1st Workshop on Leveraging Artificial Intelligence (AI) in the Exploitation of Satellite Earth Observations & Numerical Weather Prediction (NWP)
April 23-25, 2019

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

Remote Access is available, see page 11 for more information.

Monday, April 22, 2019		
3:00 PM - 5:00 PM	-	*Registration*[+~]
Tuesday, April 23, 2019		
7:00 AM - 8:30 AM	-	*Registration*[+~]
Plenary Session		
8:30AM - 8:35 AM	-	Workshop logistics *Kevin Garrett (NOAA/NESDIS)*
8:35 AM - 8:45 AM	-	Welcoming remarks and introduction of keynote speakers. *Harry Cikanek, Director of the Center for Satellite Applications and Research (STAR) NOAA/NESDIS*
8:45 AM - 9:00 AM	-	NOAA Priorities and Plans, Keynote Speaker *Dr. Neil Jacobs, NOAA Administrator*
9:00 AM - 9:10 AM	-	Perspectives on Exploiting AI/ ML in NESDIS *Dr. Steve Volz, Assistant Administrator of NOAA/NESDIS*
9:10 AM - 9:20 AM	-	Thoughts on Exploiting AI/ML in the National Weather Service (NWS) *Dr. Louis Uccellini, Assistant Administrator of NOAA/NWS*
9:20 AM - 9:40 AM	-	NOAA Data Strategy and AI Potential Contribution, Keynote Speaker *Dr. Ed Kearns, NOAA Chief data Officer*
9:40 AM- 10:10 AM	-	Leadership Panel Discussion, Facilitator: *Harry Cikanek,(NOAA/NESDIS/STAR)*
10:10 AM -10:30 AM	-	Coffee Break
Session 1 (S1): Overview Talks Chairs: Amy McGovern (University of Oklahoma) and Kenneth Casey (NOAA/NCEI)		
10:30 AM - 10:50 AM	-	*The AMS AI Committee: 25 Years and counting of supporting the community *Philip Tissot (Corpus Christi, Texas A&M Univ.)*
10:50 AM - 11:10 AM	-	Overview of NOAA AI activities in Satellite Observations and NWP: Status and Perspectives *Sid Boukabara (NOAA/NESDIS)*
11:10 AM - 11:30 AM	-	*Use of AI in Forecasting and Decision Services at The Weather Company *John K. Williams (The Weather Company, IBM Business)*
11:30 AM - 11:50AM	-	*Artificial Intelligence Applications at NCAR *Sue Ellen Haupt (NCAR)*
11:50AM - 12:10PM	-	*Opportunities for using AI methods in weather forecasting at ECMWF *Alan Geer (ECMWF)*
12:10 PM - 12:30 PM	-	*Alphabet AI and Weather *Jason Hickey (Google)*
12:30 PM - 12:50 PM	-	*AI for Science: Applications of NVIDIA GPUs for Numerical Weather Prediction *David Hall (NVIDIA)*

*Invited Talk
+Please complete registration as early as possible to avoid expected delays on Tuesday morning
~Survey questions regarding feedbacks on using AI in satellite data exploitation and NWP will be distributed during the registration. Participants are encouraged to review and participate in the live survey on Thursday afternoon.

Tuesday, April 23, 2019 (*Continued*)

12:50PM-12:55PM	-	Group Photo
12:55PM- 1:50PM	-	Lunch Break

1:50PM-2:50PM	-	1st Poster Session (1P)

Session 2 (S2): Satellite Earth Observations & Applications –Part I
Chairs: David Hall (NVIDIA) and Sid Boukabara (NOAA/NESIDS)

2:50PM - 3:10PM	-	*Combining the power of experts and machine learning to explore NASA and NOAA data: a few examples *Tianle Yuan (NASA)*
3:10PM - 3:30PM	-	*Recent Application of Machine Learning Techniques to Environmental Science at PNNL *Philip Rasch (PNNL)*
3:30PM - 3:50PM	-	Preparing AI-Enabled Weather and Environment Satellite Big Data *Allen Huang(SSEC/CIMSS)*
3:50PM - 4:10PM	-	Development of Convolutional Neural Networks for Ice and Flood Detection from Synthetic Aperture Radar (SAR) *Sean Helfrich (NOAA/NESDIS)*

4:10 PM -4:30 PM	-	Coffee Break

1st Panel Discussion
Facilitator: Allen Huang (University of Wisconsin)

4:30PM -5:30 PM	*Panel Members:* - Kayo Ide (Univ. Of Maryland) - Amy McGovern (Univ. Of Oklahoma) - Phillip Tissot (Texas A&M-Corpus Christi) - Sue Ellen. Haupt (NCAR) - John Williams (The Weather company, an IBM Business) - David Hall (NVIDIA) *Topic:* - *How can scientists and engineers embrace AI technology to enhance their work?*

6:30PM -8:30 PM	-	No-host Social Dinner (Location: TBD)

Invited Talk

Session 2 (S2): Satellite Earth Observations & Applications –Part II

Chairs: Sue Ellen Haupt, (NCAR) and Jason Hickey (Google)

8:30 AM–8:50AM	- Improving Processing and Extracting Value from Satellite Observations through Deep Learning *Jebb Stewart (NOAA/OAR)*
8:50 AM–9:10AM	- Democratizing machine learning through AI for Earth's API framework *Patrick Flickinger (Microsoft, AI for Earth)*
9:10 AM–9:30AM	- Using Deep Learning to Extract Regions of Interest from Satellite Data *Christina Kumler (NOAA/OAR)*
9:30 AM–9:50AM	- Quantitative Precipitation Estimate Results from a Convolutional Neural Network Machine Learning Model *Micheal Simpson (CIMSS/NSSL)*
9:50 AM–10:10AM	- Deep Neural Network Perspective on Atmospheric Motion Vectors *Fei He (UCLA)*

10:10 AM -10:30 AM	- Coffee Break

Session 2 (S2): Satellite Earth Observations & Applications –Part III

Chairs: Jebb Stewart (NOAA/OAR/ESRL, CIRA) and Nikuni Oza (NASA/Ames and NASA/ESTO)

10:30AM-10:50AM	- EarthInsights: Parallel Clustering of Large Earth Science Datasets on the Summit Supercomputer *Sarat Sreepathi (Oak Ridge National Lab)*
10:50AM-11:10AM	- Developing fine-scale snow cover fraction estimates using deep learning *Soni Yatheendradas (UMD/GSFC)*
11:10AM-11:30AM	- Intermediate Frame Interpolation to Improve Temporal Coverage of GOES-16/17 *Thomas Vandal (NASA Ames)*
11:30AM-11:50AM	- Deep learning for estimating land surface response with uncertainty: soil moisture and other opportunities *Chaopeng Shen (Pennsylvania State University)*
11:50AM-12:10PM	- Deep learning estimation of tropical cyclone intensity from microwave satellite imagery *Tony Wimmers (UW-CIMSS)*

12:10PM-1:10PM	- Lunch Break

1:10PM-2:10PM	- 2nd Poster Session (2P)

*Invited Talk

Session 3 (S3): Nowcasting and NWP data assimilation

Chairs: Kevin Garrett (NOAA/NESDIS/STAR) and Kayo Ide (University of Maryland)

2:10PM - 2:30PM	- Machine learning meets data assimilation *Peter Jan van Leeuwen (Colorado State University)*
2:30PM - 2:50PM	- Improvement to hurricane track and intensity forecast by exploiting satellite data and machine learning, *Narges Shahroudi (RTi@NOAA/NESDIS)*
2:50PM - 3:10PM	- Machine Learning Based Applications for Environmental Hazard Detection: Data vs. Actionable Information, User Evaluations, and Future Possibilities *Michael Pavolonis (NOAA/NESDIS/STAR)*
3:10PM - 3:30PM	- Development of Merged Cloud Forecasts from Satellite and Numerical Model Data *Jason Nachamkin (Naval Research Laboratory)*
3:30PM - 3:50PM	- Data driven numerical methods partial differential equations *Jason Hickey (Google)*

3:50 PM -4::10 PM	- Coffee Break

Session 4 (S4): Environmental and Numerical Modeling (S4)-Part I

Chairs: Vladimir Krasnopolsky (NOAA/NWS/NCEP) and John Williams (The Weather Company, an IBM Business)

4:10PM - 4:30PM	- *Machine Learning for Climate Extremes: Training is Everything *William Collins (UC Berkeley)*
4:30PM - 4:50M	- *Machine learning for moist physics parameterizations in weather and climate models *Christopher Bretherton (University of Washington)*
4:50PM - 5:10PM	- *Machine Learning for Predicting the Evolution of Large Complex Spatiotemporally Chaotic Systems *Edward Ott (UMD)*
5:10PM - 5:30PM	- Training Neural Network Parameterizations with Near-Global Cloud-Resolving Models - *Noah D Brenowitz(University of Washington)*

*Invited Talk

Thursday, April 25, 2019

Session 4 (S4): Environmental and Numerical Modeling –Part II

Chairs Pete Childs (Priogen Energy) and Phillip Tissot (Texas A&M-Corpus Christi, AMS AI Committee Member)

8:30AM-8:50AM	- Neural network applications in numerical modeling *Vladimir Krasnopolsky (* NOAA/NWS)
8:50AM-9:10AM	- Atmospheric chemistry modeling and air quality forecasting using machine learning *Christoph Keller (NASA/GMAO)*
9:10AM-9:30AM	- Improving reference evapotranspiration forecasting with numerical weather predictions *Hanoi Medina (Auburn University)*
9:30AM-9:50AM	- Analog Forecast Models for Space Weather Predictions *Eric Kihn (NOAA/NESDIS)*
9:50AM-10:10AM	- A deep learning model to improve WRF forecasts: a case study of temperature, relative humidity, and wind speed *Yunsoo Choi (University of Houston)*

10:10 AM -10:30 AM	- Coffee Break

Session 5 (S5): Post-Forecast and Extreme Weather

Chairs: John Ten Hoeve (NOAA/NWS Office of Org. Excellence) & Vladimir Krasnopolsky (NOAA/NWS)

10:30AM-10:50AM	- *Using Machine Learning to Improve Prediction and Understanding of Convective Hazards *Amy McGovern* (University of Oklahoma)
10:50AM-11:10AM	- Leveraging AI for Tropical Cyclone Prediction *Stephanie Stevenson (CIRA/NHC)*
11:10AM-11:30AM	- Hybrid AI hurricane forecasting system: deep learning ensemble approach and Kalman filter *Yunsoo Choi (University of Houston)*
11:30AM-11:50AM	- Nonlinear Wave Ensemble Averaging using Neural Networks *Ricardo Martins Campos (University of Lisbon)*
11:50AM-12:10PM	- Nowcasting Lightning Events with a Cloud-based Deep Learning approach *Valliappa Lakshmanan (Google)*
12:10PM-12:30PM	- Using Artificial Neural Networks to Improve CFS Week 3-4 Precipitation and 2 Meter Air Temperature Forecasts *Yun Fan (NOAA/NWS)*

*Invited Talk

12:30PM-1:30PM	- Lunch Break
1:30PM-1:50PM	- ~Live Survey from the audience (on recommendations and suggestions) , *John Ten Hoeve (NOAA/NWS Office of Org Excellence)*

Session 6 (S6): Conclusion General Discussion

Facilitator: John Ten Hoeve (NOAA/NWS Office of Org Excellence)

1:50 PM-2:00 PM	- ***Special talk :*** Building bridges between domain scientists and machine learning experts: the essential role of weather/climate scientists in machine learning collaborations *Imme Ebert-Uphoff (Colorado State University)*
2:00 PM-3:00 PM	- **General Discussion** *Panel Members:* - Vladimir Krasnopolsky (NOAA/NWS/NCEP) - Imme Ebert-Uphoff (Colorado State University) - Kenneth Casey (NOAA/NCEI) - Jebb Stewart (NOAA/OAR/ESRL, CIRA) - Nikuni Oza (NASA/Ames and NASA/ESTO) - Jason Hickey (Google) - Pete Childs (Priogen Energy) *Topic:* - *Where do we go from here?*

Session 7(S7): Parallel Sessions (Tutorials)

Facilitator: Kevin Garrett (NOAA/NESDIS)

3:00 PM-5:00 PM	- How to do machine learning in the cloud: a fast intro to public data sets, Keras, Tensorflow, and Earth engine *Valliappa Lakshmanan (Google)* - Deep Learning in Python for Environmental Prediction *David Gagne & Ryan Lagerquist (University of Oklahoma)* - Unleashing machine learning's potential impact through containerized deployment *Patrick Flickinger (Microsoft, AI for Earth)*

5:00 PM	- Workshop Adjourns

~ Results of this survey will help formulate NOAA's data and AI strategy in the future.

1st Poster Session (1P)

1. (1P.1) Leveraging NWP for ML Coastal Predictions and Other Coastal ML Applications *Phillippe Tissot (Texas A&M University-Corpus Christi)*

2. (1P.2) Automatic Extraction of Internal Solitary Wave Signature in HIMAWARI-8 Images Based on Deep Convolutional Neural Networks *Shuangshang Zhang (University of Maryland Eastern Shore)*

3. (1P. 3) Separation of Forecast Wind Wave Systems Using K-Means Clustering *Andre van der Westhuysen (IMSG at NOAA/NWS)*

4. (1P.4) Improvements in Remotely-Sensed Cloud Property Estimation using Simple Machine Learning Models *Charles H. White (University of Wisconsin/CIMSS)*

5. (1P.5) Machine learning approach to understanding vegetation distribution and dynamics using high resolution remote sensing *Jitendra Kumar (Oak Ridge National Laboratory)*

6. (1P.6) Nighttime sea-fog detection from geostationary satellite using machine learning *DaeSeong Choi, Seyun Min, Jae Kim (Pusan National University)*

7. (1P.7) AI and Meteorology/Remote Sensing Applications Research at PGCAP/INPE *Rafael Santos, (Brazilian National Institute for Space Research)*

8. (1P.8) A Fully Connected Scheme for Detection of Convective Rain from Satellite Passive Microwave Measurements *Veljko Petkovic (CSU/UMD)*

9. (1P.9) The new machine learning toolbox within NOAA's Microwave Integrated Retrieval System *Ryan Honeyager (IMSG at NOAA/NESDIS)*

10. (1P.10) Development and application of a 33-year daily multi-layer cropland soil moisture dataset in China using machine learning *Yaling Liu (Columbia University)*

11. (1P.11) An improved ATMS-based Hurricane Warm Core Animation System (HWCAS) Using Convolutional Neural Network Method *Ding Liang (GST)*

12. (1P.12) Interpretable AI for Deep-Learning-Based Meteorological Applications *Eric Wendoloski (The Aerospace Corporation)*

13. (1P.13) Improving Validation Performance of VIIRS Radiometric Measurements with ICVS Machine Learning-based Clear-Sky Mask Algorithm *Xingming Liang (GST Inc.)*

14. (1P.14) AI for water infrastructure mapping in Africa *Pamela Collins (Conservation International)*

15. (1P.15) Dimensionality Reduction for Fast and Accurate Radiative Transfer *Patrick Stegmann (JCSDA)*

16. (1P.16) Airmass Properties from GOES ABI Using Machine Learning *Kyle Hilburn (CIRA/CSU)*

17. (1P.17) Exploring AI Capabilities with JPSS/STAR Integrated Calibration/Validation System *Banghua Yan (NOAA/NESDIS/STAR)*

18. (1P.18) Retrieving aerosol optical depth over land from satellites by using a machine learning algorithm to build the relationships between surface reflectance at different wavelengths *Tianning Su (UMD)*

19. (1P.19) How much better can we do in identifying aerosols and distinct cloud types from radiometers by harnessing recent advances in deep learning methods? *Willem Marais (University of Wisconsin/CIMMS)*

20. (1P.20) Machine Learning for Winter Precipitation Type Supervised by Citizen Science (mPING) Observations Plus a New Tornado Detection Algorithm for the WSR-88D Dual-Polarization Radar *Kim Elmore (SSEC/CIMSS)*

21. (1P.21) *Reconstruction of missing data in GOCI AOD using a deep learning algorithm* Yunsoo Choi (University of Houston)

22. (1P.22) Leveraging deep learning hyperparameter tuning frameworks for intelligent WRF ensembles *Derek D. Jensen (Lawrence Livermore National Laboratory)*

23. (1P.23) Enterprise Validation to Characterize AI Products Performance *Anthony L Reale (NOAA)*

24. (1P.24) GSICS Action Tracker: A Supervised Machine Learning Content extraction tool on Google Cloud *Manik Bali (ESSIC/UMD)*

25. Improving Atmospheric River Forecasts with Convolutional Neural Networks *William Chapman (Oceanography)*

2nd Poster Session (2P)

1. (2P.1) Spatio-Temporal Climate Causality Analytics *Jianwu Wang (UMBC)*
2. (2P.2) Stochastic PDE model identification from partial noisy data *Fei Lu (Johns Hopkins University)*
3. (2P.3) Creating Synthetic Weather Radar Images Using Convolutional Neural Networks *Christopher Mattioli (MIT Lincoln Laboratory)*
4. (2P.4) Satellite Imaging Techniques for the Analysis of High-Impact Historical Severe Thunderstorm Events *Kenneth Pryor (NOAA/NESDIS)*
5. (2P.5) The improvement of predictability for very short range precipitation using Micro-genetic algorithm *Jiyeon Jang (KMA)*
6. (2P.6) Advancing Predictive Understanding of Terrestrial Ecosystem through Machine Learning *Dan Lu (Oak Ridge National Laboratory)*
7. (2P.7) INPE Nowcasting system: Steps toward an automatic severe storm forecasting system in Brazil *Alan James Peixoto Calheiros (Brazilian National Institute for Space Research)*
8. (2P.8) Assessing the variability of VIIRS Day/Night Band observed nocturnal light sources for use in atmospheric retrievals via k-means clustering *Jeremy Solbrig (CSU)*
9. (2P.9) Improving hydrological simulations via the integration of remotely sensed data assimilation in coupled land surface and hydrologic model framework *Chandana Gangodagamage (NASA)*
10. (2P.10) Modelling HPC workloads with (some) Machine Learning *Antonino Bonanni (ECMWF)*
11. (2P.11) Convective Storm Nowcasting: Capabilities of Remote Sensing in Central Europe *Patrik Benacek* (*Charles University in Prague*)
12. (2P.12) Atlantic Basin RI Prediction Enhancement through NWP Spatial Information *Alexandria Grimes* (*Mississippi State University*)
13. (2P.13) Learning to automatically detect avalanche deposits from SAR satellite imagery *Sophie Giffard-Roisin, Saumya Sinha (University of Colorado)*
14. (2P.14) Is your Model right today? *Dean Wakeham*
15. (2P.15) Engaging Freshmen Undergraduates in Atmospheric Data Science. *Alexandra Jones (UMD)*
16. (2P.16) Visceralization of Future Climate Change *S.Karthik Mukkavilli (Montreal Institute for Learning Algorithms)*
17. (2P.17) Translating climate and remote sensing information into improved decision making in agriculture and water resources *Di Tian (Auburn University)*
18. (2P.18) Interpretation of Deep-learning Models for Short-term Forecasting of Tornadogenesis *Ryan Lagerquist (University of Oklahoma/CIMSS)*
19. (P.19) A Study on the Bias Correction of the Surface Temperature Forecast using Recurrent Neural Networks *KIM MANKI (KMA)*

20. (2P.20) Post-processing 12-36 hour multi-model ensemble PQPFs using a random forest *Eric Loken (University of Oklahoma/CIMMS)*
21. (2P.21) Machine Learning Parameterizations from the Surface to the Clouds *David Gagne (University of Oklahoma)*
22. (2P.22) Linking GOES-R observations and Multi-Radar/Multi-Sensor precipitation using unsupervised learning approach *Shruti A Upadhyaya (CIMMS)*
23. (2P.23) TPUs, TensorFlow Research Cloud, and Mesh Tensorflow. *Peter Dolan (Google/Deep Mind)*
24. (2P.24) An Evaluation of Deep Learning Approaches for Nationwide Land Cover Mapping *Chris Robinson (Lynker Tech at the NOAA Office for Coastal Management)*

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Remote Access information

Tuesday, April 23, 2019

Meeting Number: 909 473 760

Password: starAI

https://noaa-nesdis-star.webex.com/noaa-nesdis-star/j.php?MTID=mc915b5e2f02ba335e159250c14f57280

Join by phone: +1(415)-527-5035 US Toll – Access Code: 909 473 760

Wednesday, April 24, 2019

Meeting Number: 903 651 377

Password: starAI

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Thursday, April 25, 2019

Meeting Number: 901 865 234

Password: starAI

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