Winds Forecast Rapid Prototype

Technology Office | Lincoln Laboratory

Strong winds are a leading cause of air traffic delay due to their impact on aircraft spacing and runway use, yet most airports lack high-quality real-time wind forecast information and wind decision support. In response, the Laboratory is developing technology to generate improved wind forecasts through the use of data fusion and machine learning. The goal of this project is to develop an initial platform where new wind forecast products can be developed, assessed, and demonstrated. Beyond manned aircraft, this technology could benefit unmanned aircraft systems, bio/chemical dispersion modeling, wind energy, fire and rescue operations, and Department of Defense (DoD) applications.

The Winds Forecast Rapid Prototype, an allocated-funded project, focuses on the highest-priority needs for the Federal Aviation Administration (FAA): runway surface winds and low altitude terminal approach. Using the Lincoln Laboratory Supercomputing Center, researchers are applying machine learning algorithms, such as convolutional neural networks and Gaussian processes, to develop forecasts that leverage the Laboratory’s rich weather data sources, including aircraft-derived wind observations. These algorithms add value to less timely numerical model-based wind forecasts by intelligently fusing wind measurements in real time. This allows for more timely wind forecasts that also include measures of forecast confidence. The project will demonstrate its capabilities to potential stakeholders (e.g., FAA, Department of Homeland Security, DoD) to identify areas for further development and application.

Objectives for fiscal year 2018 include building the project database and testbed, developing an initial wind forecast algorithm with confidence metrics, and performing product evaluation.

For more information, contact William Dupree or Dr. Mark Veillette, Air Traffic Control Systems, Group 43, or visit the program page.