Department of Commerce - Artificial Intelligence (AI) Use Case Inventory - 2022				
AI Use Case	**Bureau**	**Point of Contact (POC)**	**POC email**	**Description**
B2B Matchmaking	International Trade Administration (ITA)	Russell, Ryan	Ryan.Russell@trade.gov	The system's algorithms and AI technology qualifies data and makes B2B matches with event participants according to their specific needs and available opportunities. The systems inputs are data related to event participants and the outputs are suggested B2B matches between participants and a match strength scorecard.
Chatbot Pilot	International Trade Administration (ITA)	Howard, Ed	Ed.Howard@trade.gov	Chatbot embedded into trade.gov to assist ITA clients with FAQs, locating information and content, suggesting events and services. ITA clients would enter input into the chatbot in the form of questions or responses to prompts. The chatbot would scan ITA content libraries and input from ITA staff and return answers and suggestions based on client persona (exporter, foreign buyer, investor).
Consolidated Screening List	International Trade Administration (ITA)	Kirwin, Patrick	patrick.kirwin@trade.gov	The Consolidated Screening List (CSL) is a list of parties for which the United States Government maintains restrictions on certain exports, reexports, or transfers of items. It consists of the consolidation of 13 export screening lists of the Departments of Commerce, State, and Treasury. The CSL search engine has “Fuzzy Name Search” capabilities, allowing a search without knowing the exact spelling of an entity’s name. In Fuzzy Name mode, the CSL returns a “score” for results that exactly or nearly match the searched name. This is particularly helpful when searching on CSL for names that have been translated into English from non-Latin alphabet languages.
AD/CVD Self Initiation	International Trade Administration (ITA)	Kennedy, Brooke	brook.kennedy@trade.gov	The ADCVD program investigates allegations of dumping and/or countervailing of duties. Investigations are initiated when a harmed US entity files a petition identifying the alleged offence and the specific harm inflicted. Self-Initiation will allow ITA to monitor trade patterns for this activity and preemptively initiate investigations by identifying harmed US entities, often before these entities are aware of the harm.
Market Diversification Toolkit	International Trade Administration (ITA)	Barr, Morgan	morgan.barr@trade.gov	The Market Diversification Tool identifies potential new export markets using current trade patterns. A user enters what products they make and the markets they currently export to. The Market Diversification Tool applies a ML algorithm to identify and compare markets that should be considered. The tool brings together product-specific trade and tariff data and economy-level macroeconomic and governance data to provide a picture of which markets make sense for further market research. Users can limit the markets in the results to only the ones they want to consider and modify how each of the eleven indicators in the tool contributes to a country’s overall score. Users can export all the data to a spreadsheet for further analysis.
Fisheries Electronic Monitoring Image Library	*National Oceanic and Atmospheric Administration (NOAA)*	Alger, Brett	brett.alger@noaa.gov	The Fisheries Electronic Monitoring Library (FEML) will be the central repository for electronic monitoring (EM) data related to marine life.

Passive acoustic analysis using ML in Cook Inlet, AK	*National Oceanic and Atmospheric Administration (NOAA)*	Angliss, Robyn	robyn.angliss@noaa.gov	Passive acoustic data is analyzed for detection of beluga whales and classification of the different signals emitted by these species. Detection and classification are done with an ensemble of 4 CNN models and weighted scoring developed in collaboration with Microsoft. Results are being used to inform seasonal distribution, habitat use, and impact from anthropogenic disturbance within Cook Inlet beluga critical habitat. The project is aimed to expand to other cetacean species as well as anthropogenic noise.
AI-based automation of acoustic detection of marine mammals	*National Oceanic and Atmospheric Administration (NOAA)*	Berchok, Catherine	cathering.bderchok@noaa.gov	Timely processing of these data is critical for adapting mitigation measures as climate change continues to impact Arctic marine mammals. Infrastructure for Noise and Soundscape Tolerant Investigation of Nonspecific Call Types (INSTINCT) is command line software which was developed in-house for model training, evaluation, and deployment of machine learning models for the purpose of marine mammal detection in passive acoustic data. It also includes annotation workflows for labeling and validation. INSTINCT has been successfully deployed in several analyses, and further development of detectors within INSTINCT is desired for future novel studies and automation. Continued integration of AI methods into existing processes of the CAEP acoustics group requires a skilled operator familiar with INSTINCT, machine learning, and acoustic repertoire of Alaska region marine mammals.
Developing automation to determine species and count using optical survey data in the Gulf of Mexico	*National Oceanic and Atmospheric Administration (NOAA)*	Campbell, Matthew	matthew.d.campbell@noaa.gov	VIAME - This project focuses on optical survey collected in the Gulf of Mexico: 1) develop an image library of landed catch, 2) develop of automated image processing (ML/DL) to identify and enumerate species from underwater imagery and 3) develop automated algorithms to process imagery in near real time and download information to central database.
Fast tracking the use of VIAME for automated identification of reef fish	*National Oceanic and Atmospheric Administration (NOAA)*	Campbell, Matthew	matthew.d.campbell@noaa.gov	We've been compiling image libraries for use in creating automated detection and classification models for use in automating the annotation process for the SEAMAP Reef Fish Video survey of the Gulf of Mexico. This work is being conducted in VIAME but we're looking at several other paths forward in the project to identify best performing models. Current status is that models are performing well enough that we will incorporate automated analysis in video reads this spring as part of a supervised annotation-qa/qc process.
A Hybrid Statistical-Dynamical System for the Seamless Prediction of Daily Extremes and Subseasonal to Seasonal Climate Variability	*National Oceanic and Atmospheric Administration (NOAA)*	Collins, Dan	dan.collins@noaa.gov	Demonstrate the skill and suitability for operations of a statistical- dynamical prediction system that yields seamless probabilistic forecasts of daily extremes and sub seasonal-to-seasonal temperature and precipitation. We recently demonstrated a Bayesian statistical method for post-processing seasonal forecasts of mean temperature and precipitation from the North American Multi-Model Ensemble (NMME). We now seek to test the utility of an updated hybrid statistical-dynamical prediction system that facilitates seamless sub seasonal and seasonal forecasting. Importantly, this method allows for the representation of daily extremes consistent with climate conditions. This project explores the use of machine learning.
FathomNet	*National Oceanic and Atmospheric Administration (NOAA)*	Cromwell, Megan	megan.cromwell@noaa.gov	FathomNet provides much-needed training data (e.g., annotated, and localized imagery) for developing machine learning algorithms that will enable fast, sophisticated analysis of visual data. We've utilized interns and college class curriculums to localize annotations on NOAA video data for inclusion in FathomNet and to begin training our own algorithms.

ANN to improve CFS T and P outlooks	*National Oceanic and Atmospheric Administration (NOAA)*	Fan, Yun	yun.fan@noaa.gov	Fan Y., Krasnopolsky, V., van den Dool H., Wu, C. , and Gottschalck J. (2021). Using Artificial Neural Networks to Improve CFS Week 3-4 Precipitation and Temperature Forecasts.
Drought outlooks by using ML techniques	*National Oceanic and Atmospheric Administration (NOAA)*	Fan, Yun	yun.fan@noaa.gov	Drought outlooks by using ML techniques with NCEP models. Simple NN and Deep Learning techniques used for GEFSv12 to predict Week 1-5 Prcp & T2m over CONUS
EcoCast: A dynamic ocean management tool to reduce bycatch and support sustainable fisheries	*National Oceanic and Atmospheric Administration (NOAA)*	Hazen, Elliott	elliot.hazen@noaa.gov	Operational tool that uses boosted regression trees to model the distribution of swordfish and bycatch species in the California Current
Coastal Change Analysis Program (C-CAP)	*National Oceanic and Atmospheric Administration (NOAA)*	Herold, Nate	nate.herold@noaa.gov	Beginning in 2015, C-CAP embarked on operational high resolution land cover development effort that utilized geographic object-based image analysis and ML algorithms such as Random Forest to classify coastal land cover from 1m multispectral imagery. More recently, C-CAP has been relying on a CNN approach for the deriving the impervious surface component of their land cover products. The majority of the work is accomplished through external contracts. Prior to the high-res effort, C-CAP focused on developing Landsat based moderate resolution multi-date land cover for the coastal U.S. In 2002, C-CAP adopted a methodology that employed Classification and Regression Trees for land cover data development.
Deep learning algorithms to automate right whale photo id	*National Oceanic and Atmospheric Administration (NOAA)*	Khan, Christin	christin.khan@noaa.gov	AI for right whale photo id began with a Kaggle competition and has since expanded to include several algorithms to match right whales from different viewpoints (aerial, lateral) and body part (head, fluke, peduncle). The system is now live and operational on the Flukebook platform for both North Atlantic and southern right whales. We have a paper in review at Mammalian Biology.
NN Radiation	*National Oceanic and Atmospheric Administration (NOAA)*	Krasnopolosky, Vladimir	vladimir.krasnopolsky@noaa.gov	Developing fast and accurate NN LW- and SW radiations for GFS and GEFS. NN LW- and SW radiations have been successfully developed for previous version of GFS, see: doi: 10.1175/2009MWR3149.1 and the stability and robustness of the approach used was demonstrated, see: https://arxiv.org/ftp/arxiv/papers/2103/2103.07024.pdf NN LW- and SW radiations will be developed for the current versions of for GFS and GEFS.
NN training software for the new generation of NCEP models	*National Oceanic and Atmospheric Administration (NOAA)*	Krasnopolosky, Vladimir	vladimir.krasnopolsky@noaa.gov	Optimize NCEP EMC Training and Validation System for efficient handling of high spatial resolution model data produced by the new generation of NCEP's operational models
Coral Reef Watch	*National Oceanic and Atmospheric Administration (NOAA)*	Manzello, Derek	derek.manzello@noaa.gov	For more than 20 years, NOAA Coral Reef Watch (CRW) has been using remote sensing, modeled, and in situ data to operate a Decision Support System (DSS) to help resource managers (our target audience), researchers, decision makers, and other stakeholders around the world prepare for and respond to coral reef ecosystem stressors, predominantly resulting from climate change and warming of the Earth's oceans. Offering the world's only global early-warning system of coral reef ecosystem physical environmental changes, CRW remotely monitors conditions that can cause coral bleaching, disease, and death; delivers information and early warnings in near real-time to our user community; and uses operational climate forecasts to provide outlooks of stressful environmental conditions at targeted reef locations worldwide. CRW products are primarily sea surface temperature (SST)-based but also incorporate light and ocean color, among other variables.

Robotic microscopes and machine learning algorithms remotely and autonomously track lower trophic levels for improved ecosystem monitoring and assessment	*National Oceanic and Atmospheric Administration (NOAA)*	Moore, Stephanie	stephanie.moore@noaa.gov	Phytoplankton are the foundation of marine food webs supporting fisheries and coastal communities. They respond rapidly to physical and chemical oceanography, and changes in phytoplankton communities can impact the structure and functioning of food webs. We use a robotic microscope called an Imaging Flow Cytobot (IFCB) to continuously collect images of phytoplankton from seawater. Automated taxonomic identification of imaged phytoplankton uses a supervised machine learning approach (random forest algorithm). We deploy the IFCB on fixed (docks) and roving (aboard survey ships) platforms to autonomously monitor phytoplankton communities in aquaculture areas in Puget Sound and in the California Current System. We map the distribution and abundance of phytoplankton functional groups and their relative food value to support fisheries and aquaculture and describe their changes in relation to ocean and climate variability and change.
Edge AI survey payload development	*National Oceanic and Atmospheric Administration (NOAA)*	Moreland, Erin	erin.moreland@noaa.gov	Continued support of multispectral aerial imaging payload running detection model pipelines in real-time. This is a nine camera (color, infrared, ultraviolet) payload controlled by dedicated on-board computers with GPUs. YOLO detection models run at a rate faster than image collection, allowing real-time processing of imagery as it comes off the cameras. Goals of effort are to reduce overall data burden (by TBs) and reduce the data processing timeline, expediting analysis and population assessment for arctic mammals.
Ice seal detection and species classification in multispectral aerial imagery	*National Oceanic and Atmospheric Administration (NOAA)*	Moreland, Erin	erin.moreland@noaa.gov	Refine and improve detection and classification pipelines with the goal of reducing false positive rates (to < 50%) while maintaining > 90% accuracy and significantly reducing or eliminating the labor intensive, post survey review process.
First Guess Excessive Rainfall Outlook	*National Oceanic and Atmospheric Administration (NOAA)*	Nelson, James	james.a.nelson@noaa.gov	Machine Learning Product that is a first guess for the WPC Excessive Rainfall Outlook - It is learned from the ERO with atmospheric variables. It is for the Day 4-7 products
First Guess Excessive Rainfall Outlook	*National Oceanic and Atmospheric Administration (NOAA)*	Nelson, James	james.a.nelson@noaa.gov	Machine Learning Product that is a first guess for the WPC Excessive Rainfall Outlook - It is learned from the ERO with atmospheric variables. It is for the Day 1, 2, 3 products
CoralNet: Ongoing operational use, improvement, and development, of machine vision point classification	*National Oceanic and Atmospheric Administration (NOAA)*	Oliver, Thomas	thomas.oliver@noaa.gov	CoralNet is our operational point annotation software for benthic photo quadrat annotation. Our development of our classifiers has allowed us to significantly reduce our human annotation, and we continue to co-develop (and co-fund) new developments in CoralNet,
Automated detection of hazardous low clouds in support of safe and efficient transportation	*National Oceanic and Atmospheric Administration (NOAA)*	Pavolonis, Mike	mike.pavolonis@noaa.gov	This is a maintenance and sustainment project for the operational GOES-R fog/low stratus (FLS) products. The FLS products are derived from the combination of GOES-R satellite imagery and NWP data using machine learning. The FLS products, which are available in AWIPS, are routinely used by the NWS Aviation Weather Center and Weather Forecast Offices.
The Development of ProbSevere v3 - An improved nowcasting model in support of severe weather warning operations	*National Oceanic and Atmospheric Administration (NOAA)*	Pavolonis, Mike	mike.pavolonis@noaa.gov	ProbSevere is a ML model that utilizes NWP, satellite, radar, and lightning data to nowcast severe wind, severe hail, and tornadoes. ProbSevere, which was transitioned to NWS operations in October 2020, is a proven tool that enhances operational severe weather warnings. This project aims to develop the next version of ProbSevere, ProbSevere v3. ProbSevere v3 utilizes additional data sets and improved machine learning techniques to improve upon the operational version of ProbSevere. ProbSevere v3 was successfully demonstrated in the 2021 Hazardous Weather Testbed and a JTTI proposal was recently submitted to facilitate an operational update. The development is funded by GOES-R.

The VOLcanic Cloud Analysis Toolkit (VOLCAT): An application system for detecting, tracking, characterizing, and forecasting hazardous volcanic events	*National Oceanic and Atmospheric Administration (NOAA)*	Pavolonis, Mike	mike.pavolonis@noaa.gov	Volcanic ash is a major aviation hazard. The VOLcanic Cloud Analysis Toolkit (VOLCAT) consists of several AI powered satellite applications including: eruption detection, alerting, and volcanic cloud tracking. These applications are routinely utilized by Volcanic Ash Advisory Centers to issue volcanic ash advisories. Under this project, the VOLCAT products will be further developed, and subsequently transitioned to the NESDIS Common Cloud Framework, to help ensure adherence to new International Civil Aviation Organization requirements.
SUVI Thematic Maps	*National Oceanic and Atmospheric Administration (NOAA)*	Rachmeler, Laurel	laurel.rachmeler@noaa.gov	The GOES-16 Solar Ultraviolet Imager (SUVI) is NOAA's operational solar extreme-ultraviolet imager. The SUVI Level 2 Thematic Map files in these directories are produced by NOAA's National Centers for Environmental Information in Boulder, Colorado. These data have been processed from Level 2 High Dynamic Range (HDR) composite SUVI images. The FITS file headers are populated with metadata to facilitate interpretation by users of these observations. Please note that these files are considered to be experimental and thus will be improved in future releases. Users requiring assistance with these files can contact the NCEI SUVI team by emailing goesr.suvi@noaa.gov. The SUVI Thematic Maps product is a Level 2 data product that (presently) uses a machine learning classifier to generate a pixel-by-pixel map of important solar features digested from all six SUVI spectral channels.
BANTER, a machine learning acoustic event classifier	*National Oceanic and Atmospheric Administration (NOAA)*	Rankin, Shannon	shannon.rankin@noaa.gov	A supervised machine learning acoustic event classifier using hierarchical random forests
ProbSR (probability of subfreezing roads	*National Oceanic and Atmospheric Administration (NOAA)*	Reeves, Heather	heather.reeves@noaa.gov	A machine-learned algorithm that provides a 0-100% probability roads are subfreezing
VIAME: Video and Image Analysis for the Marine Environment Software Toolkit	*National Oceanic and Atmospheric Administration (NOAA)*	Richards, Benjamin	benjamin.richards@noaa.gov	The Video and Image Analysis for the Marine Environment Software Toolkit, commonly known as VIAME, is an open-source, modular software toolkit that allows users to employ high-level, deep-learning algorithms for automated annotation of imagery using a low code/no code graphical user interface. VIAME is available free of charge to all NOAA users. The NOAA Fisheries Office of Science and Technology supports an annual maintenance contract covering technical and customer support by the developer, routine software updates, bug fixes, and development efforts that support broad, cross center application needs.
ENSO Outlooks using observed/analyzed fields	*National Oceanic and Atmospheric Administration (NOAA)*	Rosencrans, Matthew	matthew.rosencrans@noaa.gov	LSTM model that uses ocean and atmospheric predictors throughout the tropical Pacific to forecast ONI values up to 1 year in advance. An extension of this was submitted to the cloud portfolio with the intent of adding a CNN layer that that uses reforecast data to improve the ONI forecasts.
Using community-sourced underwater photography and image recognition software to study green sea turtle distribution and ecology in southern California	*National Oceanic and Atmospheric Administration (NOAA)*	Seminoff, Jeffrey	jeffrey.seminoff@noaa.gov	The goal of this project is to study green turtles in and around La Jolla Cove in the San Diego Region-a highly populated site with ecotourism-by engaging with local photographers to collect green turtle underwater images. The project uses publicly available facial recognition software (HotSpotter) to identify individual turtles, from which we determine population size, residency patterns, and foraging ecology
An Interactive Machine Learning Toolkit for Classifying Species Identity of Cetacean Echolocation	*National Oceanic and Atmospheric Administration (NOAA)*	Soldevilla, Melissa	melissa.soldevilla@noaa.gov	Develop robust automated machine learning detection and classification tools for acoustic species identification of toothed whale and dolphin echolocation clicks for up to 20 species found in the Gulf of Mexico. Tool development project funded from June 2018 to

Signals in Passive Acoustic Recordings				May 2021. Tool will be used for automated analyses of long-term recordings from Gulf-wide passive acoustic moored instruments deployed from 2010-2025 to look at environmental processes driving trends in marine mammal density and distribution.
Steller sea lion automated count program	*National Oceanic and Atmospheric Administration (NOAA)*	Sweeney, Katie	katie.sweeney@noaa.gov	NOAA Fisheries Alaska Fisheries Science Center's Marine Mammal Laboratory (MML) is mandated to monitor the endangered western Steller sea lion population in Alaska. MML conducts annual aerial surveys of known Steller sea lion sites across the southern Alaska coastline to capture visual imagery. It requires two full-time, independent counters to process overlapping imagery manually (to avoid double counting sea lions in multiple frames), and count and classify individuals by age and sex class. These counts are vital for population and ecosystem-based modeling to better understand the species and ecosystem, to inform sustainable fishery management decisions, and are eagerly anticipated by stakeholders like the NOAA Alaska Regional Office, industry, and environmental groups. MML worked with Kitware to develop detection and image registration pipelines with VIAME (updates to the DIVE program to support updated interface needs). MML is now working to assess the algorithms efficacy and develop a workflow to augment the traditional counting method (to RL 9).
Steller sea lion brand sighting	*National Oceanic and Atmospheric Administration (NOAA)*	Sweeney, Katie	katie.sweeney@noaa.gov	Detection and identification of branded steller sea lions from remote camera images in the western Aleutian Islands, AK. The goal is to help streamline photo processing to reduce the effort required to review images.
Replacing unstructured WW3 in the Great Lakes with a Recurrent neural network and a boosted ensemble decision tree	*National Oceanic and Atmospheric Administration (NOAA)*	Van Der Westhuysen, Andre	andre.vanderwesthuysen@noaa.gov	Investigated replacing unstructured WW3 in the Great Lakes with (i) a Recurrent Neural Network (RNN, especially an LSTM) developed by EMC and (ii) a boosted ensemble decision tree (XGBoost) developed by GLERL. These two AI models were trained on two decades of wave observations in Lake Erie and compared to the operational Great Lakes unstructured WW3.
Using k-means clustering to identify spatially and temporally consistent wave systems	*National Oceanic and Atmospheric Administration (NOAA)*	Van Der Westhuysen, Andre	andre.vanderwesthuysen@noaa.gov	Postprocessing that uses k-means clustering to identify spatially and temporally consistent wave systems from the output of NWPS v1.3. Has been successfully evaluated in the field by NWS marine forecasters nationwide and has been implemented into operations on February 3, 2021.
Picky	*National Oceanic and Atmospheric Administration (NOAA)*	Zhang, Chen	chen.zhang@noaa.gov	Using CNN to pick out objects of a particular size from sides scan imagery. Presents users with a probability that allows for automation of contact picking in the field. Side scan imagery is simple one channel intensity image which lends itself well to basic CNN techniques.
Data Science: Clutter	National Telecommunications and Information Administration (NTIA)	Eales, Bradley	beales@ntia.gov	NTIA's Institute for Telecommunication Sciences (ITS) is investigating the use of AI to automatically identify and classify clutter obstructed radio frequency propagation paths. Clutter is vegetation, buildings, and other structures that cause radio signal loss through dispersion, reflection, and diffraction. It does not include terrain effects. The classifier is a convolutional neural network (CNN) trained using lidar data coinciding with radio frequency propagation measurements made by ITS. This trained CNN can be fed new radio path lidar data and a clutter classification label is predicted.
WAWENETS	National Telecommunications and Information Administration (NTIA)	Voran, Steve	svoran@ntia.gov	The algorithm produces estimates of telecommunications speech quality and speech intelligibility. The input is a recording of speech from a telecommunications system in digital file format. The output is a single number that indicates speech quality (typically on a 1 to 5 scale) or speech intelligibility (typically on a 0 to 1 scale).

Azure Chatbot	Minority Business Development Administration (MBDA)	Bajwa, Prabhjot	pbajwa@doc.gov	Azure Chatbot is being leveraged to automate and streamline the user response to potential questions for MBDA users while interacting with the external facing MBDA website. The solution leverages AI based chatbot response coupled with Machine Learning and Natural Language Processing capabilities.
AI retrieval for patent search	United States Patent and Trade Office (USPTO)	Horner, Jon	jonathan.horner@uspto.gov	Augmentation for next generation patent search tool to assist examiners identify relevant documents and additional areas to search. System takes input from published or unpublished applications and provides recommendations on further prior art areas to search, giving the user the ability to sort by similarity to concepts of their choosing.
AI use for CPC classification	United States Patent and Trade Office (USPTO)	Yang, Nelson	nelson.yang@uspto.gov	System that classifies incoming patent application based on the cooperative patent classification scheme for operational assignment of work and symbol recommendation for aI search. Backoffice processing system that uses incoming patent applications as input and outputs the resulting classification symbols.
AI retrieval for TM design coding and Image search	United States Patent and Trade Office (USPTO)	Doninger, Chris	chris.doninger@uspto.gov	Clarivate COTS solution to assist examiner identification of similar trademark images, to suggest the correct assignment of mark image design codes, and to determine the potential acceptability of the identifications of goods and services. System is anticipated to use both incoming trademark images and registered trademark images and output design codes and/or other related images.
Enriched Citation	United States Patent and Trade Office (USPTO)	Yang, Nelson	nelson.yang@uspto.gov	Data dissemination system that identifies which references, or prior art, were cited in specific patent application office actions, including: bibliographic information of the reference, the claims that the prior art was cited against, and the relevant sections that the examiner relied upon. System extracts information from unstructured office actions and provides the information through a structured public facing API.
Inventor Search Assistant (iSAT)	United States Patent and Trade Office (USPTO)	Beliveau, Scott	scott.beliveau@uspto.gov	Service to help inventors "get started" identifying relevant documents, figures, and classification codes used to conduct a novelty search. System takes a user entered short description of invention and provides a user selectable set of recommended documents, figures, and classification areas.

ANDRE MENDES Digitally signed by ANDRE MENDES
Date: 2022.09.22 16:32:54 -04'00'

André V. Mendes
Chief Information Officer
U.S. Department of Commerce