Machine Learning & Artificial Intelligence in Science Research

Bibliography

July 23, 2019

Gloria Aversano, Librarian

Articles:

Estimating the monthly pCO2 distribution in the North Atlantic using a self-organizing neural network.

M. Telszewski1, A. Chazottes2, U. Schuster1, A. J. Watson1, C. Moulin2, D. C. E. Bakker1,M. González-Dávila3, T. Johannessen4, A. Körtzinger5, H. Lüger6, A. Olsen4,8,9, A. Omar4, X. A. Padin7,A. F. Ríos7, T. Steinhoff5, M. Santana-Casiano3, D. W. R. Wallace5, and R. Wanninkhof6

Biogeosciences, 6, 1405-1421, 2009 6: 1405-1421.

<https://doi.org/10.5194/bg-6-1405-2009>

Abstract.

“Here we present monthly, basin-wide maps of the partial pressure of carbon dioxide (*p*CO2) for the North Atlantic on a 1° latitude by 1° longitude grid for years 2004 through 2006 inclusive. The maps have been computed using a neural network technique which reconstructs the non-linear relationships between three biogeochemical parameters and marine *p*CO2. A self organizing map (SOM) neural network has been trained using 389 000 triplets of the SeaWiFS-MODIS chlorophyll-*a* concentration, the NCEP/NCAR reanalysis sea surface temperature, and the FOAM mixed layer depth. The trained SOM was labelled with 137 000 underway *p*CO2 measurements collected in situ during 2004, 2005 and 2006 in the North Atlantic, spanning the range of 208 to 437 μatm. The root mean square error (RMSE) of the neural network fit to the data is 11.6 μatm, which equals to just above 3 per cent of an average *p*CO2value in the in situ dataset. The seasonal *p*CO2 cycle as well as estimates of the interannual variability in the major biogeochemical provinces are presented and discussed. High resolution combined with basin-wide coverage makes the maps a useful tool for several applications such as the monitoring of basin-wide air-sea CO2 fluxes or improvement of seasonal and interannual marine CO2 cycles in future model predictions. The method itself is a valuable alternative to traditional statistical modelling techniques used in geosciences.”

[Unsupervised Learning Reveals Geography of Global Ocean Dynamical Regions](http://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=GeneralSearch&qid=4&SID=5F8uugdcIyxwHPlE6Ch&page=1&doc=1)

By: [Sonnewald, Maike](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Sonnewald,%20Maike&dais_id=9401674&excludeEventConfig=ExcludeIfFromFullRecPage" \o "Find more records by this author); [Wunsch, Carl](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Wunsch,%20Carl&dais_id=93561&excludeEventConfig=ExcludeIfFromFullRecPage" \o "Find more records by this author); [Heimbach, Patrick](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Heimbach,%20Patrick&dais_id=209897&excludeEventConfig=ExcludeIfFromFullRecPage" \o "Find more records by this author)

[EARTH AND SPACE SCIENCE](javascript:;)  Volume: 6   Issue: 5   Pages: 784-794   Published: MAY 2019

Online: <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2018EA000519>

Abstract:

[“Dynamically similar regions of the global ocean are identified using a barotropic vorticity (BV) framework from a 20-year mean of the Estimating the Circulation and Climate of the Ocean state estimate at 1 degrees resolution. An unsupervised machine learning algorithm, K-means, objectively clusters the standardized BV equation, identifying five unambiguous regimes. Cluster 1 covers 43 +/- 3.3% of the ocean area. Surface and bottom stress torque are balanced by the bottom pressure torque and the nonlinear torque. Cluster 2 covers 24.8 +/- 1.2%, where the beta effect balances the bottom pressure torque. Cluster 3 covers 14.6 +/- 1.0%, characterized by a "Quasi-Sverdrupian" regime where the beta effect is balanced by the wind and bottom stress term. The small region of Cluster 4 has baroclinic dynamics covering 6.9 +/- 2.9% of the ocean. Cluster 5 occurs primarily in the Southern Ocean. Residual "dominantly nonlinear" regions highlight where the BV approach is inadequate, found in areas of rough topography in the Southern Ocean and along western boundaries.”](javascript:;)

Advancing multi-vehicle deployments in oceanographic field experiments

[Ferreira, AS](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=Ferreira,%20AS) (Ferreira, Antonio Sergio)[[1](javascript:sup_focus('addressWOS:000474366100016-1'))]; [Costa, M](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=Costa,%20M) (Costa, Maria)[[1](javascript:sup_focus('addressWOS:000474366100016-1'))]; [Py, F](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=Py,%20F" \o "Find more records by this author) (Py, Frederic)[[1](javascript:sup_focus('addressWOS:000474366100016-1')),[6](javascript:sup_focus('addressWOS:000474366100016-6'))]; [Pinto, J](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=Pinto,%20J) (Pinto, Jose)[[1](javascript:sup_focus('addressWOS:000474366100016-1'))]; [Silva, MA](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=Silva,%20MA) (Silva, Monica A.)[[2](javascript:sup_focus('addressWOS:000474366100016-2')),[3](javascript:sup_focus('addressWOS:000474366100016-3'))]; [Nimmo-Smith, A](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=Nimmo-Smith,%20A" \o "Find more records by this author) (Nimmo-Smith, Alex)[[4](javascript:sup_focus('addressWOS:000474366100016-4'))]; [Johansen, TA](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=Johansen,%20TA) (Johansen, Tor Arne)[[5](javascript:sup_focus('addressWOS:000474366100016-5'))]; [de Sousa, JB](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=de%20Sousa,%20JB) (de Sousa, Joao Borges)[[1](javascript:sup_focus('addressWOS:000474366100016-1'))]; [Rajan, K](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=Rajan,%20K" \o "Find more records by this author) (Rajan, Kanna)[[1](javascript:sup_focus('addressWOS:000474366100016-1')),[5](javascript:sup_focus('addressWOS:000474366100016-5'))]

AUTONOMOUS ROBOTS, Volume: 43, Issue: 6, Pages: 1555-1574, DOI: 10.1007/s10514-018-9810-x

2019 (I need to get via-ILL)

Abstract:

“Our research concerns the coordination and control of robotic vehicles for upper water-column oceanographic observations. In such an environment, operating multiple vehicles to observe dynamic oceanographic phenomena, such as ocean processes and marine life, from fronts to cetaceans, has required that we design, implement and operate software, methods and processes which can support opportunistic needs in real-world settings with substantial constraints. In this work, an approach for coordinated measurements using such platforms, which relate directly to task outcomes, is presented. We show the use and operational value of a new Artificial Intelligence based mixed-initiative system for handling multiple platforms along with the networked infrastructure support needed to conduct such operations in the open sea. We articulate the need and use of a range of middleware architectures, critical for such deployments and ground this in the context of a field experiment in open waters of the mid-Atlantic in the summer of 2015.”

[CONET: A Cogitive Ocean Network](http://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=GeneralSearch&qid=8&SID=5F8uugdcIyxwHPlE6Ch&page=1&doc=2)

[Lu, Huimin](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=Lu,%20Huimin); [Wang, Dong](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=Wang,%20Dong); [Li, Yujie](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&excludeEventConfig=ExcludeIfFromFullRecPage&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&field=AU&value=Li,%20Yujie); et al.

[IEEE WIRELESS COMMUNICATIONS](javascript:;)  Volume: 26   Issue: 3  Pages: 90-96   Published: JUN 2019

Abstract:

[“The scientific and technological revolution of the Internet of Things has begun in the area of oceanography. Historically, humans have observed the ocean from an external viewpoint in order to study it. In recent years, however, changes have occurred in the ocean, and laboratories have been built on the sea floor. Approximately 70.8 percent of the Earth's surface is covered by oceans and rivers. The Ocean of Things is expected to be important for disaster prevention, ocean resource exploration, and underwater environmental monitoring. Unlike traditional wireless sensor networks, the Ocean Network has its own unique features, such as low reliability and narrow bandwidth. These features will be great challenges for the Ocean Network. Furthermore, the integration of the ocean network with artificial intelligence has become a topic of increasing interest for oceanology researchers. The cognitive ocean network (CONet) will become the mainstream of future ocean science and engineering developments. In this article, we define the CONet. The contributions of the article are as follows: a CONet architecture is proposed and described in detail; important and useful demonstration applications of the CONet are proposed; and future trends in CONet research are presented.” (need to get via ILL)](javascript:;)

A hybrid case-based model for forecasting

[Corchado, JM](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Corchado,%20JM&dais_id=55358&excludeEventConfig=ExcludeIfFromFullRecPage) (Corchado, JM); [Lees, B](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Lees,%20B&dais_id=486599&excludeEventConfig=ExcludeIfFromFullRecPage) (Lees, B)

APPLIED ARTIFICIAL INTELLIGENCE

Volume: 15,,Issue: 2,,Pages: 105-127,DOI: 10.1080/088395101750065723,FEB 2001

Abstract:

“An investigation is described into the application of artificial intelligence to forecasting in the domain of oceanography. A hybrid approach to forecasting the thermal structure of the water ahead of a moving vessel is presented which combines the ability of a case-based reasoning system for identifying previously encountered similar situations and the generalizing ability of an artificial neural network to guide the adaptation stage of the case-based reasoning mechanism. The system has been successfully tested in real time in the Atlantic Ocean; the results obtained are presented and compared with those derived from other forecasting methods.”

Oceanic Eddy Identification Using an AI Scheme

By:[Xu, GJ](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Xu,%20GJ&dais_id=30341176&excludeEventConfig=ExcludeIfFromFullRecPage) (Xu, Guangjun)[[1](javascript:sup_focus('addressWOS:000472648000092-1')),[2](javascript:sup_focus('addressWOS:000472648000092-2')),[3](javascript:sup_focus('addressWOS:000472648000092-3'))]; [Cheng, C](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Cheng,%20C&dais_id=30324975&excludeEventConfig=ExcludeIfFromFullRecPage) (Cheng, Cheng)[[3](javascript:sup_focus('addressWOS:000472648000092-3')),[4](javascript:sup_focus('addressWOS:000472648000092-4'))]; [Yang, WX](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Yang,%20WX&dais_id=29660089&excludeEventConfig=ExcludeIfFromFullRecPage) (Yang, Wenxian)[[3](javascript:sup_focus('addressWOS:000472648000092-3')),[4](javascript:sup_focus('addressWOS:000472648000092-4'))]; [Xie, WH](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Xie,%20WH&dais_id=30312829&excludeEventConfig=ExcludeIfFromFullRecPage" \o "Find more records by this author) (Xie, Wenhong)[[1](javascript:sup_focus('addressWOS:000472648000092-1')),[3](javascript:sup_focus('addressWOS:000472648000092-3'))]; [Kong, LM](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Kong,%20LM&dais_id=602878&excludeEventConfig=ExcludeIfFromFullRecPage) (Kong, Lingmei)[[3](javascript:sup_focus('addressWOS:000472648000092-3')),[4](javascript:sup_focus('addressWOS:000472648000092-4'))]; [Hang, RL](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Hang,%20RL&dais_id=2922095&excludeEventConfig=ExcludeIfFromFullRecPage) (Hang, Renlong)[[5](javascript:sup_focus('addressWOS:000472648000092-5'))]; [Ma, FR](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Ma,%20FR&dais_id=1048330&excludeEventConfig=ExcludeIfFromFullRecPage) (Ma, Furong)[[5](javascript:sup_focus('addressWOS:000472648000092-5'))]; [Dong, CM](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Dong,%20CM&dais_id=213845&excludeEventConfig=ExcludeIfFromFullRecPage) (Dong, Changming)[[1](javascript:sup_focus('addressWOS:000472648000092-1')),[2](javascript:sup_focus('addressWOS:000472648000092-2')),[3](javascript:sup_focus('addressWOS:000472648000092-3'))]; [Yang, JS](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Yang,%20JS&dais_id=360458&excludeEventConfig=ExcludeIfFromFullRecPage) (Yang, Jingsong)[[6](javascript:sup_focus('addressWOS:000472648000092-6'))]

REMOTE SENSING, Volume: 11, Issue: 11, Article Number: 1349

DOI: 10.3390/rs11111349, Published: JUN 1 2019

Abstract:

“Oceanic eddies play an important role in global energy and material transport, and contribute greatly to nutrient and phytoplankton distribution. Deep learning is employed to identify oceanic eddies from sea surface height anomalies data. In order to adapt to segmentation problems for multi-scale oceanic eddies, the pyramid scene parsing network (PSPNet), which is able to satisfy the fusion of semantics and details, is applied as the core algorithm in the eddy detection methods. The results of eddies identified from this artificial intelligence (AI) method are well compared with those from a traditional vector geometry-based (VG) method. More oceanic eddies are detected by the AI algorithm than the VG method, especially for small-scale eddies. Therefore, the present study demonstrates that the AI algorithm is applicable of oceanic eddy detection. It is one of the first few of efforts to bridge AI techniques and oceanography research.”

INTELLIGENT TRAFFIC WITH CONNECTED VEHICLES Intelligent and Connected Traffic Systems

By:[Balabhadruni, SK](http://apps.webofknowledge.com/DaisyOneClickSearch.do?product=WOS&search_mode=DaisyOneClickSearch&colName=WOS&SID=5F8uugdcIyxwHPlE6Ch&author_name=Balabhadruni,%20SK&dais_id=20943008&excludeEventConfig=ExcludeIfFromFullRecPage" \o "Find more records by this author) (Balabhadruni, Sai Kumar)[[1](javascript:sup_focus('addressWOS:000380439200311-1'))]

2015 INTERNATIONAL CONFERENCE ON ELECTRICAL, ELECTRONICS, SIGNALS, COMMUNICATION AND OPTIMIZATION (EESCO)

Book Group Author(s):[IEEE](http://apps.webofknowledge.com/OneClickSearch.do?product=WOS&search_mode=OneClickSearch&colName=WOS&excludeEventConfig=ExcludeIfFromFullRecPage&SID=5F8uugdcIyxwHPlE6Ch&field=GP&value=IEEE" \o "Find more records by this group author)  2015

Abstract:

This paper describes the structured approach involved in the development of an Intelligent Autonomous (self-driving, unmanned, driverless or robotic) Vehicles. In which autopilot with artificial intelligence are critical subsystems whose development requires multidisciplinary approach along with concurrent engineering to create a better, safer and reliable future. We have studied and implemented a miniature scale model with outcome of satisfactory results of supporting realistic vehicular mobility simulation using concepts of swarm technology discussed in this paper. Our Model must be equipped with a variety of instrumentation and controls depending upon the mission of the target vehicle. Mechatronics, Systems Engineering (SE), Control Systems (CS), Swarm Technology, Artificial Intelligence, Image Processing Cloud Computing, Virtualization with caching, Fuzzy Logic and Neural Networks has a potential scope of design for the prototype needed to be developed that will navigate to a desired location with obstacle avoidance. In this design of autonomous vehicles have access to information about their surroundings gathered from its several sensors such as Radar, GPS including a very important component of this system Infrastructure Unit which is connected virtually with Vehicle's Operating System, mapping and direction system is discussed broadly. Here, Infrastructure Unit plays a major role in routing the traffic to maintain free flow and accident avoidance, by provides information such as Routes, Traffic, Time, Directions to Vehicles and maintain constant speed for all vehicles to achieve an efficient autonomous transportation reducing accidents to zero. To improve the response time and storage of V2I Communication a new approach of caching and virtualization are encapsulated with a better and faster hardware such as Solid State Technology. This study has various applications in Space Science, Oceanography, and Automation in Traffic control which can effortlessly meet the necessity, scalability of future Generation.

Adoption of Machine Learning Techniques in Ecology and Earth Science

Citation: Thessen A (2016) Adoption of Machine Learning Techniques in Ecology and Earth Science. One

Ecosystem 1: e8621. doi: 10.3897/oneeco.1.e8621

Online: <https://oneecosystem.pensoft.net/article/8621/> (sent PDF)

Could Machine Learning Break the Convection Parameterization Deadlock?

P. Gentine1, M. Pritchard2, S. Rasp3, G. Reinaudi1, and G. Yacalis

Geophysical Research Letters DOI:10.1029/2018GL078202

Online: <https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2018GL078202>

(sent PDF )

Applications for Deep Learning in Ecology

Sylvain Christin1 , Éric Hervet2 , Nicolas Lecomte1 \*

Online: <https://www.biorxiv.org/content/biorxiv/early/2018/05/30/334854.full.pdf>

Note: bioRxiv preprint first posted online May. 30, 2018; doi: http://dx.doi.org/10.1101/334854. The copyright holder for this preprint (which was not peer-reviewed) is the author/funder, who has granted bioRxiv a license to display the preprint in perpetuity. It is made available under a CC-BY-NC-ND 4.0 International license.

(sent PDF)

Machine Learning for the Geosciences: Challenges and Opportunities

Anuj Karpatne, Imme Ebert-Uphoff, Sai Ravela, Hassan Ali Babaie, and Vipin Kumar

Online: <https://arxiv.org/pdf/1711.04708.pdf>

Abstract:

“Geosciences is a field of great societal relevance that requires solutions to several urgent problems facing our humanity and the planet. As geosciences enters the era of big data, machine learning (ML)— that has been widely successful in commercial domains—offers immense potential to contribute to problems in geosciences. However, problems in geosciences have several unique challenges that are seldom found in traditional applications, requiring novel problem formulations and methodologies in machine learning. This article introduces researchers in the machine learning (ML) community to these challenges offered by geoscience problems and the opportunities that exist for advancing both machine learning and geosciences. We first highlight typical sources of geoscience data and describe their properties that make it challenging to use traditional machine learning techniques. We then describe some of the common categories of geoscience problems where machine learning can play a role, and discuss some of the existing efforts and promising directions for methodological development in machine learning. We conclude by discussing some of the emerging research themes in machine learning that are applicable across all problems in the geosciences, and the importance of a deep collaboration between machine learning and geosciences for synergistic advancements in both disciplines. “

Performances of machine learning algorithms for mapping fractional cover of an invasive plant species in a dryland ecosystem

[Hailu Shiferaw](https://www.ncbi.nlm.nih.gov/pubmed/?term=Shiferaw%20H%5BAuthor%5D&cauthor=true&cauthor_uid=30891200),corresponding author 1 , 2[Woldeamlak Bewket](https://www.ncbi.nlm.nih.gov/pubmed/?term=Bewket%20W%5BAuthor%5D&cauthor=true&cauthor_uid=30891200),2and [Sandra Eckert](https://www.ncbi.nlm.nih.gov/pubmed/?term=Eckert%20S%5BAuthor%5D&cauthor=true&cauthor_uid=30891200)3

[Ecol Evol](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6405495/). 2019 Mar; 9(5): 2562–2574.

Online 2019 Feb 12. doi: [10.1002/ece3.4919](https://dx.doi.org/10.1002%2Fece3.4919) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6405495/>

PMCID: PMC6405495

PMID: [30891200](https://www.ncbi.nlm.nih.gov/pubmed/30891200)

Abstract:

“In recent years, an increasing number of distribution maps of invasive alien plant species (IAPS) have been published using different machine learning algorithms (MLAs). However, for designing spatially explicit management strategies, distribution maps should include information on the local cover/abundance of the IAPS. This study compares the performances of five MLAs: gradient boosting machine in two different implementations, random forest, support vector machine and deep learning neural network, one ensemble model and a generalized linear model; thereby identifying the best‐performing ones in mapping the fractional cover/abundance and distribution of IPAS, in this case called *Prosopis juliflora (SW. DC.)*. Field level *Prosopis* cover and spatial datasets of seventeen biophysical and anthropogenic variables were collected, processed, and used to train and validate the algorithms so as to generate fractional cover maps of *Prosopis* in the dryland ecosystem of the Afar Region, Ethiopia. Out of the seven tested algorithms, random forest performed the best with an accuracy of 92% and sensitivity and specificity >0.89. The next best‐performing algorithms were the ensemble model and gradient boosting machine with an accuracy of 89% and 88%, respectively. The other tested algorithms achieved comparably low performances. The strong explanatory variables for *Prosopis*distributions in all models were NDVI, elevation, distance to villages and distance to rivers; rainfall, temperature, near‐infrared and red reflectance, whereas topographic variables, except for elevation, did not contribute much to the current distribution of *Prosopis*. According to the random forest model, a total of 1.173 million ha (12.33% of the study region) was found to be invaded by *Prosopis* to varying degrees of cover. Our findings demonstrate that MLAs can be successfully used to develop fractional cover maps of plant species, particularly IAPS so as to design targeted and spatially explicit management strategies.”

Big Earth data analytics: a survey, Big Earth Data

Chaowei Yang, Manzhu Yu, Yun Li, Fei Hu, Yongyao Jiang, Qian Liu, Dexuan Sha, Mengchao Xu & Juan Gu (2019, 3:2, 83-107, DOI: [10.1080/20964471.2019.1611175](https://doi.org/10.1080/20964471.2019.1611175)

Online: <https://www.tandfonline.com/doi/full/10.1080/20964471.2019.1611175>

Abstract:

“Big Earth data are produced from satellite observations, Internet-of-Things, model simulations, and other sources. The data embed unprecedented insights and spatiotemporal stamps of relevant Earth phenomena for improving our understanding, responding, and addressing challenges of Earth sciences and applications. In the past years, new technologies (such as cloud computing, big data and artificial intelligence) have gained momentum in addressing the challenges of using big Earth data for scientific studies and geospatial applications historically intractable. This paper reviews the big Earth data analytics from several aspects to capture the latest advancements in this fast-growing domain. We first introduce the concepts of big Earth data. The architecture, various functionalities, and supporting modules are then reviewed from a generic methodology aspect. Analytical methods supporting the functionalities are surveyed and analyzed in the context of different tools. The driven questions are exemplified through cutting-edge Earth science researches and applications. A list of challenges and opportunities are proposed for different stakeholders to collaboratively advance big Earth data analytics in the near future.”

Website:

State of the Planet, Columbia University

Artificial Intelligence—A Game Changer for Climate Change and the Environment

BY [RENEE CHO](https://blogs.ei.columbia.edu/author/renee-cho/)|JUNE 5, 2018

Online: <https://blogs.ei.columbia.edu/2018/06/05/artificial-intelligence-climate-environment/>

Machine Learning with MATLAB

Offers four sections: Introduction to Machine Learning; Getting Started with Machine Learning; Applying Unsupervised Learning (see article above, [*Unsupervised Learning Reveals Geography of Global Ocean Dynamical Regions*](http://apps.webofknowledge.com/full_record.do?product=WOS&search_mode=GeneralSearch&qid=4&SID=5F8uugdcIyxwHPlE6Ch&page=1&doc=1)*,*

<https://www.mathworks.com/campaigns/offers/machine-learning-with-matlab.html?gclid=EAIaIQobChMIpO2ChJDL4wIVxp6zCh14vwJgEAMYASAAEgIyBPD_BwE&ef_id=EAIaIQobChMIpO2ChJDL4wIVxp6zCh14vwJgEAMYASAAEgIyBPD_BwE:G:s&s_kwcid=AL!8664!3!259079695804!p!!g!!machine%20learning&s_eid=psn_33521757490&q=machine%20learning>

Powered by TensorFlow: utilizing deep learning to better predict extreme weather

YouTube video:

<https://www.youtube.com/watch?v=p45kQklIsd4&feature=youtu.be>

“Machine learning is helping to solve challenging, real-world problems around the world. See how a team of engineers and researchers at NERSC (National Energy Research Scientific Computing Center) at the Lawrence Berkeley National Laboratory ([https://www.nersc.gov/](https://www.youtube.com/redirect?q=https%3A%2F%2Fwww.nersc.gov%2F&redir_token=F58CTvBudHvIaZNzwJ1R_krLLvd8MTU2NDE1ODI2NUAxNTY0MDcxODY1&event=video_description&v=p45kQklIsd4)) and NVIDIA ([https://www.nvidia.com/en-us/](https://www.youtube.com/redirect?q=https%3A%2F%2Fwww.nvidia.com%2Fen-us%2F&redir_token=F58CTvBudHvIaZNzwJ1R_krLLvd8MTU2NDE1ODI2NUAxNTY0MDcxODY1&event=video_description&v=p45kQklIsd4)) are using state-of-the-art machine learning powered by TensorFlow and high-performance supercomputing to better predict extreme weather.” Published Mar. 7, 2019

Books:

[Machine learning methods in the environmental sciences: Neural networks and kernels](https://books.google.com/books?hl=en&lr=&id=z_LIZwiKA3EC&oi=fnd&pg=PR9&dq=machine+learning+in+oceanography&ots=AkkfAQZwKN&sig=c1K-5_mj-Sxb6Gwg64G-yHM1pX8)

[WW Hsieh](https://scholar.google.com/citations?user=nr4rdYYAAAAJ&hl=en&oi=sra) - 2009 - books.google.com