

Topic: N142-121

Charles River Analytics Inc.

Climatological Observations for Maritime Prediction and Analysis Support Service (COMPASS)

The Climatological Observations for Maritime Prediction and Analysis Support Service (COMPASS) uses machine learning to create forecasts of the probability that conditions differ from average climatology or mission-specific thresholds. COMPASS integrates multi-model forecast data to generate skillfully-superior forecasts to improve mission readiness and effectiveness; ensure safety; and reduce cost, labor, and resource requirements.

COMPASS enables operational planners and decision makers to plan missions using more reliable and longer-term weather and climate predictions, thereby adding extended-range forecasting capabilities to current forecasting systems and mission-planning tools. Charles River Analytics applies computational intelligence technologies to develop mission-relevant tools to transform customer data into knowledge that drives robust decision-making. Our goal is to integrate and transition this technology into government and prime contractor systems for providing long- or medium-range forecasts.

Technology Category Alignment:

None

None

None

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SYSCOM: ONR

Contract: N68335-16-C-0087

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-16-C-0087

Department of the Navy SBIR/STTR Transition Program

STATEMENT A. Approved for public release; distribution is unlimited.

ONR Approval # 43-2203-16

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Climatological Observations for Maritime Prediction and Analysis Support Service (COMPASS)

Charles River Analytics, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: ONR Code 32

Transition Target: Advanced Climate Analysis and Forecasting (ACAF) System

TPOC:

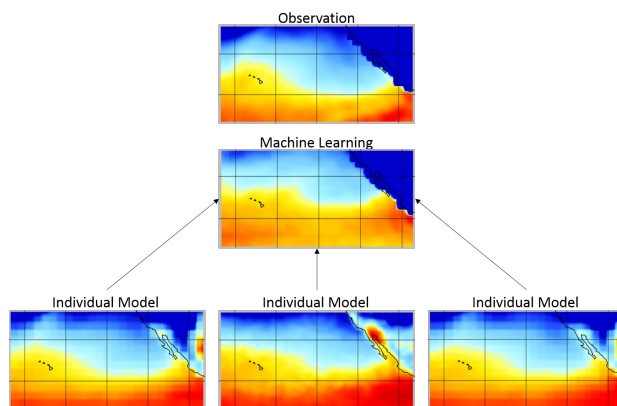
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Other transition opportunities:

Forecasting systems and mission-planning tools, including those used by the Fleet Numerical Meteorology and Oceanography Center (FNMOC), the U.S. Air Force 14th Weather Squadron, and the National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center (CPC).

Notes: Using machine learning, COMPASS combines multiple individual forecast models to create a forecast that is most similar to the observed forecast.



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WHAT

Operational Need and Improvement: Extended-range forecasts can improve mission readiness and effectiveness; ensure safety; and reduce cost, labor, and resource requirements. If Navy operational planners and decision makers had tools and systems that incorporated long- or medium-range forecasts, they could plan missions using more reliable and longer-term weather and climate predictions. Further, using multi-model forecast ensembles instead of single forecast models would produce higher predictive performance.

Specifications Required: The goals of the technology are to: (1) Use massive and diversely formatted forecast and related product data sets without requiring user-side download and manipulation of local copies of the source data sets; (2) Develop software that enables DoD climate and seasonal forecasters to develop decision-support products from sub-seasonal to seasonal ensemble numerical forecast; (3) Perform computations in a timely (minutes to hours) and workflow-efficient manner; and (4) Provide enhancements to existing forecasting products.

Technology Developed: COMPASS uses machine learning to create operationally relevant forecasts of the probability that conditions are different from the long-term average climatology or mission-specific thresholds for a specific region, time period, and set of environmental conditions. COMPASS integrates extended-range multi-model forecast ensemble data to generate the probabilistic forecasts; the skill of COMPASS forecasts is superior to the skill of individual forecast models and commonly used weighted forecasts that integrate several forecast models.

Warfighter Value: COMPASS enables operational planners and decision makers to plan missions using more reliable and longer-term weather and climate predictions. Therefore, COMPASS can improve mission readiness and effectiveness; ensure safety; and reduce cost, labor, and resource requirements. Also, by providing a single unified forecast, COMPASS eliminates the time and resource-intensive task of comparing multiple forecasts to each other and against mission requirements.

WHEN

Contract Number: N68335-16-C-0087 **Ending on:** December 8, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
COMPASS Framework Development	N/A	Proof of concept service and initial results	3	April 2015
Machine Learning Approach Validation and Forecast Visualizations	N/A	Successful creation of weighted forecast for single use case and visualization	4	December 2017
Alternative Use Case Validation	Low	Successful evaluation of several use cases	5	October 2018
Demonstration of COMPASS in ACAF	Med	Successful operation by FNMOC climatologists	6	April 2020

HOW

Projected Business Model: Charles River will develop this technology, and work directly with the engineers of the forecasting and mission-planning tools that COMPASS will integrate with. Once integrated, Charles River will provide users with all of the documentation to use the service.

Company Objectives: Machine learning and data fusion are core business areas for Charles River, making the success of this effort fall squarely within our corporate interests and competencies. Charles River expertise will ensure the success of the innovations developed under the COMPASS program beyond the SBIR contract. In particular, Charles River plans to pursue a multi-part plan to transition this technology to the U.S. Navy and other U.S. Government customers, as well as provide benefits to commercial markets and customers by developing mobile applications.

Potential Commercial Applications: COMPASS can enhance the effectiveness of forecasting systems and mission-planning tools, including those used by FNMOC, the USAF 14th Weather Squadron, and the NOAA CPC. Charles River plans to integrate the COMPASS service, which can produce general and mission-specific probabilistic forecasts, into existing systems, such as ACAF. Also, targeted several industries can greatly benefit from extended-range forecasting by creating a set of general purpose Extended-Range Forecaster mobile applications (apps). Extended-Range Forecaster apps, empowered by COMPASS' extended-range forecasting ability, will have immediate and tangible benefits to industries where weather poses a threat, such as the event-planning, tourism, transportation, construction, and agriculture industries. These industries are currently promising markets to target due to their size, revenue, and projected growth.

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