



information
fusion lab



Zero-shot micro-climate prediction with deep learning



Climate Change AI

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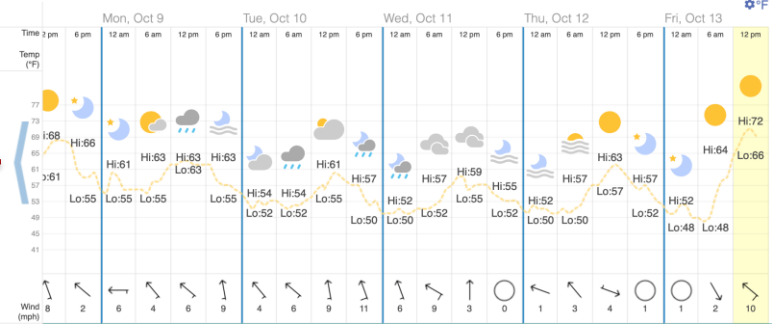
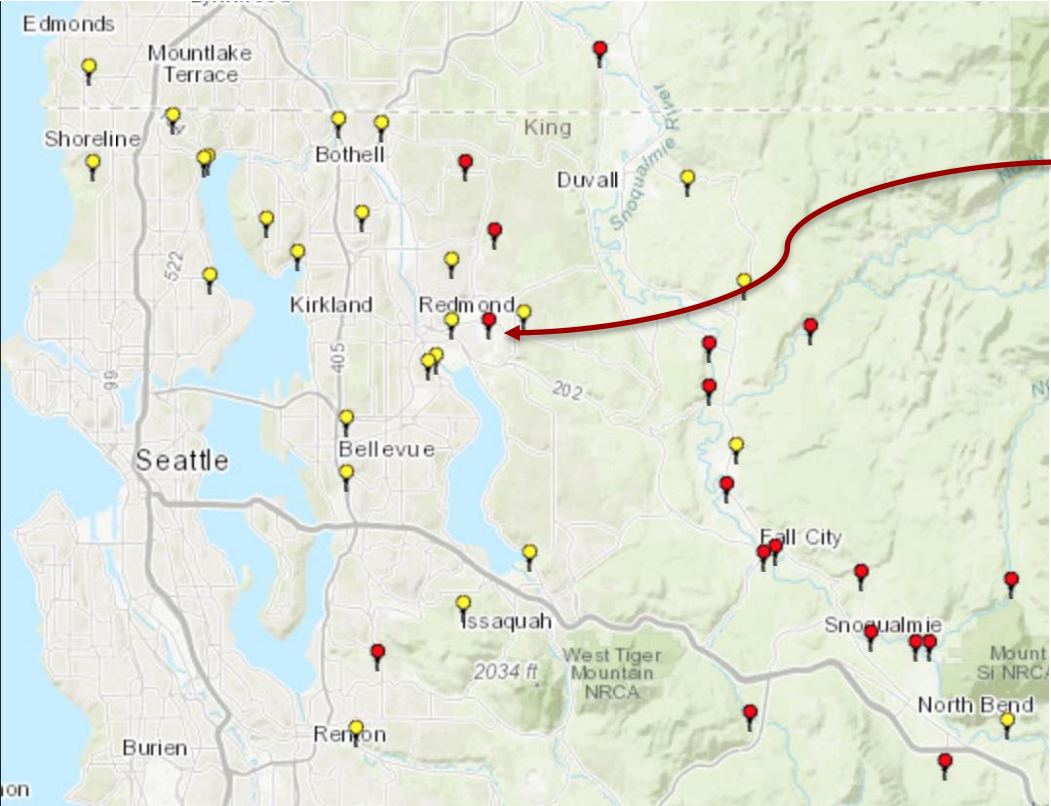
1. Manning college of information and computer sciences, University of Massachusetts Amherst, MA, USA
2. Microsoft Research, Redmond, WA, USA



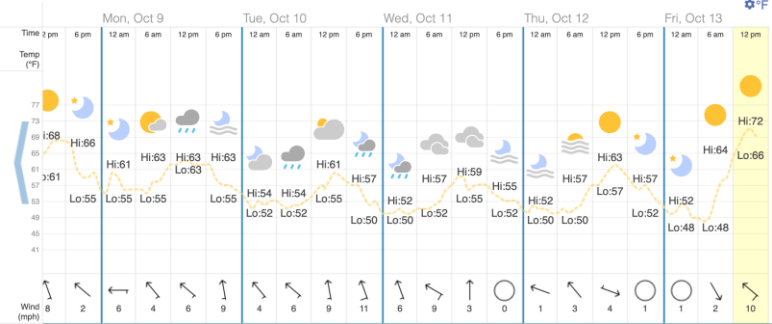
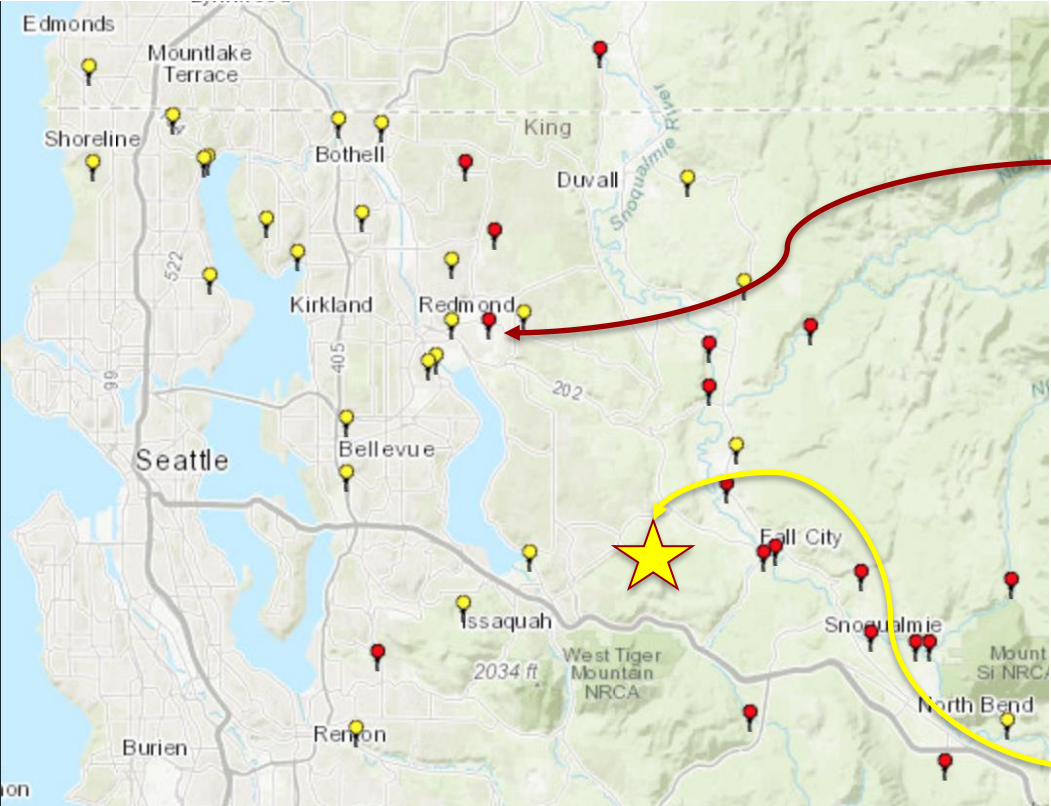
Micro-climate prediction

- Micro-climate prediction:
 - Detailed weather analysis for small, specific regions.
 - Crucial in many applications
 - agriculture, forestry, architecture, urban planning, ecology, and maritime activities;
 - Enhances decision-making and resource allocation
 - Aids in climate change adaptation.

Zero-Shot Micro-Climature Prediction

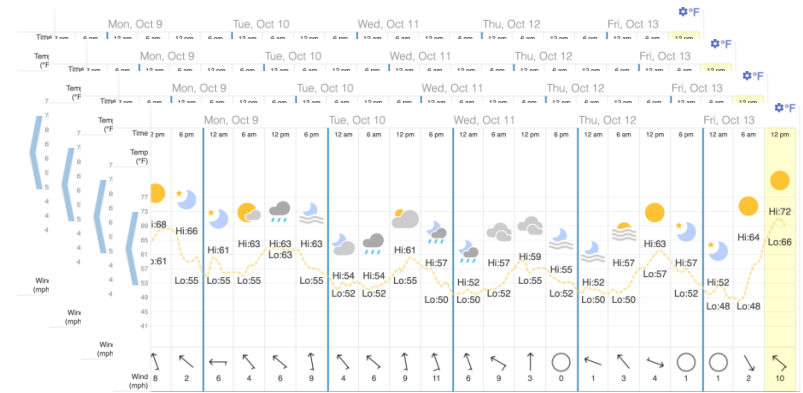
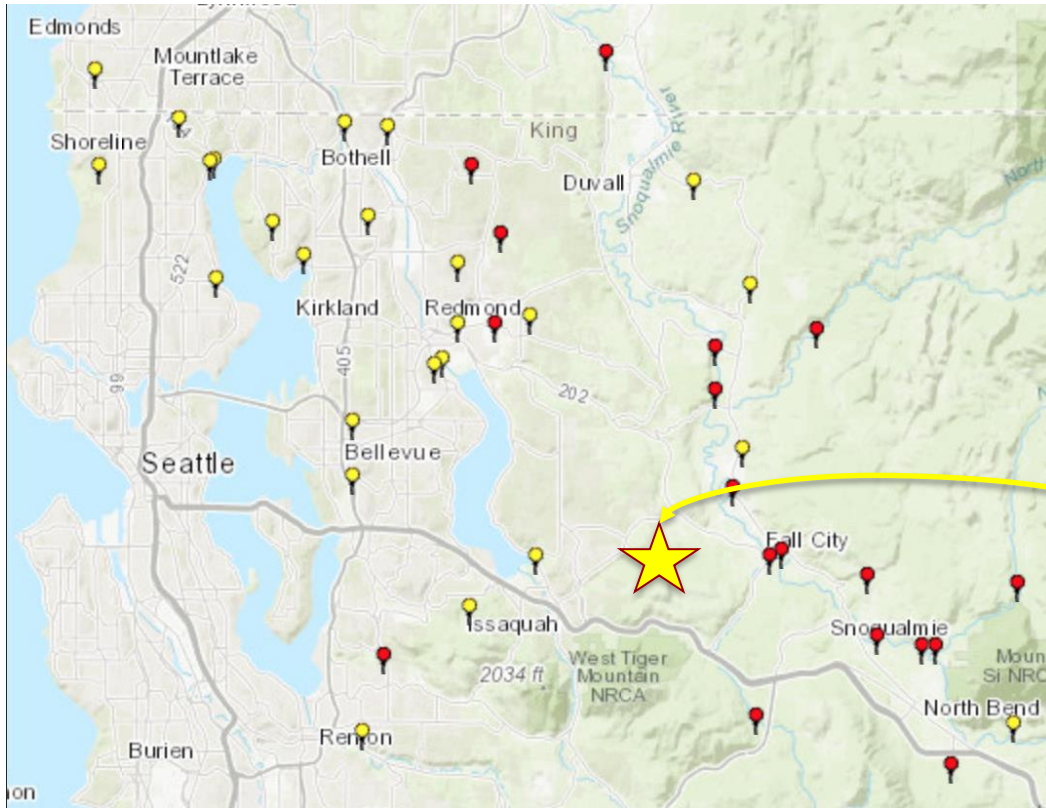


Zero-Shot Micro-Climature Prediction



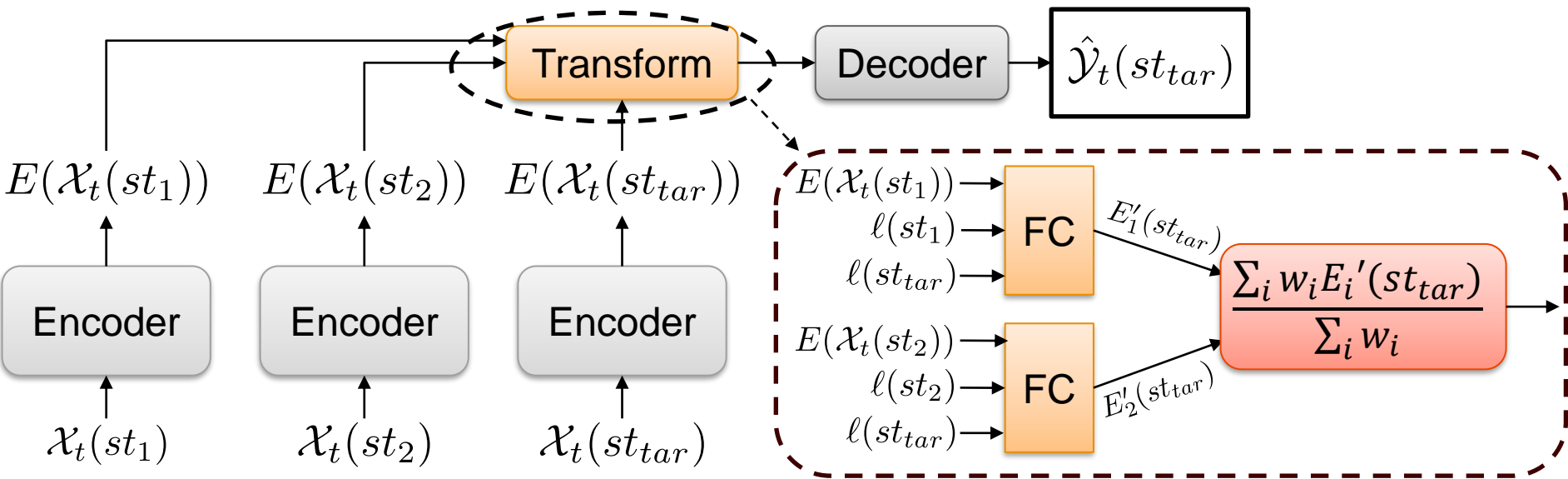
! New Location

Zero-Shot Micro-Climature Prediction



Task: based on data from other weather stations, perform *micro-climate prediction for the new location*

Zero-Shot Micro-Climate Prediction

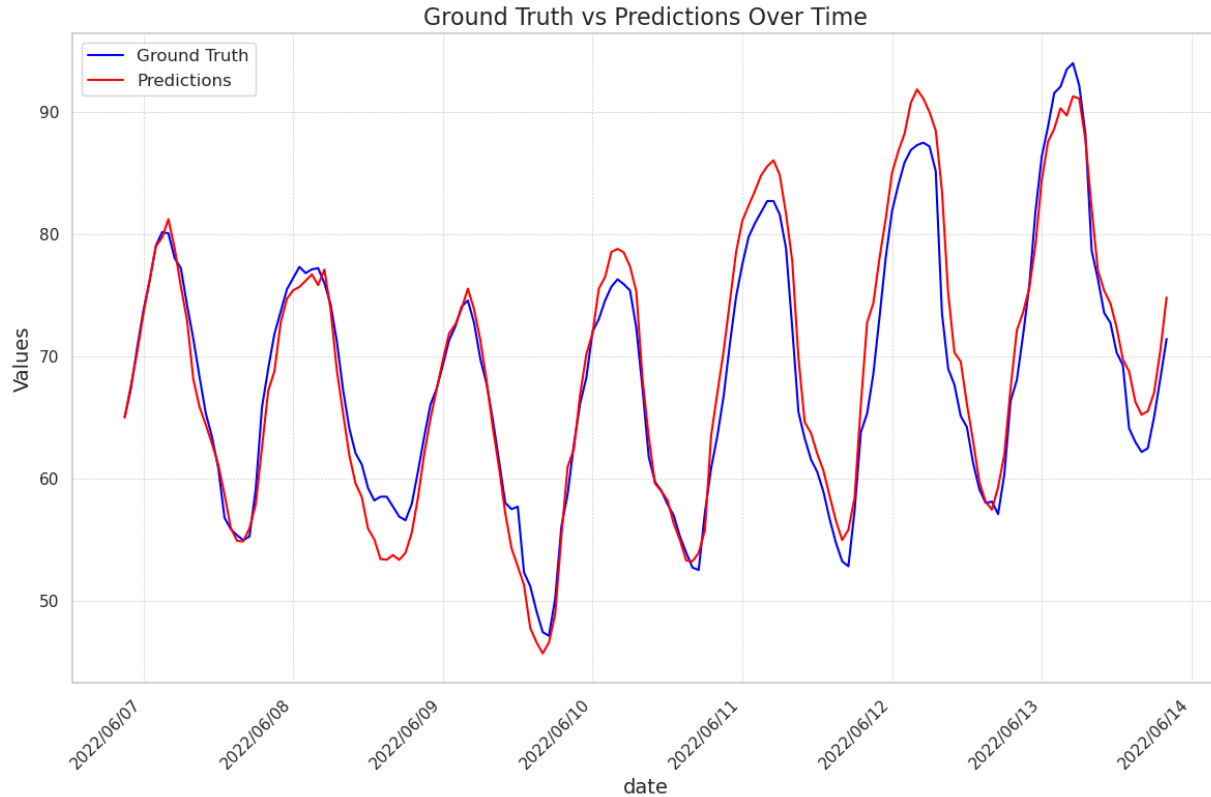


ℓ = geographic data encompassing latitude, longitude, and elevation

Zero-Shot Micro-Climate Prediction

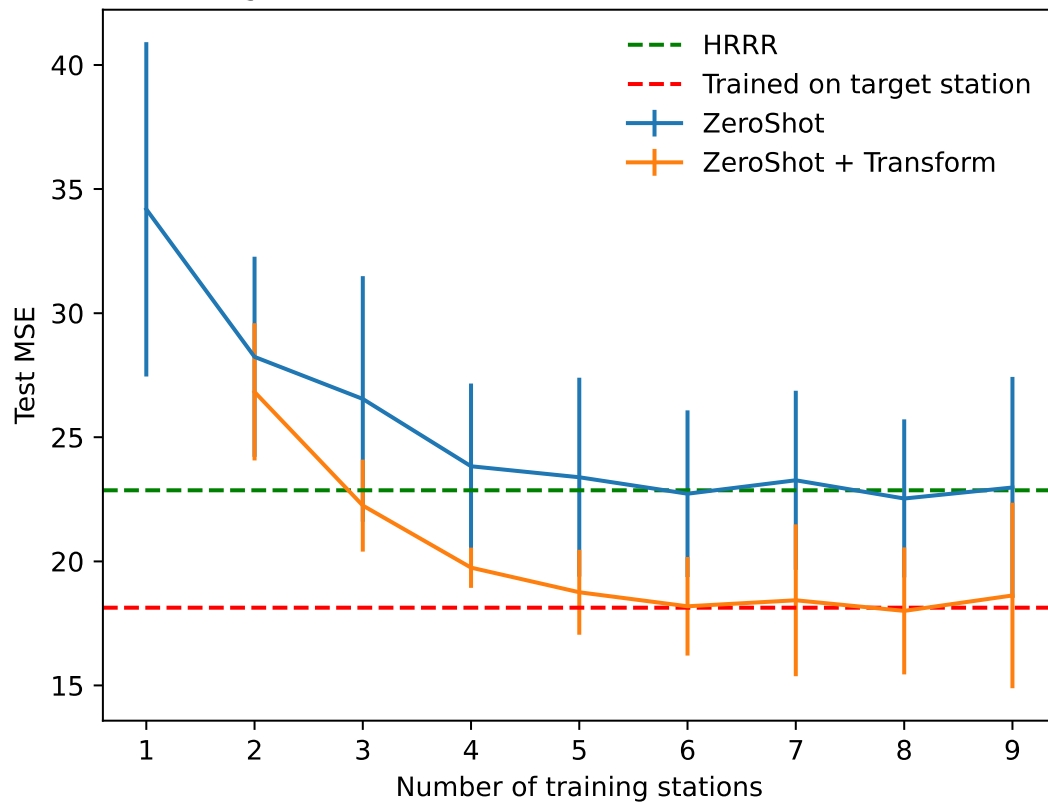
AgweatherNet	MSE	MAE
Full data		
Last value	97.66	7.42
Moving avg	63.41	6.19
Persistence model	26.99	3.88
Auto Reg.	17.42	3.07
HRRR	25.53	3.86
Informer	17.9 \pm 1.12	3.21 \pm 0.15
Informer + transform	14.42 \pm 0.86	2.85 \pm 0.05
Zero shot		
Informer	19.77 \pm 0.84	3.41 \pm 0.24
Informer + transform	15.02 \pm 0.32	2.95 \pm 0.02

Model predictions



Zero-Shot Micro-Climate Prediction

Avg MSE of ZeroShot vs. ZeroShot + Transform



Conclusions and future direction

Future Directions

- **Extensive Model Evaluation:**
 - Broader testing with various weather datasets coming from diverse regions.
 - Detailed theoretical and practical analyses using synthetic data.
- **Enhancing the Transformation Function:**
 - Plans to incorporate more location-specific details.
 - Introduction of a more complex structural design for the transformation.

Thank you!

Code



https://github.com/Information-Fusion-Lab-Umass/Zero_Shot_MicroClimate_Prediction