



Applications of Machine Learning 2024 (OP333)

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This conference provides a technical forum for members of both industry and academia to present their latest applications of machine learning. Machine learning has been applied to a broad domain of image/vision systems from medical imaging to consumer cameras. Learned tasks such as image recognition, noise reduction, or natural language processing, are currently being applied in many common devices in consumer and industrial settings. Training datasets and training methods for machine learning are critical for the success of a system. Studies demonstrating the deployment and benchmarking of machine learning algorithms on specialized computer hardware is highly valuable to many groups in this field. Sensor hardware design or selection as it pertains to machine learning tasks; for example, an analysis of different camera designs and how each pertains to the performance of an image recognition task such as object detection, is of interest. Analysis of full systems that include the sensor technology, data processing hardware, and results are welcome as each area is critical for the successful application of machine learning.

Papers or tutorials reviewing the topics covered by this section are welcome. All abstracts will be reviewed by the program committee for originality and merit. Topics of interest include, but are not limited to, the following:

ALGORITHMS

- application or adaptation of known neural network and deep learning architectures
- neural networks, deep learning, reinforcement learning, evolutionary, and spiking algorithms
- computational intelligence, graphical models
- optimization methods which better enable application of machine learning algorithms (mixed or lower precision, pruning, grouped convolutions, node fusion, etc.)
- analysis and comparison of computational complexity, utility, speed, green AI
- full system analysis of image sensor data, computer hardware, machine learning task, and results
- training methods, such as transfer learning, meta learning, few shot learning, low shot learning, weakly supervised, unsupervised, recurrent and self-supervised learning

- data augmentation techniques
- application of AR, VR, or MR to ML tasks
- explainable AI, uncertainty quantification, salient image studies.

CONSUMER APPLICATION

- application of ML algorithms to specific datasets, tasks, or hardware
- image classification, detection, localization, segmentation
- interpolation, denoising, dehazing, clustering, super-resolution, image quality
- hyperspectral target detection
- biometrics
- voice recognition, natural language processing
- human/machine smart interface
- tracking (global and local), generative models, and RF applications (classification, detection, spoofing, etc.).

INDUSTRIAL APPLICATION

- remote sensing
- predictive and preventative maintenance
- automotive safety
- self-driving cars
- machine inspection of industrial parts
- agricultural, food safety
- surveillance
- optical manufacturing
- additive manufacturing
- cognitive agents and decision making
- robotics.

SECURITY

- biometrics
- face recognition
- bias in security application.
- Protection Maritime and Terrestrial Infrastructures.

MEDICINE

- medical diagnostic and evaluation
- drug/viral antibody design.

BIG DATA

- real-time processing of data using machine learning algorithms
- Big Data applications of machine learning
- medical data (tumor, cancer, longitudinal studies)
- training datasets for machine learning
- multi-sensor data and data fusion (radio frequency, EO, hyperspectral, IR)
- meteorological
- remote sensing data.
- Synthetic data (virtual engines).

HARDWARE

- application of machine learning algorithms on low SWaP computer hardware
- sensor modalities (mobile phone, consumer camera, machine vision systems, automotive imaging systems, micro-pulse radar, x-ray, OCT, CAT, MRI, hyperspectral, image satellites, airborne imaging systems, astronomical observing telescopes)
- image system or general sensor design and its relationship to machine learning tasks, methodologies for system characterization using machine learning tasks
- selection of image system parameters and their relationship to machine learning tasks
- real-time applications of machine learning.

BIG EXPERIMENTAL FACILITIES

- controlling multiparameter physics experiments
- optical damage evaluation
- big physics data
- optical component manufacturing
- boutique and large scale manufacturing
- high energy physics facilities such as NIF and others
- multiparameter optimization in large physics-based simulations.

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Below are abstract submission instructions, the accompanying submission agreement, conference presentation guidelines, and guidelines for publishing in the Proceedings of SPIE on the SPIE Digital Library. Submissions subject to chair approval.

Important dates

Abstracts due	7 February 2024
Registration opens	April 2024
Authors notified and program posts online	29 April 2024
Submission system opens for manuscripts and poster PDFs*	17 June 2024
Poster PDFs due for spie.org preview and publication	24 July 2024
Manuscripts due	31 July 2024
Advance upload deadline for oral presentation slides**	16 August 2024

*Contact author or speaker must register prior to uploading

**After this date slides must be uploaded onsite at Speaker Check-In

What you will need to submit

- Title
- Author(s) information
- Speaker biography (1000-character max including spaces)
- Abstract for technical review (200-300 words; text only)
- Summary of abstract for display in the program (50-150 words; text only)
- Keywords used in search for your paper (optional)
- Check the individual conference call for papers for additional requirements (i.e. extended abstract PDF upload for review or instructions for award competitions)

Note: Only original material should be submitted. Commercial papers, papers with no new research/development content, and papers with proprietary restrictions will not be accepted for presentation.

How to submit your abstract

- Visit the conference page: www.spie.org/op333call
- You may submit more than one abstract but submit each abstract only once
- Click the "Submit An Abstract" button on the conference page
- Sign in to your SPIE account or create an account if you do not already have one
- Follow the steps in the submission wizard until the submission process is completed

Submission agreement

All presenting authors, including keynote, invited, oral, and poster presenters, agree to the following conditions by submitting an abstract:

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- Email messaging for the conference series
- Submit a manuscript by the advertised due date for publication in the Proceedings of SPIE in the SPIE Digital Library
- Obtain funding for registration fees, travel, and accommodations
- Attend the meeting
- Present at the scheduled time

Review and program placement

- To ensure a high-quality conference, all submissions will be assessed by the conference chair/editor for technical merit and suitability of content
- Conference chairs/editors reserve the right to reject for presentation any paper that does not meet content or presentation expectations
- Final placement in an oral or poster session is subject to chair discretion

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