Yuchuan Lai

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Professional Positions

Research Engineer

Tetra Tech, Inc.

Research and Development

Lafayette, CA

Sep 2022 – Present

Postdoctoral Research Associate

Carnegie Mellon University

Civil and Environmental Engineering

Pittsburgh, PA

Oct 2020 – Aug 2022

Graduate Research Assistant

Carnegie Mellon University

Civil and Environmental Engineering

Pittsburgh, PA

Aug 2017 – Sep 2020

Education

Ph.D. Civil and Environmental Engineering

Carnegie Mellon University

Sep 2020

Pittsburgh, PA

M.S. Civil and Environmental Engineering

Carnegie Mellon University

May 2016

Pittsburgh, PA

B.S. Civil Engineering

Southeast University

Jun 2015

Nanjing, China

Experience

Research ……………………………………………………………………………………………………

Postdoctoral Research Associate, Carnegie Mellon University   Pittsburgh, PA

Advisors: Matteo Pozzi, Peter J. Adams

From Future Learning to Current Action: Long-Term Sequential Infrastructure Planning Under Uncertain Climate Change   Oct 2020 - Present

- Develop physical-parameters-based state space models for projecting future climate change.
- Implement Bayesian inference for assessing global climate model projections.
- Assess the dependence of projection uncertainty with respect to the availability of observation data.
- Integrate stochastic dynamical programming for engineering decision-making.

Ph.D. Researcher, Carnegie Mellon University   Pittsburgh, PA

Advisor: David A. Dzombak

Use of Historical Data to Assess and Forecast Regional Climate Change and Implications for Engineering Applications   Aug 2017 - Sep 2020

- Compiled and provided an open access to historical daily and annual climate records for over 100 U.S. cities.
- Performed trend analyses on historical temperature and precipitation records of individual U.S. cities.
- Developed statistical near-term climate forecasting techniques based on compiled historical climate data.

- Compared statistical forecasts with downscaled global climate model projections.
- Evaluated engineering applications of regional climate model projections.
- Evaluated the effects of increasing air temperature on the water quality in drinking water distribution systems.
- Developed long-term forecasting techniques combining statistical forecasting and climate model projections.

M.S. Researcher, Carnegie Mellon University   Pittsburgh, PA

Sustainable Engineering Project course   Jan 2016 – May 2016
- Utilized the ArcGIS to estimate the annual soil loss for the Wolf Creek reservoir (Coffey County, KS).
- Estimated the lifetime of the Wolf Creek reservoir based on the annual soil loss.

Independent Study Project: 'Simply Structural'   Aug 2015 – Dec 2015
- Designed an online server to generate simple structural calculations.
- Designed an iOS app allowing users to quickly access structural calculations.

B.S. Researcher, Southeast University   Nanjing, China

Chinese National Student Innovation Training Program   Dec 2012 – Nov 2014
- Evaluated the historical development of Chinese drinking water standard.
- Analyzed the similarities and differences between Chinese, WTO, and EPA drinking water standards.
- Assessed potential future amendments for Chinese drinking water standard.

Teaching …………………………………………………………………………………………………

Teaching Assistant, Carnegie Mellon University   Pittsburgh, PA

12-726 Mathematical Modeling of Environmental Quality Systems   Jan 2020 – May 2020
Instructor: Mitchell Small
- Provided reinforcement of course materials, held regular office hours, and helped students with assignments.
- Gave lectures about applications of MATLAB and introductions of global climate models.

12-749 Climate Change Adaptation   Jan 2019 – May 2019
Instructor: Constantine Samaras
- Developed class activities for students to acquire historical and future regional climate data.
- Developed class activities for students to perform climate data analyses with the computational language R.
- Helped develop an individual project to evaluate engineering adaptations to climate change.

12-766 Climate Change Science and Solutions   Aug 2018 – Dec 2018
Instructor: Parth Vaishnav
- Helped develop a mid-term exam on climate science and global climate change.
- Led the development of an individual project using the climate change impact assessment model GCAM.

Advising ……………………………………………………………………………………………………

At Carnegie Mellon University   Pittsburgh, PA

Master Student:
Shuochen Wang   Jan 2022 – Aug 2022
Use of Pattern Scaling and the ARIMA Model to Forecast Regional Temperature

Honors and Awards

Mao Yisheng Outstanding Dissertation Award (2021)

Member of the Honor Society Phi Kappa Phi (2018 - Present)

Carnegie Mellon University College of Engineering Dean's Fellowship Recipient (2017)

Member of the Civil Engineering Honor Society Chi Epsilon (2015 - Present)

Carnegie Mellon University Civil Engineering Scholarship (2015)

ASCE Environmental Competition at Ohio Valley Student Conference. 3rd place for overall treatment, 2nd place for Poster and Display, and 2nd place for Most Creative Apparatus (2015)

Guanghua Scholarship (2014)

Southeast University Institute of Design Scholarship (2013)

Professional Certification

Engineer in Training (E.I.T.) issued April 2016 by the National Council of Examiners for Engineering and Surveying. Credential ID: 15-909-92.

Languages

Chinese (native)

English (fluent)

Japanese (proficient)

Publications

Peer-reviewed journal articles …………………………………………………………………………………………

Lai, Y., P.J. Adams, and M. Pozzi. Assessing Climate Change Uncertainty with Physical-parameter-based State-Space Models and Bayesian Inference. In preparation.

Lai, Y., T. Lopez-Cantu, D.A. Dzombak, and C. Samaras. 2022. Framing the Use of Climate Model Projections in Infrastructure Engineering – Practices, Uncertainties, and Recommendations. *Journal of Infrastructure Systems.* 28 (3), 04022020. https://doi.org/10.1061/(ASCE)IS.1943-555X.0000685

Lai, Y. and D.A. Dzombak. 2021. Assessing the Effect of Changing Ambient Air Temperature on Water Temperature and Quality in Drinking Water Distribution Systems. *Water*. 13(14), 1916. https://doi.org/10.3390/w13141916

Lai, Y. and D.A. Dzombak. 2021. Use of Integrated Global Climate Model Simulations and Statistical Time Series Forecasting to Project Regional Temperature and Precipitation. *Journal of Applied Meteorology and Climatology.* 60, 695–710. https://doi.org/10.1175/JAMC-D-20-0204.1

Lai, Y. and D.A. Dzombak. 2020. Use of the Autoregressive Integrated Moving Average (ARIMA) Model to Forecast Near-term Regional Temperature and Precipitation. *Weather and Forecasting*, 35, 959–976, https://doi.org/10.1175/WAF-D-19-0158.1

Lai, Y. and D.A. Dzombak. 2019: Use of Historical Data to Assess Regional Climate Change. *Journal of Climate*, 32, 4299–4320, https://doi.org/10.1175/JCLI-D-18-0630.1

Conference proceedings - abstracts………

Lai, Y. and D.A. Dzombak. 2022. Use of Historical Data to Forecast Regional Climate Change and Implications for Engineering Applications. 2022 Association of Environmental Engineering and Science Professors (AEESP) Research and Education Conference.

Lai, Y., P.J. Adams, and M. Pozzi. 2022. Assessing Climate Projection Uncertainty with the Physical-parameter-based Probabilistic Model. International Symposium for Sustainable Systems and Technology 2022.

Lai, Y., P.J. Adams, and M. Pozzi. 2022. Assessing Uncertainty in Climate Forecasting with Physical-Based Probabilistic State-Space Models. ASCE Engineering Mechanics Institute Conference 2022.

Lai, Y., P.J. Adams, and M. Pozzi. 2021. Assessing Climate Change Projection Uncertainty with Physical-parameter-based States-Space Models and Bayesian Inference. AGU Fall Meeting 2021.

Lai, Y., P.J. Adams, and M. Pozzi. 2021. Assessing Climate Change Uncertainty for Infrastructure Planning with Physical-parameter-based State-Space Model and Bayesian Inference. ASCE International Conference on Sustainable Infrastructure 2021.

Lai, Y. and D.A. Dzombak. 2021. Use of Regional Air Temperature Observations and Projections to Assess Effect of Water Temperature Change in Drinking Water Distribution Systems. ASCE International Conference on Sustainable Infrastructure 2021.

Lai, Y. and D.A. Dzombak. 2021. Use of A Statistical Time Series Forecasting Model for Location-specific Temperature and Precipitation to Facilitate Engineering Applications. International Symposium for Sustainable Systems and Technology 2021.

Lai, Y. and D.A. Dzombak. 2020. Integration of A Statistical Time Series Forecasting Model with GCMs to Provide Location-specific Regional Temperature and Precipitation Projections. AGU Fall Meeting 2020.

Lai, Y. and D.A. Dzombak, 2019. Use of Historical Data to Forecast Regional Climate Change. AGU Fall meeting 2019.

Lai, Y. and D.A. Dzombak, 2019. Use of Historical Data to Assess and Forecast Regional Climate Change. ASCE International Conference on Sustainable Infrastructure 2019.

Lai, Y. and D.A. Dzombak, 2019. Use of Historical Data to Assess and Forecast Regional Climate Change. ASCE 2019 World Environmental & Water Resources Congress.

Lai, Y. and D.A. Dzombak, 2018. Use of Historical Data to Assess and Forecast Regional Climate Change. AGU Fall meeting 2018.

Lai, Y. and D.A. Dzombak, 2018. Use of Historical Data to Assess Regional Climate Change. 2018 UCOWR/NIWR Annual Water Resources Conference.

Published datasets and software ……………………………………………………………………………………………

Lai, Y. and D.A. Dzombak. 2020. Statistical Climate Forecasting Integrated for Civil and Environmental Engineering (scifi) R Package. https://github.com/yuchuan-lai/scifi.

Lai, Y. and D.A. Dzombak. 2019. Compiled historical daily temperature and precipitation data for selected 210 U.S. cities. Carnegie Mellon University, Dataset, https://doi.org/10.1184/R1/7890488.

Lai, Y. and D.A. Dzombak. 2019. Historical changes of annual temperature and precipitation indices in the U.S. cities. Carnegie Mellon University, Dataset, https://doi.org/10.1184/R1/7961012.v4.

Conference Presentations

Lai, Y. and D.A. Dzombak. (2022). Use of Historical Data to Forecast Regional Climate Change and Implications for Engineering Applications. 2022 AEESP Research and Education Conference, St. Louis, June 29, 2022.

Lai, Y., P.J. Adams, and M. Pozzi. (2022). Assessing Climate Projection Uncertainty with the Physical-parameter-based Probabilistic Model. International Symposium for Sustainable Systems and Technology 2022, Pittsburgh, PA June 23, 2022.

Lai, Y., P.J. Adams, and M. Pozzi. (2022). Assessing Uncertainty in Climate Forecasting with Physical-Based Probabilistic State-Space Models. ASCE Engineering Mechanics Institute Conference 2022, Baltimore, MD, June 2, 2022.

Lai, Y., P.J. Adams, and M. Pozzi. (2021). Assessing Climate Change Projection Uncertainty with Physical-parameter-based States-Space Models and Bayesian Inference. AGU Fall meeting 2021, Online, December 13, 2021.

Lai, Y., P.J. Adams, and M. Pozzi. (2021). Assessing Climate Change Uncertainty for Infrastructure Planning with Physical-parameter-based State-Space Model and Bayesian Inference. ASCE International Conference on Sustainable Infrastructure 2021, Online, December 10, 2021.

Lai, Y. and D.A. Dzombak. (2021). Use of Regional Air Temperature Observations and Projections to Assess Effect of Water Temperature Change in Drinking Water Distribution Systems. ASCE International Conference on Sustainable Infrastructure 2021, Online, December 6, 2021.

Lai, Y. and D.A. Dzombak. (2021). Use of A Statistical Time Series Forecasting Model for Location-specific Temperature and Precipitation to Facilitate Engineering Applications. International Symposium for Sustainable Systems and Technology 2021, Online, June 24, 2021.

Lai, Y. and D.A. Dzombak. (2020). Integration of A Statistical Time Series Forecasting Model with GCMs to Provide Location-specific Regional Temperature and Precipitation Projections. AGU Fall Meeting 2020, Online, December 19, 2020.

Lai, Y. and D.A. Dzombak, (2019). Use of Historical Data to Forecast Regional Climate Change. AGU Fall meeting 2019, San Francisco, CA, December 11, 2019.

Lai, Y. and D.A. Dzombak, (2019). Use of Historical Data to Assess and Forecast Regional Climate Change. ASCE International Conference on Sustainable Infrastructure 2019, Los Angeles, CA, Nov 08, 2019.

Lai, Y. and D.A. Dzombak, (2019). Use of Historical Data to Assess and Forecast Regional Climate Change. ASCE 2019 World Environmental & Water Resources Congress, Pittsburgh, PA, May 20, 2019.

Lai, Y. and D.A. Dzombak, (2018). Use of Historical Data to Assess and Forecast Regional Climate Change. AGU Fall meeting 2018, Washington DC, December 10, 2018.

Lai, Y. and D.A. Dzombak, (2018). Use of Historical Data to Assess Regional Climate Change. 2018 UCOWR/NIWR Annual Water Resources Conference, Pittsburgh, PA, June 26, 2018.

Krynock, M., **Lai, Y.,** Guo, J. (2015) ASCE Environmental Competition at Ohio Valley Student Conference. Cincinnati, OH, March 26-28, 2015.

Professional Affiliation and Activities

Memberships

      American Geophysical Union (2018 - Present)

American Society of Civil Engineers (2015 - Present)

Association of Environmental Engineering and Science Professors (2020 - Present)

Society of Environmental Toxicology and Chemistry (2019 - Present)

Activities - committees

Organizer of the graduate student group of the Infrastructure and Climate Network (Mar 2021 - Oct 2021)

Activities - reviewer for journals

Air Quality, Atmosphere and Health (Springer)

Applied Ocean Research (Elsevier)

Earth Systems and Environment (Springer)

Journal of Hydrometeorology (American Meteorological Society)

International Journal of Climatology (Wiley)

Urban Climate (Elsevier)