The 2nd NOAA Workshop on Leveraging AI in Environmental Sciences:

Exploiting Space- and Ground-Based Observations and Enhancing Earth System Prediction

April 21–24, 2020

LOCATION

NOAA Center for Weather and Climate Prediction
5830 University Research Court
College Park, Maryland 20740

WHO SHOULD ATTEND

Scientists, program managers, and leaders from the public, academic and commercial sectors interested in identifying innovative ways to use satellite and other environmental data and to improve environmental predictions.

DEADLINE FOR ABSTRACT SUBMISSION:
February 14, 2020

DEADLINE FOR GENERAL REGISTRATION:
March 13, 2020

INQUIRIES TO
stacy.bunin@noaa.gov

2nd NOAA WORKSHOP

On Leveraging AI in Environmental Sciences:

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April 21–24, 2020

NOAA Center for Weather and Climate Prediction (NCWCP)
5830 University Research Court
College Park, Maryland 20740

Register at:
https://www.star.nesdis.noaa.gov/star/meeting_2020AIWorkshop.php

Purpose of Workshop

The workshop will build on the success of the 1st Workshop on Leveraging AI. This workshop will help gather scientists, program managers, and leaders from public, academic and private sectors. It will enable experts involved in the development and adaptation of AI tools and applications in a number of fields to meet and exchange experiences.

It is important to note that there are fields with similar fundamental issues as the field of environmental science. These fundamental issues include image and signal processing, pattern recognition, morphing, projection mapping, data mining, clustering, etc. This workshop will facilitate the cross-fertilization of knowledge in different communities within NOAA and outside of NOAA to benefit in environmental science.

This gathering will allow participants to exchange ideas, share lessons learned, and to discuss both the future potential and limitations of AI. It will also help to establish collaborations for using AI tools for many purposes, including:

- Reviewing AI-enabling technology and tools
- Furthering scientific objectives of better utilization of Earth observation
- Sharing ideas to improve environmental science
- Improving efficiency of environmental data processing and exploitation for cost effectiveness
- Identifying innovative ways to use satellite data and other environmental data to create new products and services and generate new markets
- Expanding commercial markets of high-level environment-related products and services to benefit society and the economy

Background and Workshop Motivations

Artificial Intelligence (AI), machine/deep learning techniques (including deep neural networks, DNNs) have advanced considerably in recent years across a number of areas and applications: in medicine, self-driving cars, social media, the finance industry, etc. The astonishing increase in accuracy and applicability of AI has been significant in the private sector, driven by the ease, efficiency, cost-effectiveness, speed and auto-learning features of AI. Significant advances have also been made in application of AI in different areas of meteorology and oceanography.
However, until recently, far fewer AI applications were developed in the area of environmental data exploitation of satellite data, high-level information extraction in the area of Numerical Weather Prediction (NWP), data assimilation and forecasting, as well as for extreme weather prediction and nowcasting.

There have been encouraging signs that AI is increasingly considered for these applications, with promising results—including predictive skills—and this trend is expected to continue with the ever-increasing volume of satellite data and the increased societal reliance on improved forecasting accuracy and resolutions. The increase of data volume comes from higher resolution satellites and sensors, from a growing list of new sensors (traditional as well as smallsats/cubesats), and from an explosion of new virtual observing systems made possible by the internet of things (IoT). These large increases are expected to present major challenges for exploiting these data sources, and AI has emerged as a potentially transformational and mitigating technology.

Confirmed Invited Speakers

- Samantha Adams (UKMO)
- V. Balaji (GFDL)
- Chris Bretherton (University of Washington)
- DaNa Carlis (NOAA)
- Leila De Floriani (UMD)
- Peter Dueben (ECMWF)
- David Gagne (NCAR, AMS AI Committee Chair)
- Alan Geer (ECMWF)
- David Hall (NVIDIA)
- Sue Ellen Haupt (NCAR)
- Jason Hickey (Google)
- Jacqueline Le Moigne (NASA)
- Hyesook Lee (KMA/NIMS)
- Sebastian Lerch (Karlsruhe Institute of Technology)
- Amy McGovern (Univ. Of Oklahoma, AMS AI Committee)
- John Williams (The Weather Company, an IBM Business)

Registration Fee

No registration fee is expected for this workshop.

Milestones

- Abstract submission Deadline Feb 3rd, 2020.
- Foreign National Registration Deadline Feb 14, 2020
- Abstract acceptance notification: March 2nd, 2020.
- General Registration Deadline March 13, 2020.
- Workshop Schedule Publication: March 20, 2020.

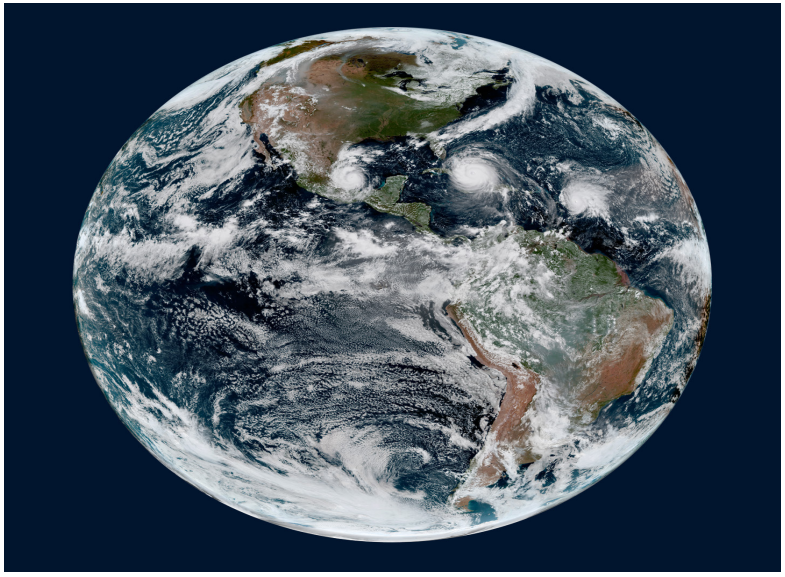
Ordering Food for Lunch and Breaks

We have arranged with the NCWCP cafeteria (Kloud Café) to supply boxed lunches and refreshments during registration, morning and afternoon breaks. These can either be purchased in a package, or a la carte. The link to order will be posted soon.

Dining and Accommodation Options in College Park

http://shopcollegepark.org

https://www.campustravel.com/university/umdconf/index.html



Workshop Format

Prior to the workshop 3 introductory seminars will be offered. More information on the seminar will be posted. The workshop will have oral presentations as well as posters organized by sessions. It will also have panel discussions and invited speaker presentations. Tutorials on AI/ML tools will be offered as part of the workshop. Registration for the Tutorial will be open in March 2020. More information on the Tutorials is posted on:

https://www.star.nesdis.noaa.gov/star/meeting_2020AIWorkshop_tutorials.php.

Presentation Uploading

Oral Presenters are encouraged to submit their presentations ahead of time, by sending an email to narges.shahroudi@noaa.gov with CC stacy.bunin@noaa.gov. The preferred format is pdf or PPT, preferably by April 20th, 2020 but no later than the day before the presentation.

Location

The workshop will be hosted in the NCWCP building in College Park, Maryland. This location offers convenient access to the Metro public transit system of the Washington, DC area (College Park/Univ. of MD Metro station, and the Metro bus). It is also within walking distance of downtown College Park, MD.

Parking/Public Transportation

Limited parking will be available in NCWCP parking garage. Parking passes will be available in April 2020. Note that a Government-issued ID is required to enter. Using public transportation, carpooling, or parking at the College Park Metro Station is strongly encouraged due to the large volume of workshop attendees.

Building Access

Visitors to NCWCP must show a valid Government/State ID at the entrance.

Some State IDs are considered Non-Compliant for U.S. Federal Government building access. A list of those States and options for other forms of Government IDs and information are listed at http://www.dhs.gov/real-id-enforcement-brief#.

Foreign nationals (those who are not U.S. citizens or green card holders) must have submitted the foreign visitor form in advance and at the time of arrival should check in at the guard desk.

Science & Organization Committee

Government

- Sid Boukabara, Chair (NOAA/NESDIS/STAR)
- Vladimir Krasnopolsky, Co-Chair (NOAA/NWS/NCEP)
- Kenneth Casey (NOAA/NCEI)
- Jebb Stewart, (NOAA/OAR/ESRL, CIRA)
- Nikunj Oza (NASA/Ames and NASA/ESTO)
- John Ten Hoeve (NOAA/NWS Office of Org. Excellence)
- Greg Dusek (NOAA/NOS)
- V Ramaswamy (NOAA, GFDL)
- William Michaels (NOAA, Fisheries)

Academia

- Kayo Ide (Univ. Of Maryland)
- Amy McGovern (Univ. Of Oklahoma, AMS AI Committee Member)
- Allen Huang (Univ. Of Wisconsin)
- Philippe Tissot (Texas A&M-Corpus Christi, AMS AI Committee Chair)
- Sue E. Haupt (NCAR)

Private Sector

- John Williams (The Weather Company, an IBM Business)
- Jason Hickey (Google)
- David Hall (NVIDIA)

Local Organizing Committee

- Kevin Garrett, Science & Technical Coordination Lead
- Ross Hoffman, Organization and Coordination
- Eric Maddy, Science & Technical Coordination
- Narges Shahroudi, Technical Support
- Erin Jones, Technical Support
- Katherine Lukens, Technical Support
- Andre Van der Westhuysen, Technical Support
- Stacy Bunin, Organization and leadership support
- Lori Brown, IT/Web Support

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Monday, April 20, 2020

1:00 PM - 5:00PM	**Tutorial 1** 1) Tutorial on Video and Image Analytics for Marine Environments (VIAME), a Do-it-yourself AI Toolkit" *Matt Dawkins and Anthony Hoogs (Kitware)*
3:00 PM - 5:00 PM	**Registration**

Tuesday, April 21, 2020

7:00 AM - 8:30 AM	**Registration**
8:30 AM - 10:10 AM	**Plenary Session** **Theme:** AI for Earth Sciences, AI strategy, and partnership **Chair:** Sid Boukabara (NOAA/NESDIS)
10:10 AM - 10:30 AM	**Coffee Break**
10:30 AM - 12:30 PM	**Session 1: Part 1: Overview Talks** **Theme:** Overview of AI activities at national and international centers **Chair:** William Michaels (NOAA, Fisheries)
12:30 PM-1:30 PM	**Lunch and Group Photo**
1:30PM – 3:10PM	**Session 1: Part 2: Overview Talks** **Theme:** Overview of AI activities at AMS and leading private companies **Chair:** John Ten Hoeve (NOAA, NWS Office of Org. Excellence)
10:10 AM - 10:30 AM	**Coffee Break**
3:30 PM - 5:10 PM	**Session 2: Fundamentals of AI for Earth Sciences** **Theme:** This session explores the mathematical basis of AI, the optimal use of ML tools, and effective techniques for developing training sets **Chair:** Vladimir Krasnopolsky (NOAA, NWS)
5:10 PM - 6:10 PM	**Session 3: Panel Discussion**

Wednesday, April 22, 2020

8:30 AM - 10:10 AM	**Session 4: Machine Learning Tools and Best Practices** **Theme:** This session explores AI/ML tools, codes, and software to leverage for environmental sciences **Chair:** David Hall (NVIDIA)
10:10 AM - 10:30 AM	**Coffee Break**
10:30 AM - 12:10 PM	**Session 5: AI/ML for Environmental data, image, and signal processing** **Theme:** This session explores the AI/ML techniques to exploit, calibrated, process, invert images and data and to do pattern recognition, classification, change detection, feature tracking, and etc. **Chair:** V. Ramaswamy (NOAA,GFDL)
12:10 PM - 1:10 PM	**Lunch Break**
1:10 PM - 2:10 PM	**Poster Session 1**
2:10 PM - 3:50 PM	**Session 6: AI/ML for Information Extraction from Data** **Theme:** This session explores the AI/ML techniques to do quality control, retrieving geo-information from remote sensing, space mapping and projection, and time series analysis **Chair:** Philip Tissot (Texas A & M - Corpus Christi)
3:50 PM - 4:10 PM	**Coffee Break**
4:10 PM - 5:50 PM	**Session 7: AI/ML for Data Fusion/Assimilation** **Theme:** This session explores the AI and ML techniques and approaches for data aggregation from different observing systems sources including satellites, IoT, ground, ocean, air-based sensors, data fusion, data assimilation, nowcasting, situational awareness, and etc. **Chair:** Kenneth Casey (NCEI)

Thursday, April 23, 2020

8:30 AM - 10:10 AM	**Session 8: Part 1: AI/ML for Models Parameterization, Emulation, and Hybrid Model/AI construct** **Theme:** This session explores AI/ML techniques for Hydrological, Land, Hurricane, Weather, Ocean and coastal Modeling, water quality, air quality and aerosols, and Biology(marine, land and vegetation) **Chair:** Vladimir Krasnopolsky (NOAA/NWS)
10:10 AM - 10:30 AM	**Coffee Break**
10:30 AM - 12:10 PM	**Session 8: Part 2: AI/ML for Models Parameterization, Emulation, and Hybrid Model/AI construct** **Theme:** This session explores AI/ML techniques for Hydrological, Land, Hurricane, Weather, Ocean and coastal Modeling, water quality, air quality and aerosols, and Biology(marine, land and vegetation) **Chair:** Sue Ellen Haupt (NCAR)
12:10 PM - 1:10 PM	**Lunch Break**
1:10 PM - 2:10 PM	**Poster Session 2**
2:10 PM - 3:50 PM	**Session 9: Part 1: AI/ML for post-processing and Data dissemination** **Theme:** *This session explores AI/ML techniques used in hurricane predictions, post forecast correction, extreme events, bias correction, and ML ensembles* **Chair:** *Greg Dusek (NOS)*
3:50 PM - 4:10 PM	**Coffee Break**
4:10 PM - 5:50 PM	**Session 9: Part 2: AI/ML for post-processing and Data dissemination** **Theme:** *This session explores AI/ML techniques used in hurricane predictions, post forecast correction, extreme events, bias correction, and ML ensembles*. **Chair:** Amy McGovern (Oklahoma University)

Friday, April 24, 2020

8:30 AM - 10:10 AM	**Session10: AI for Innovation: New Ways to Exploit Environmental Data** **Theme:** This session will explore the use of IoTs, new products and applications with AI, and using AI to combine environmental data with other data for new applications. **Chair:** Amy McGovern (Oklahoma University)
10:10 AM - 10:30 AM	**Coffee Break**
10:30 AM - 12:10 PM	**Session 11: Looking Ahead (Using AI for NOAA mission)art 2: AI/ML for Models Parameterization, Emulation, and Hybrid Model/AI construct** **Theme:** This session will address the challenges, priorities for development, collaboration prospects, and NOAA AI strategy implementation plan (NOAA AI Center, cost benefits and added value of AI technology, and etc.) **Chair:** Jebb Stewart (NOAA/ESRL)
12:10 PM -1:10 PM	**Session 12: Panel Discussion**
1:10 PM - 2:10 PM	**Lunch Break**
2:10PM-5:00PM	**Session 13: Tutorials 2** 1) Hackathon/Physics Constrained Machine Learning models *Karthik Kashinath (LBL)* 2) Overview/Neural Nets Applications to Weather & Climate *Imme Ebert-Uphoff (CIRA)* 3) Combination of the AWS SageMaker platform (a notebook based cloud environment for ML/AI) and the “Earth-on-AWS” free and open data repository on AWS (with datasets like GOES, NEXRAD, LandSat, etc) *Kevin Jorissen (AWS)* 4) Feature detection / segmentation (identifying tropical storms on Earth and geomagnetic storms on the Sun). *David Hall (NVIDIA)*