NORTHWEST REGIONAL TECHNOLOGY CENTER
for Homeland Security

Pacific Northwest NATIONAL LABORATORY

AROUND THE REGION IN HOMELAND SECURITY

The Northwest Regional Technology Center (NWRTC) is a virtual resource center operated by Pacific Northwest National Laboratory (PNNL) to support regional preparedness, resilience, response, and recovery. The center enables homeland security solutions for emergency responder communities and federal, state, and local stakeholders in the Northwest.

ARTIFICIAL INTELLIGENCE BRINGS BETTER HURRICANE PREDICTIONS

Thanks to a new model developed by researchers at PNNL, improved hurricane intensity predictions are within reach in the near future and under future climate scenarios. Using artificial intelligence (AI) techniques, the team created a model that can, on average, more accurately predict hurricane intensity relative to models used at the national level—and it can run on a commercial laptop.

To address the need for better intensity predictions, the team looked to deep learning: a type of machine learning where researchers feed information to algorithms that, in this case, detect relationships between hurricane behavior and climate factors like heat stored within the ocean, wind speed, and air temperature. The algorithms then form predictions about which path a storm may take, how strong it could become, and how quickly it could intensify.

The new model relies on the same data as other hurricane models, but it differs in its use of neural networks: a system of artificial neurons that mimic the computation of the human brain, empowering the model to make predictions. The team is most excited by the model's ability to project how hurricane behavior may change in different climate scenarios.

The study, "Deep Learning Experiments for Tropical Cyclone Intensity Forecasts," in which this model is described, was published in the August issue of *Weather and Forecasting*, a journal of the American Meteorological Society. See the news release to learn more.

OPPORTUNITIES

Events current at time of publication. Have a virtual resource or event to share? Email us!

- November 17-18 – Natural Disaster and Emergency Management Expo
- November 17-19 – Pacific NorthWest 2021 Economic Leadership Forum
- December 1, 8, 15 – 2021 Chemical Security Seminars
- February 7-9 – 14th Annual Nuclear Deterrence Summit

CONTACT

- Want to know more? Visit us at pnnl.gov/projects/nwrtc.
- Contact the NWRTC with questions and comments at nwrtc@pnnl.gov.

PREPARING FOR A FUTURE PANDEMIC WITH AI

PNNL researchers are turning their expertise toward fundamental questions about treatments for COVID-19. What they are learning sharpens the tools available in the computational toolbox for responding quickly to a future pandemic.

For example, the vast amount of COVID-related research provided computational scientist Jeremy Zucker and his team with a trove of biochemical details about the novel coronavirus and how immune systems respond to it. The scientists reported several case studies of their counterfactual reasoning algorithm predicting simulated patient outcomes following treatment in a recent special issue of *IEEE Transactions on Big Data*.

A team of scientists from PNNL and the University of Washington School of Medicine screened more than 13,000 compounds from existing drug libraries for the ability to inhibit a vital protein produced by genetic information in the novel coronavirus SARS-CoV-2. In results published in the journal *PLoS ONE*, the team identified one molecule out of that collection with promising antiviral activity against SARS-CoV-2.

PNNL computer scientist Sutanay Choudhury, data scientist Neeraj Kumar, data scientist Jenna Pope, and their colleagues at Argonne National Laboratory are using graph neural networks to generate structures for molecules that could be candidates for drug development. They presented a workshop paper at the International Conference on Learning Representations, where they compared their methods to design molecules that might inhibit a key SARS-CoV-2 protein called protease.

To learn more about how PNNL researchers, projects, and partnerships are confronting the challenges of COVID-19, visit https://www.pnnl.gov/covid.

PANELS REFLECT ON RESPONSE, RESILIENCE POST-9/11

In September 2021, PNNL hosted a series of events to reflect on the 20 years that have passed since the September 11, 2001 attacks.

In a virtual panel titled "Voices of the First Responder—Reflections on 9/11 to today," first responder leaders from the Pacific Northwest and across the nation reflected on how their teams and other first responders rose to the occasion on 9/11 and how first responder concerns continue to be addressed today. PNNL also produced two videos highlighting how first responders, agencies, and individuals around the country came together in an unprecedented fashion for the homeland security mission. This suite of videos is available at https://www.pnnl.gov/projects/911-remembering-20/multimedia.

In a look forward from the 9/11 tragedy, PNNL Laboratory Director Steve Ashby shared in his monthly column how science and engineering solutions continue to help keep America safe from the emerging challenges, including explosive, radiological, biological, and cyber threats. The resulting 20 years of partnerships, programs, and national security solutions have made and will continue to make a difference.

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PNNL-SA-167593