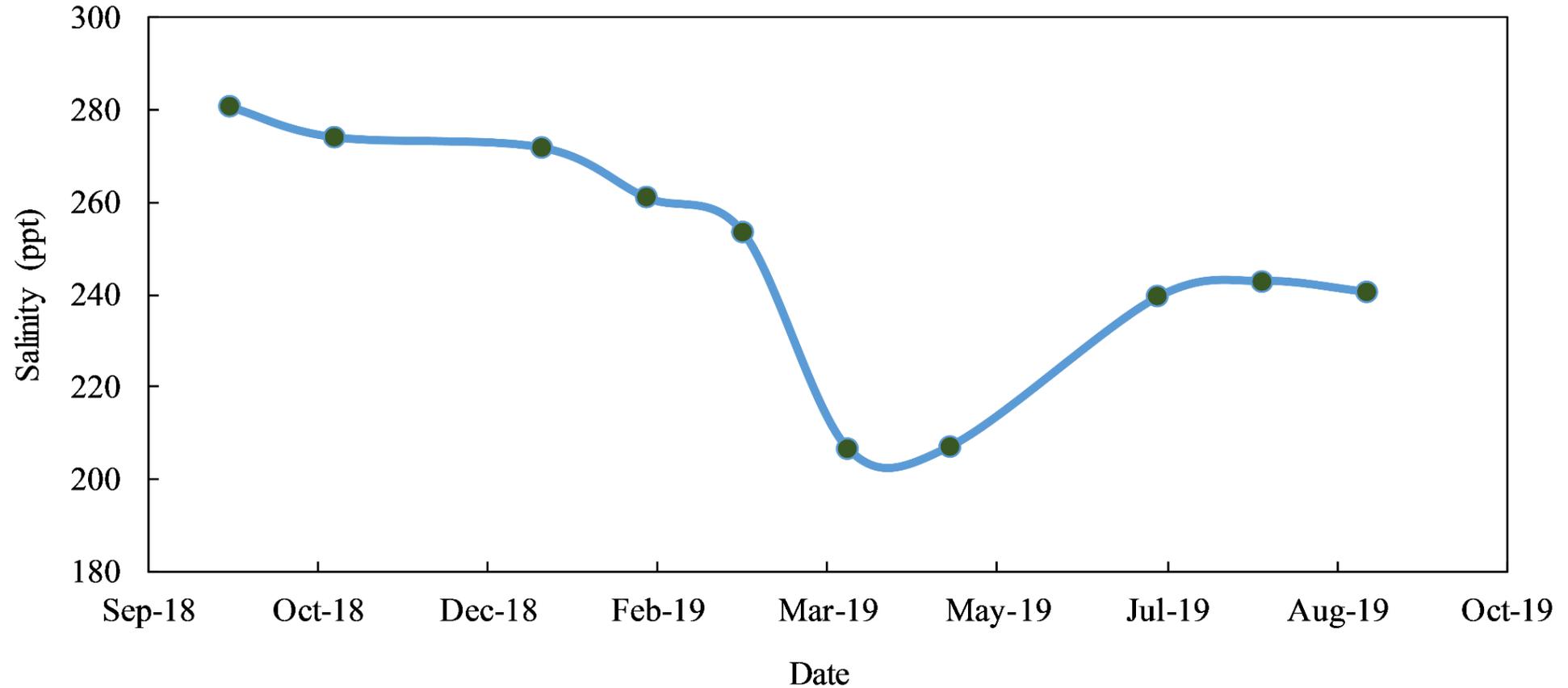
Training: $R^2=0.61$



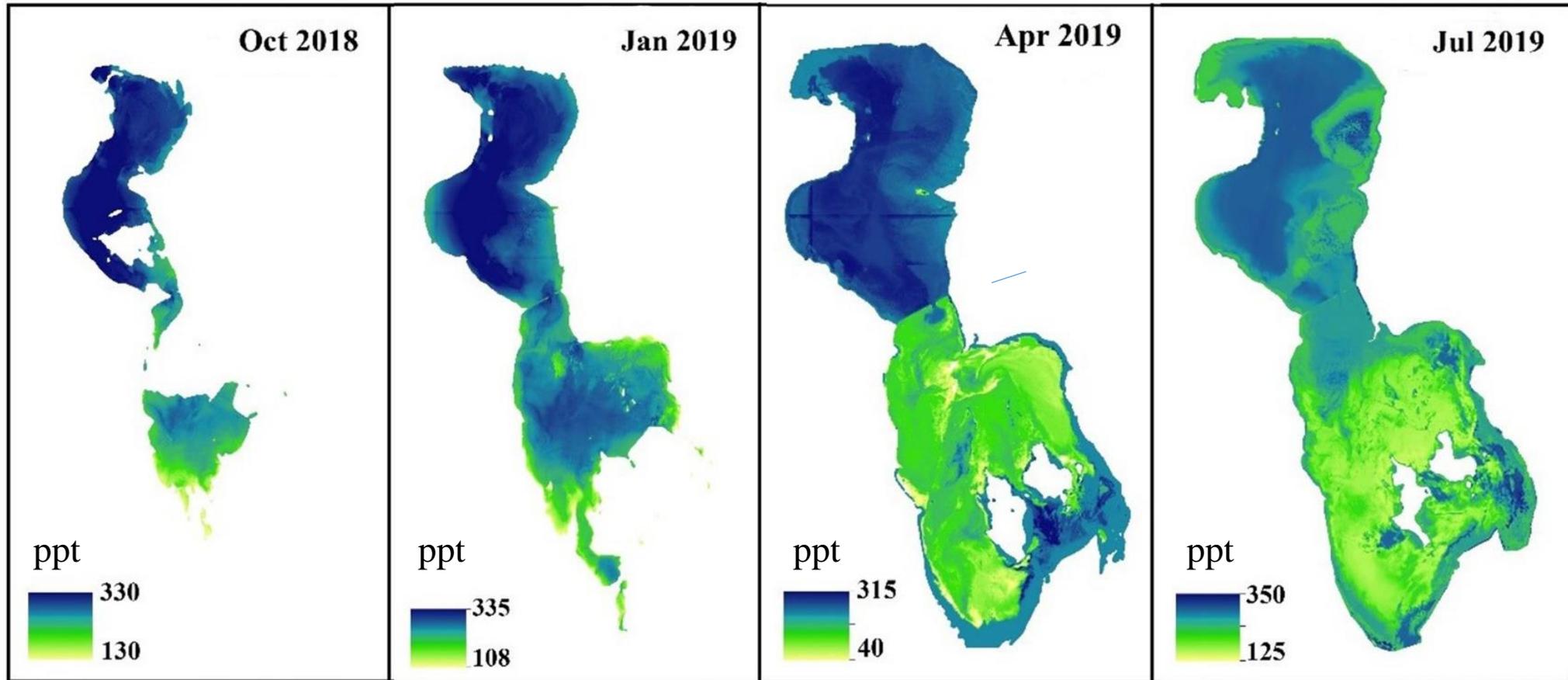
Test: $R^2=0.57$



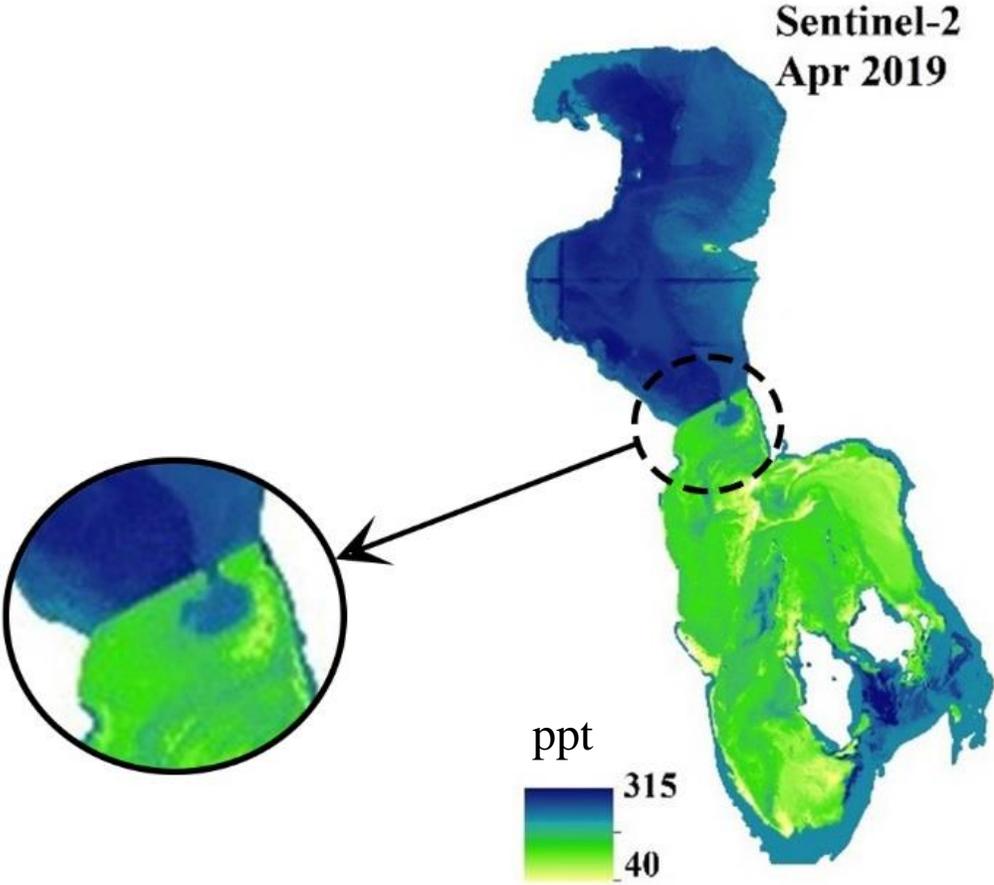
Annual Mean Salinity Variation of LU (ANN)



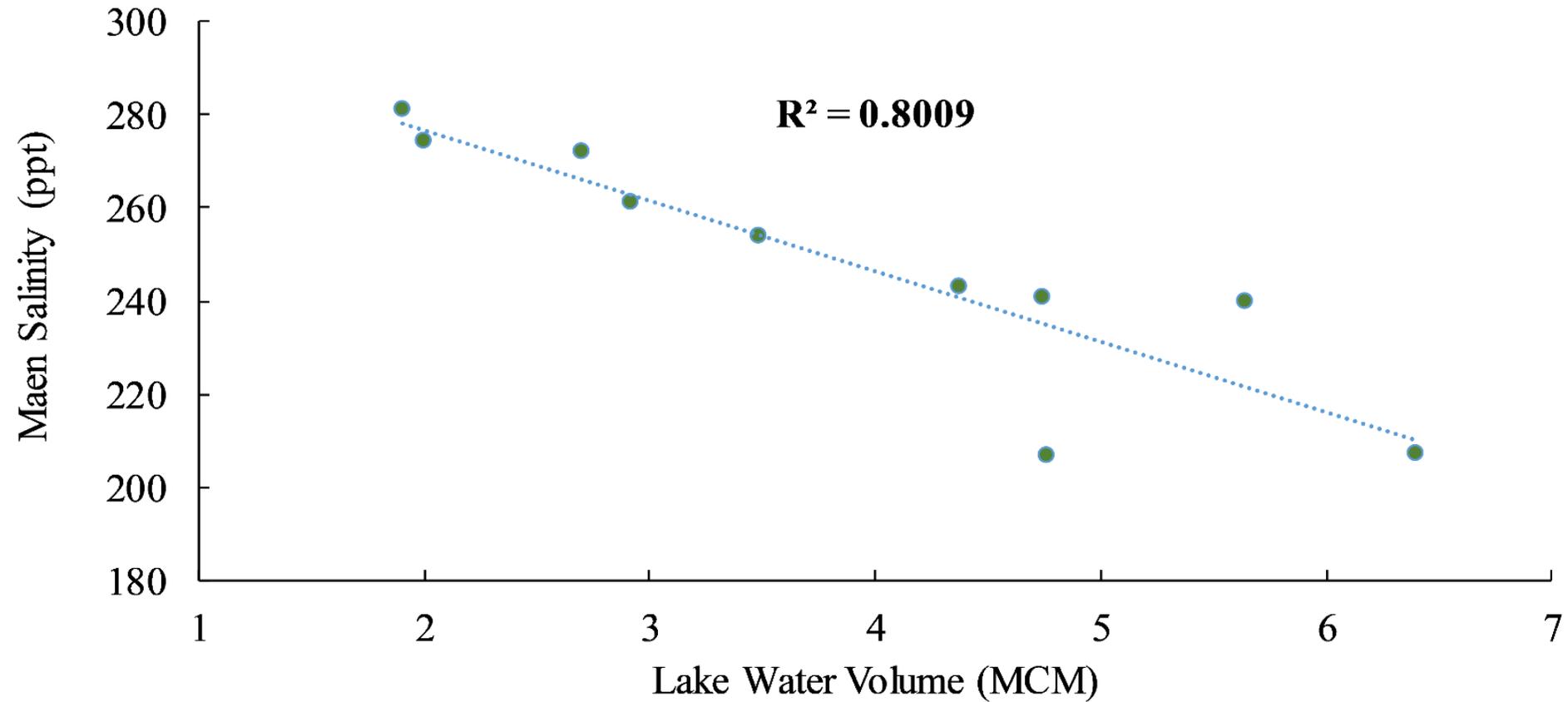
Lake Urmia Seasonal Salinity Variation

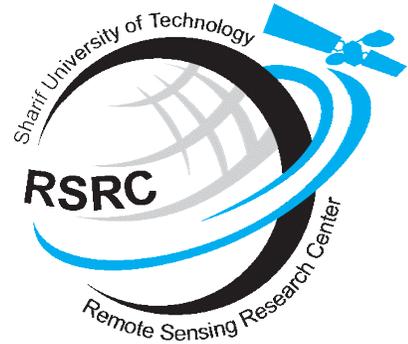


Adverse consequences of middle Causeway in LU



Salinity-Volume relation in LU





Thanks for your attention



danesh@sharif.edu
Majid.bayati.ara@gmail.com



www.rsrc.sharif.ir

