Computational Hydrology and Remote Sensing at Rice University

The *Computational Hydrology and Remote Sensing* research group at Rice University focuses on the intersection between water resources, food, and climate. Our research aims to aid actionable decision-making by improving hydrological information for monitoring and forecasting hydrological extremes and their impacts at the local scales. To this end, we develop scalable computational approaches for hyper-resolution hydrological prediction targeting regional to global scale applications by leveraging advances in satellite remote sensing, land surface modeling, artificial intelligence, big geospatial data, data fusion, and high-performance computing. More information at www.waterai.earth.

Our research group works on multidisciplinary projects in the following areas (and at their intersections) :

1. Advancing terrestrial hydrology through physics-based AI
2. Satellite remote sensing and AI data assimilation
3. Integrated Earth system modeling and climate change impacts
4. Prediction of extreme hydroclimate events (floods, droughts, wildfires)
5. Quantitative assessments of climate change and human interventions on water scarcity

Background:

Successful candidates will have a background in geosciences, environmental science and engineering, climate sciences, applied math, physics, scientific deep learning, or related fields. This is an excellent opportunity to develop expertise in land surface modeling, hydrologic prediction, satellite remote sensing, and data science while contributing to cutting-edge research in Earth science.

Essential Qualifications:

- Strong analytical skills, ability to think critically and solve problems effectively.
- A solid understanding of calculus and numerical methods.
- Experience with geospatial datasets (e.g., GeoTIFF, NetCDF, HDF5, Zarr) and data processing using Python geospatial libraries (e.g., dask, xarray, cartopy, rasterio).
- Familiarity with machine learning and/or deep learning concepts using Python (e.g., scikit-learn, PyTorch, TensorFlow) and interest in learning state-of-the-art approaches.
- Strong programming skills (UNIX/Linux, Python, shell scripting) for processing and visualization of simulation and remote sensing data.
- Eagerness to acquire new skills and adapt them to cutting-edge research in hydrology and Earth sciences.
- Excellent written and verbal communication.

Preferred Qualifications:

- Demonstrate a research track record of involvement in topics relevant to computational hydrology, remote sensing, or related fields.
- Experience with an advanced programming language (e.g., C, C++, Fortran, etc.)
- Experience with big geospatial data and/or satellite remote sensing.

- Hands-on experience with machine learning or deep learning frameworks (e.g., TensorFlow, PyTorch).
- Experience with High-performance computing (HPC) systems and/or cloud computing (e.g., AWS, Google Cloud, etc.).
- Familiarity with version control systems for collaborative code development (e.g., Github, Gitlab)

All researchers will benefit from our group's involvement with national and international collaborative projects, ongoing partnerships with NOAA Climate Research Centers, and Rice's thriving and expanding programs, such as the Rice Data Science Initiative, Data to Knowledge Lab, Ken Kennedy Insitute, and the Rice Space Institute.

We believe that a diverse team enriches our workplace and enhances our impact. We strongly encourage applications from women, individuals from underrepresented minority groups, and all who can contribute to the further diversification of ideas and perspectives.

Application for PhD students:

PhD students should submit an application to Earth, Environmental, and Planetary Sciences (deadline of **January 3rd, 2025)**. International students should also meet the language proficiency requirements. Prospective graduate students can email Dr. Vergopolan (Noemi.Vergopolan@rice.edu) with the subject "Prospective PhD student" before applying. In the email, please include the following items: unofficial transcripts, curriculum vitae, names, and contact information of three references, and a brief personal statement. We greatly appreciate all the applications, but given the high volume of submissions, please note that only candidates shortlisted for interviews will be notified. Depending on funding availability, we are able to accept students in both Fall and Spring semesters. Therefore, the enrollment time is flexible. Compensation: $33K/year stipend with benefits plus full tuition ($57K/year).

Application for Postdoctoral Researchers:

For Postdocs, prior research experiences in process-based modeling and/or remote sensing and/or land surface models are highly preferred. Strong programming skills and previous experience in supercomputing or big data analytical systems are required, as the applicant will work routinely in a supercomputer environment. Excellent writing skills as demonstrated by a strong publication record. Candidates will be considered if graduation with a Ph.D. is expected by an agreed starting date. To ensure full consideration, qualified candidates must send a cover letter, CV, and contact information of three references via email with the subject "Prospective Postdoctoral Researcher" to Dr. Vergopolan (Noemi.Vergopolan@rice.edu). Positions are available depending on funding availability, the appointment is renewed annually, contingent upon the performance. Salary is competitive and commensurate with experience in relevant research, with compensation between $58-$70K/year with full benefits.

For outstanding applicants, prestigious opportunities at Rice University are available, including the Rice University Academy of Fellows (deadline on **January 2025**), and the Pan Postdoctoral Research Fellowship (deadline on **November 1st, 2024**), among others.