Products

Title: Advancing Molecular Spectroscopy Efficiency with Extensive Parallelism

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URL: https://doi.org/10.3390/metrology4040043
Title: Advancing Molecular Spectroscopy Efficiency with Extensive Parallelism
Abstract:

Molecular spectroscopy, with a legacy spanning over a century, has profoundly enriched our understanding of the microscopic world, driving major advancements across science and engineering. Over time, this field has steadily advanced, incorporating innovations such as lasers and digital computers to reach new levels of precision and sensitivity. Over the past decade, the integration of high-speed embedded electronic systems and advanced light sources has ushered molecular spectroscopy into a new era, characterized by extensive parallelism and enhanced sensitivity. This review delves into two pioneering technologies that embody recent advancements in molecular spectroscopy: Chirped-Pulse Fourier Transform Microwave (CP-FTMW) spectroscopy and optical frequency comb (OFC) spectroscopy. We provide an overview of the fundamental principles behind these methods, examine their most impactful applications across diverse fields, and discuss their potential to drive future developments in molecular spectroscopy. By highlighting these technologies, we aim to underscore the transformative impact of integrating high-speed digital electronics and advanced light sources with molecular spectroscopy, enabling extensive parallelism and paving the way for groundbreaking discoveries and innovations in this rapidly evolving field.

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Title: Adversarial Robustness for Deep Learning-Based Wildfire Prediction Models

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Title: Adversarial Robustness for Deep Learning-Based Wildfire Prediction Models
Abstract:

Rapidly growing wildfires have recently devastated societal assets, exposing a critical need for early warning systems to expedite relief efforts. Smoke detection using camera-based Deep Neural Networks (DNNs) offers a promising solution for wildfire prediction. However, the rarity of smoke across time and space limits training data, raising model overfitting and bias concerns. Current DNNs, primarily Convolutional Neural Networks (CNNs) and transformers, complicate robustness evaluation due to architectural differences. To address these challenges, we introduce WARP (Wildfire Adversarial Robustness Procedure), the first model-agnostic framework for evaluating wildfire detection models' adversarial robustness. WARP addresses inherent limitations in data diversity by generating adversarial examples through image-global and -local perturbations. Global and local attacks superimpose Gaussian noise and PNG patches onto image inputs, respectively; this suits both CNNs and transformers while generating realistic adversarial scenarios. Using WARP, we assessed real-time CNNs and Transformers, uncovering key vulnerabilities. At times, transformers exhibited over 70% precision degradation under global attacks, while both models generally struggled to differentiate cloud-like PNG patches from real smoke during local attacks. To enhance model robustness, we proposed four wildfire-oriented data augmentation techniques based on WARP's methodology and results, which diversify smoke image data and improve model precision and robustness. These advancements represent a substantial step toward developing a reliable early wildfire warning system, which may be our first safeguard against wildfire destruction.

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Title: A machine learning framework to measure Water Drop Penetration Time (WDPT) for soil water repellency analysis

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Title: A mixing rule for imaginary parts of refractive indices of aerosols or colloids in the Rayleigh regime

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Title: A mixing rule for imaginary parts of refractive indices of aerosols or colloids in the Rayleigh regime
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Title: A novel extreme adaptive GRU for multivariate time series forecasting

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URL: http://dx.doi.org/10.1038/s41598-024-53460-y
Title: A novel extreme adaptive GRU for multivariate time series forecasting
Abstract:

Multivariate time series forecasting is a critical problem in many real-world scenarios. Recent advances in deep learning have significantly enhanced the ability to tackle such problems. However, a primary challenge in time series forecasting comes from the imbalanced time series data that include extreme events. Despite being a small fraction of the data instances, extreme events can have a negative impact on forecasting as they deviate from the majority. However, many recent time series forecasting methods neglect this issue, leading to suboptimal performance. To address these challenges, we introduce a novel model, the Extreme Event Adaptive Gated Recurrent Unit (eGRU), tailored explicitly for forecasting tasks. The eGRU is designed to effectively learn both normal and extreme event patterns within time series data. Furthermore, we introduce a time series data segmentation technique that divides the input sequence into segments, each comprising multiple time steps. This segmentation empowers the eGRU to capture data patterns at different time step resolutions while simultaneously reducing the overall input length. We conducted comprehensive experiments on four real-world benchmark datasets to evaluate the eGRU's performance. Our results showcase its superiority over vanilla RNNs, LSTMs, GRUs, and other state-of-the-art RNN variants in multivariate time series forecasting. Additionally, we conducted ablation studies to demonstrate the consistently superior performance of eGRU in generating accurate forecasts while incorporating a diverse range of labeling results.

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Title: A Novel Spatial Data Pipeline for Orchestrating Apache NiFi/MiNiFi

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Published Date: 2023-11-01
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URL: http://dx.doi.org/10.4018/ijsi.333164
Title: A Novel Spatial Data Pipeline for Orchestrating Apache NiFi/MiNiFi
Abstract:

In many smart city projects, a common choice to capture spatial information is the inclusion of lidar data, but this decision will often invoke severe growing pains within the existing infrastructure. In this article, the authors introduce a data pipeline that orchestrates Apache NiFi (NiFi), Apache MiNiFi (MiNiFi), and several other tools as an automated solution to relay and archive lidar data captured by deployed edge devices. The lidar sensors utilized within this workflow are Velodyne Ultra Puck sensors that produce 6-7 GB packet capture (PCAP) files per hour. By both compressing the file after capturing it and compressing the file in real-time; it was discovered that GZIP and XZ both saved considerable file size being from 2-5 GB, 5 minutes in transmission time, and considerable CPU time. To evaluate the capabilities of the system design, the features of this data pipeline were compared against existing third-party services, Globus and RSync.

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Title: ArcGIS Online Group: HDRFS Field Data

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Product Type: Database
Published Status: Published
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URL: https://arcg.is/188TKG0
Title: ArcGIS Online Group: HDRFS Field Data
Abstract:

This private ArcGIS Online group (accessible only to those invited by Andres Andrade) serves as a repository for field data gathered at all HDRFS study sites, including Red Rock Road 2 (RRR2) and the University of Nevada Reno farm (UNRF). This includes plot locations, soil type, biomass measurements, and fire history. This database is continuously being updated.

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Title: Artificial Turf on Urban Landscapes: An Overview

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Title: Artificial Turf on Urban Landscapes: An Overview
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Title: Assessing the Impact of Burn Severity on Vegetation: A Time SeriesAnalysis of the Meadow Valley & South Sugar Loaf Wildfire

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Title: A User Study of Two Downstream Single-Cell Data Analysis Methods: Clustering and Trajectory Inference

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Title: Bringing Fire Science to the High School Classroom

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Title: Bringing Fire Science to the High School Classroom
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Title: Chemical Speciation Network Reveals Variations of Brown Carbon Concentration and Optical Property Across the United States

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Title: Curriculum - Final Draft of MS Wildfire Ecology curriculum. Used in classrooms by pre-service teachers through UNR and UNLV outreach programs during the 23-24 school year. Will become available for public use on Green Box website in May 2024.

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Title: Detecting Backdoor Attacks in Federated Learning via Direction Alignment Inspection

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Title: Detecting Backdoor Attacks in Federated Learning via Direction Alignment Inspection
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Title: Dipole-like scattering by Rayleigh-sized particles with medium-matched real and general imaginary part of the refractive index

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Title: Distributed Sensor Networks for Decision Support in Lake Tahoe

Report: 2025/2148788
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URL:
Title: Distributed Sensor Networks for Decision Support in Lake Tahoe
Abstract:

Resource managers in the Lake Tahoe region require accurate and reliable data to make sustainable decisions. Recent seasonal volatility in this popular vacation destination has brought calls to better understand natural hazards pertaining to snow, drought, and fire. Rapid growth in outdoor recreation coupled with large spatiotemporal fluctuations in visitation often leave land managers, business owners, and community organizations at odds with policies that benefit all user groups. Current data sources do not offer the flexibility to explore ecohydrologic science questions across sub-watersheds in Tahoe, nor study the flux of recreationalists and the patterns they follow. Modern technology creates opportunities to improve quality, accuracy, and timely delivery of data products for environmental and transportation geographic sciences. Particularly, low-cost sensor systems connected by real-time data networks (e.g., the Internet of Things - IoT) is rapidly changing the research and management landscape. In the Intermountain West, the adoption of IoT so far has been grassroots and piecemeal. Our work is focused on development of science-ready IoT solutions, standardizing deployment models and associated data workflows to serve decision makers in water, fire, snow, recreation, and conservation communities. Initially, we are testing sensor deployments that use Long Range Wide-Area Network (LoRaWAN) edge communications technology, Starlink internet terminals, terrestrial wireless research network backhaul, and refined solar power designs. Our early results show that low-cost (<$100) soil and air sensors can be deployed in the Lake Tahoe region with minimal disturbance and reliable network communications to hub sites across mountain terrain separated by many kilometers.

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Title: Di- Sulfur Triazole Phosphate Fire Retardants (United States Patent Application No. 63/601,377)

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Title: Early detection of dysphoria using electroencephalogram affective modelling

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Published Date: 2023-10-01
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URL: http://dx.doi.org/10.11591/ijece.v13i5.pp5874-5884
Title: Early detection of dysphoria using electroencephalogram affective modelling
Abstract:

Dysphoria is a trigger point for maladjusted individuals who cannot cope with disappointments and crushed expectations, resulting in negative emotions if it is not detected early. Individuals who suffer from dysphoria tend to deny their mental state. They try to hide, suppress, or ignore the symptoms, making one feel worse, unwanted, and unloved. Psychologists and psychiatrists identify dysphoria using standardized instruments like questionnaires and interviews. These methods can boast a high success rate. However, the limited number of trained psychologists and psychiatrists and the small number of health institutions focused on mental health limit access to early detection. In addition, the negative connotation and taboo about dysphoria discourage the public from openly seeking help. An alternative approach to collecting ‘pure’ data is proposed in this paper. The brain signals are captured using the electroencephalogram as the input to the machine learning approach to detect negative emotions. It was observed from the experimental results that participants who scored severe dysphoria recorded ‘fear’ emotion even before stimuli were presented during the eyes-close phase. This finding is crucial to further understanding the effect of dysphoria and can be used to study the correlation between dysphoria and negative emotions.

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Title: Evaluating an Elevated Signal-to-Noise Ratio in EEG Emotion Recognition

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Published Date: 2023-11-01
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URL: http://dx.doi.org/10.4018/ijsi.333161
Title: Evaluating an Elevated Signal-to-Noise Ratio in EEG Emotion Recognition
Abstract:

Predicting valence and arousal values from EEG signals has been a steadfast research topic within the field of affective computing or emotional AI. Although numerous valid techniques to predict valence and arousal values from EEG signals have been established and verified, the EEG data collection process itself is relatively undocumented. This creates an artificial learning curve for new researchers seeking to incorporate EEGs within their research workflow. In this article, a study is presented that illustrates the importance of a strict EEG data collection process for EEG affective computing studies. The work was evaluated by first validating the effectiveness of a machine learning prediction model on the DREAMER dataset, then showcasing the lack of effectiveness of the same machine learning prediction model on cursorily obtained EEG data.

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Title: Feature Collusion Attack on PMU Data-driven Event Classification

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Title: Fire Ecology Green Boxes (self-contained teaching kits)

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Published Status: Submitted
Published Date:
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URL: https://www.dri.edu/stem-education-program/green-boxes/
Title: Fire Ecology Green Boxes (self-contained teaching kits)
Abstract:

For middle and high school students. These sets of kits were developed for the HDRFS education-workforce development to engage undergraduate pre-service or STEM Ambassadors in implementing education content throughout Nevada school districts. The curricula was informed by HDRFS research themes and faculty.

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Title: Fire impacts on soil hydraulic properties in a sagebrush ecosystem in Nevada

Report: 2025/2148788
Product Type: Conference Proceedings
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Published Date:
Peer Reviewed: No
URL:
Title: Fire impacts on soil hydraulic properties in a sagebrush ecosystem in Nevada
Abstract:

Covering approximately one third of the US, sagebrush dominated ecosystems are an important part of the continental United States' landscape. The effects of wildfires on the hydrology of semi-arid, sagebrush ecosystems are poorly understood and, as these areas experience more frequent wildfires, become more relevant. A field experiment near Reno, Nevada, aims at a better understanding of fire impacts on the hydrology of a sagebrush ecosystem by measuring hydraulic properties of the soil before and after a prescribed burn. In spring of 2024, 20 experimental plots of 3×4 side length were instrumented for soil moisture and temperature monitoring. Over the same period, infiltration and water repellency under shrubs and between shrubs have been measured. In fall 2025, 10 of the 20 experimental plots will be burned, which will allow us to compare the hydraulic properties of the same soil before and after the fire, therefore directly assess fire impact on soil hydrologic properties. This presentation introduces the field experiment, provides a site characterization as well as the first year of pre-fire soil moisture, temperature, infiltration and water repellency data. It also addresses calibration of the Campbell HydroSense II (HSII) and TOMST TMS4 soil moisture probes used for the experiment and instrumental for accurately measuring soil moisture at the 20 experimental sites

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Title: Fostering Joint Innovation: A Global Online Platform for Ideas Sharing and Collaboration

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Hossein Jamali

Title: Framework for Monitoring Post-fire Vegetation Dynamics: Insights from Carpenter-1 Wildfire

Report: 2025/2148788
Product Type: Journal Article
Published Status: Submitted
Published Date:
Peer Reviewed: No
URL:
Title: Framework for Monitoring Post-fire Vegetation Dynamics: Insights from Carpenter-1 Wildfire
RII Support: Primary
Federal Support Acknowledged: Yes
Attached Document: Framework for Monitoring Post-fire Vegetation Dynamics Insights from Carpenter-1 Wildfire.pdf
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Title: Generating Synthetic Tree Point Clouds for Deep Learning Applications in Remote Sensing

Report: 2025/2148788
Product Type: Book Chapter
Published Status: Published
Published Date: 2025-01-01
Peer Reviewed: Yes
URL: https://doi.org/10.1007/978-3-031-77389-1_1
Title: Generating Synthetic Tree Point Clouds for Deep Learning Applications in Remote Sensing
DOI: 10.1007/978-3-031-77389-1_1
Details:
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Title: GPU-Accelerated Neural Networks and Computational Strategies to Predict Wave Heights

Report: 2025/2148788
Product Type: Book Chapter
Published Status: Published
Published Date: 2024-01-01
Peer Reviewed: Yes
URL: https://doi.org/10.1007/978-3-031-56599-1_47
Title: GPU-Accelerated Neural Networks and Computational Strategies to Predict Wave Heights
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Details:
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Federal Support Acknowledged:
Attached Document:
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Title: Human- elephant conflict: insights from vegetation analysis in Sri Lanka

Report: 2025/2148788
Product Type: Other Conference Presentation/Paper
Presentation Status: Submitted
Presented Date:
Peer Reviewed: No
URL:
Title: Human- elephant conflict: insights from vegetation analysis in Sri Lanka
Abstract:

Human elephant Conflict is not an Elephant Problem; it’s a Human Problem. – Chandima Fernando In Sri Lanka, Human-Elephant Conflict (HEC) resulted in the death of 470 elephants and 145 humans, in 2023. 1,2. Agriculture directly encroaches on elephant habitat and elephants raid farmers’ crops setting the stage for conflict. 1 This study examines Sri Lankan elephant (Elephas maximus) presence in agricultural and nonagricultural areas outside Wasgamuwa National Park. Dung is elephant feces and provides data for elephant presence and dietary context. Normalized Difference Vegetation Index (NDVI) compares vegetation densities and health among agricultural and nonagricultural areas.4 This research evaluated elephant presence in relation to NDVI, providing insights for alleviating the intensity of conflict by informing management strategies for existing agricultural fields and elephant habitat conservation

Forum Name: Wolf Pack Discoveries
Details:
UNR research symposium
RII Support: Partial
Federal Support Acknowledged:
Attached Document: Final_Poster_fr (2).pdf
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Title: Initial Design and Implementation of an Edge-to-Edge LoRaWAN Data Collection System

Report: 2025/2148788
Product Type: Book Chapter
Published Status: Published
Published Date: 2024-01-01
Peer Reviewed: Yes
URL: http://dx.doi.org/10.1007/978-3-031-56599-1_32
Title: Initial Design and Implementation of an Edge-to-Edge LoRaWAN Data Collection System
DOI: 10.1007/978-3-031-56599-1_32
Details:
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Attached Document:
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Title: Light-absorbing black carbon and brown carbon components of smoke aerosol from DSCOVR EPIC measurements over North America and central Africa

Report: 2025/2148788
Product Type: Journal Article
Published Status: Published
Published Date: 2024-09-23
Peer Reviewed: Yes
URL: https://doi.org/10.5194/acp-24-10543-2024
Title: Light-absorbing black carbon and brown carbon components of smoke aerosol from DSCOVR EPIC measurements over North America and central Africa
Abstract:

Abstract. Wildfires and agricultural burning generate seemingly increasing smoke aerosol emissions, impacting societal and natural ecosystems. To understand smoke's effects on climate and public health, we analyzed the spatiotemporal distribution of smoke aerosols, focusing on two major light-absorbing components, namely black carbon (BC) and brown carbon (BrC) aerosols. Using NASA's Earth Polychromatic Imaging Camera (EPIC) instrument aboard NOAA's Deep Space Climate Observatory (DSCOVR) spacecraft, we inferred BC and BrC volume fractions and particle mass concentrations based on spectral absorption provided by the Multi-Angle Implementation of Atmospheric Correction (MAIAC) algorithm with 1–2 h temporal resolution and # 10 km spatial resolution over North America and central Africa. Our analyses of regional smoke properties reveal distinct characteristics for aerosol optical depth (AOD) at 443 nm, spectral single-scattering albedo (SSA), aerosol layer height (ALH), and BC and BrC amounts. Smoke aerosols in North America showed extremely high AOD up to 6, with elevated ALH (6–7 km) and significant BrC components up to 250 mg m#2 along the transport paths, whereas the smoke aerosols in central Africa exhibited stronger light absorption (i.e., lower SSA) and lower AOD, resulting in higher-BC mass concentrations and similar BrC mass concentrations than the cases in North America. Seasonal burning source locations in central Africa, following the seasonal shift in the Intertropical Convergence Zone and diurnal variations in smoke amounts, were also captured. A comparison of retrieved AOD443, SSA443, SSA680, and ALH with collocated AERONET and CALIOP measurements shows agreement with RMSE values of 0.2, 0.03–0.04, 0.02–0.04, and 0.8–1.3 km, respectively. An analysis of the spatiotemporal average reveals distinct geographical characteristics in smoke properties closely linked to burning types and meteorological conditions. Forest wildfires over western North America generated smoke with a small-BC volume fraction of 0.011 and a high ALH with large variability (2.2 ± 1.2 km), whereas smoke from wildfires and agricultural burning over Mexico region shows more absorption and low ALH. Smoke from savanna fires over central Africa had the most absorption, with a high-BC volume fraction (0.015) and low ALH with a small variation (1.8 ± 0.6 km) among the analyzed regions. Tropical forest smoke was less absorbing and had a high variance in ALH. We also quantify the estimation uncertainties related to the assumptions of BC and BrC refractive indices. The MAIAC EPIC smoke properties with BC and BrC volume and mass fractions and assessment of the layer height provide observational constraints for radiative forcing modeling and air quality and health studies.

DOI: 10.5194/acp-24-10543-2024
Forum Name: Atmospheric Chemistry and Physics
Details:
Publisher: Copernicus GmbH
Volume: 24
Issue: 18
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ISSN: 1680-7324

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Title: Linking Pre-fire Fuel Characteristics with Observed Fire Intensity and Severity During the 2023 Practice Burns in an Arid Shrub Ecosystem

Report: 2025/2148788
Product Type: Other Conference Presentation/Paper
Presentation Status: Submitted
Presented Date:
Peer Reviewed: No
URL:
Title: Linking Pre-fire Fuel Characteristics with Observed Fire Intensity and Severity During the 2023 Practice Burns in an Arid Shrub Ecosystem
Abstract:

We conducted practice burns in two field plots that varied in pre-fire fuel composition to determine associations between pre-fire fuels and observed fire severity. At one plot with mostly shrub fuels, shrubs had larger volumes and a greater proportion of standing dead biomass, ignited readily, burned at high temperatures, and were almost entirely consumed by fire. At the other plot with mixed herbaceous and shrub fuels, shrubs had smaller volumes and a greater proportion of live biomass, but still ignited readily and were almost entirely burned. Herbaceous fuels burned but minimally. Shrub fuels were more flammable and burned at greater severity than herbaceous fuels. This suggests that future experimental burns may be particularly severe in plots dominated by shrubs, with implications for post-fire processes.

Forum Name: HDRFS Annual Meeting 2024
Details:
RII Support: Primary
Federal Support Acknowledged: Yes
Attached Document:
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Title: Machine Learning-Based Land Cover Classification and Impact Assessment in Pre-wildfire and Post-wildfire Areas

Report: 2025/2148788
Product Type: Journal Article
Published Status: Submitted
Published Date:
Peer Reviewed: No
URL:
Title: Machine Learning-Based Land Cover Classification and Impact Assessment in Pre-wildfire and Post-wildfire Areas
RII Support: Primary
Federal Support Acknowledged: Yes
Attached Document: Machine Learning-Based Land Cover Classification and Impact Assessment in Pre-wildfire and Post-wildfire Areas.pdf
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Title: MalleTrain: Deep Neural Networks Training on Unfillable Supercomputer Nodes

Report: 2025/2148788
Product Type: Conference Proceedings Article
Published Status: Published
Published Date: 2024-05-07
Peer Reviewed: Yes
URL: http://dx.doi.org/10.1145/3629526.3645035
Title: MalleTrain: Deep Neural Networks Training on Unfillable Supercomputer Nodes
DOI: 10.1145/3629526.3645035
Forum Name: Proceedings of the 15th ACM/SPEC International Conference on Performance Engineering
Details:
  Publisher: ACM
  Event: ICPE '24: 15th ACM/SPEC International Conference on Performance Engineering
RII Support: Partial
Federal Support Acknowledged:
Attached Document:
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Title: Measurements of brown carbon and its optical properties from boreal forest fires in Alaska summer

Report: 2025/2148788
Product Type: Journal Article
Published Status: Published
Published Date: 2024-05-01
Peer Reviewed: Yes
URL: https://doi.org/10.1016/j.atmosenv.2024.120436
Title: Measurements of brown carbon and its optical properties from boreal forest fires in Alaska summer
DOI: 10.1016/j.atmosenv.2024.120436
Forum Name: Atmospheric Environment
Details:
Publisher: Elsevier BV
Volume: 324
Issue:
Page: 120436
ISSN: 1352-2310
RII Support: Partial
Federal Support Acknowledged: Yes
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Title: Measuring the Effects of Signal-To-Noise in EEG Emotion Recognition

Report: 2025/2148788
Product Type: Book Chapter
Published Status: Published
Published Date: 2024-01-01
Peer Reviewed: No
URL: http://dx.doi.org/10.1007/978-3-031-55174-1_8
Title: Measuring the Effects of Signal-To-Noise in EEG Emotion Recognition
DOI: 10.1007/978-3-031-55174-1_8
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Federal Support Acknowledged: Yes
Attached Document:
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Title: MtnClim 2024 Abstracts

Report: 2025/2148788
Product Type: Conference Proceedings
Published Status: Published
Published Date: 2024-09-16
Peer Reviewed: No
URL: https://www.westernforestry.org/past_events/mtnclim-2024-mountain-climate-water-and-ecosystem-science/#agenda
Title: MtnClim 2024 Abstracts
Abstract:

The 2024 Mountain Climate Conference is pleased to welcome attendees during September 16-19 to Granlibakken at Lake Tahoe, California. Our community of scientists, managers, students, and stakeholders will convene for three+ days of programming including dedicated presentation and poster sessions on fire science, hydroclimate, people in mountains, and observational networks, along with combined general contributions. Long-time favorite highlights include keynote talks, student meet-n-greet, “social hour”, “choose your adventure” professional networking opportunities, and sponsored group dinners.

Forum Name: MtnClim 2024
Details:
HDRFS sponsored a Fire Science Theme and Session at MtnClim 2024. The keynote speaker and two dedicated sessions invited researcher and student presentations on wildfire, fire science, and environmental impacts of fire. The abstracts/proceedings of MtnClim 2024 are attached. NSF and HDRFS were featured in conference materials, presentations, and acknowledgements.
RII Support: Partial
Federal Support Acknowledged: Yes
Attached Document: MtnClim-2024-Abstracts.pdf
Contributors:
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Title: Multi-Scale Transformer Pyramid Networks for Multivariate Time Series Forecasting

Report: 2025/2148788
Product Type: Journal Article
Published Status: Published
Published Date: 2024-01-01
Peer Reviewed: Yes
URL: http://dx.doi.org/10.1109/access.2024.3357693
Title: Multi-Scale Transformer Pyramid Networks for Multivariate Time Series Forecasting
DOI: 10.1109/access.2024.3357693
Forum Name: IEEE Access
Details:
Publisher: Institute of Electrical and Electronics Engineers (IEEE)
Volume: 12
Issue:
Page: 14731-14741
ISSN: 2169-3536
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Federal Support Acknowledged: Yes
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Title: NeedLR: Streamlining Point Cloud Annotation for Enhanced Machine Learning Integration

Report: 2025/2148788
Product Type: Conference Proceedings Article
Published Status: Published
Published Date: 2024-07-17
Peer Reviewed: Yes
URL: http://dx.doi.org/10.1145/3626203.3670552
Title: NeedLR: Streamlining Point Cloud Annotation for Enhanced Machine Learning Integration
DOI: 10.1145/3626203.3670552
Forum Name: Practice and Experience in Advanced Research Computing 2024: Human Powered Computing
Details:
  Publisher: ACM
  Event: PEARC '24: Practice and Experience in Advanced Research Computing
  Page: 1-4
RII Support: Primary
Federal Support Acknowledged:
Attached Document:
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Authors Imported from DOI:

Title: NevadaNet Research & Education DMZ network and federated applications architecture

Report: 2025/2148788
Product Type: Technology/Technique
Published Status: Submitted
Published Date:
Peer Reviewed: No
URL:
Title: NevadaNet Research & Education DMZ network and federated applications architecture
RII Support: Partial
Federal Support Acknowledged: Yes
Attached Document:
Contributors:
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Title: New Analytical Paradigm to Determine Concentration of Brown Carbon and Its Sample-by-Sample Mass Absorption Efficiency

Report: 2025/2148788
Product Type: Journal Article
Published Status: Published
Published Date: 2024-09-19
Peer Reviewed: Yes
URL: https://doi.org/10.1021/acs.est.4c06831
Title: New Analytical Paradigm to Determine Concentration of Brown Carbon and Its Sample-by-Sample Mass Absorption Efficiency
DOI: 10.1021/acs.est.4c06831
Forum Name: Environmental Science & Technology
Details:
Publisher: American Chemical Society (ACS)
Volume: 58
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Page: 17386-17395
ISSN: 0013-936X, 1520-5851
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Title: On evaporation kinetics of multicomponent aerosols: Characteristic times and implications for volatility measurements

Report: 2025/2148788
Product Type: Journal Article
Published Status: Published
Published Date: 2024-08-08
Peer Reviewed: Yes
URL: http://dx.doi.org/10.1080/02786826.2024.2385640
Title: On evaporation kinetics of multicomponent aerosols: Characteristic times and implications for volatility measurements
DOI: 10.1080/02786826.2024.2385640
Forum Name: Aerosol Science and Technology
Details:
Publisher: Informa UK Limited
Volume:
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Page: 1-12
ISSN: 0278-6826, 1521-7388
RII Support: Partial
Federal Support Acknowledged:
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Title: Options Matter: Exploring VR Input Fatigue Reduction

Report: 2025/2148788
Product Type: Book Chapter
Published Status: Published
Published Date: 2024-01-01
Peer Reviewed: Yes
URL: https://doi.org/10.1007/978-3-031-56599-1_37
Title: Options Matter: Exploring VR Input Fatigue Reduction
DOI: 10.1007/978-3-031-56599-1_37
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Federal Support Acknowledged:
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Title: Particle Size Distributions of Wildfire Aerosols in the Western USA

Report: 2025/2148788
Product Type: Journal Article
Published Status: Submitted
Published Date:
Peer Reviewed: Yes
URL:
Title: Particle Size Distributions of Wildfire Aerosols in the Western USA
Abstract:

Forum Name: Environmental Science: Atmospheres
Details:
RII Support: Partial
Federal Support Acknowledged: Yes
Attached Document:
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Title: Physical and Chemical Properties of Fire-Affected Soils from the Sagebrush Ecosystem of the Western U.S.: A Laboratory Study

Report: 2025/2148788
Product Type: Journal Article
Published Status: Submitted
Published Date:
Peer Reviewed: No
URL:
Title: Physical and Chemical Properties of Fire-Affected Soils from the Sagebrush Ecosystem of the Western U.S.: A Laboratory Study
Abstract:

Purpose: This study aims to understand the effects of wildfires in the sagebrush ecosystem on soil properties through examining connections between Soil Water Repellency (SWR), reflectance spectra, and chemistry. Ash and burned soil samples were collected after performing laboratory burns of three common sagebrush plants: sagebrush, rabbitbrush, and bitterbrush. Methods: The collected samples were analyzed for their physical properties, including SWR with Water Drop Penetration Time (WDPT) and Apparent Contact Angle (ACA) measurements, and solar spectral reflectance in the wavelength range of 350-2500 nm. Chemical functional groups of the samples were analyzed using Fourier Transform Infrared (FTIR) spectroscopy (wavenumber range: 4000–400 cm^{-1}). Results: WDPT and ACA values were in the range of 1–600 s and ~10° to 88°, respectively, for all three tested fuels. Unburned soil was more reflective than burned soil samples, also apparent by its brighter color. The FTIR analysis showed a decrease (~2-4 times) in the ratio of COO-/C=C signals for the burned soil samples compared to the unburned soil. Correlations between ACA and temperature for the burned and 2 cm deep burned soil samples showed that an increase in temperature led to the increase in ACA and decrease in visible reflectance (350–850 nm) of the same samples. Conclusions: The high linear correlation (R2=0.9) between COO-/C=C and ACA showed that non-polar compounds with C=C functional groups were formed in the burned soil samples, which led to higher values of ACA and hence SWR of the burned soil samples compared to the unburned soil.

Forum Name: Journal of Soil Science and Plant Nutrition
Details:
Springer
RII Support: Primary
Federal Support Acknowledged: Yes
Attached Document:
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Title: Post-Wildfire Mobilization of Organic Carbon

Report: 2025/2148788
Product Type: Journal Article
Published Status: Published
Published Date: 2025-01-30
Peer Reviewed: Yes
URL: https://doi.org/10.3390/soilsystems9010011
Title: Post-Wildfire Mobilization of Organic Carbon
Abstract:

Wildfires significantly alter watershed functions, particularly the mobilization of organic carbon (OC). This study investigated OC mobility and the physicochemical characteristics of wildfire-impacted soils and ashes from the northern California and Nevada fires (Dixie, Beckworth, Caldor). Organic carbon in wildfire-derived ashes (9.2–57.3 mg/g) generally exceeded levels in the background soils (4.3–24.4 mg/g), except at the Dixie fire sites. The mobile OC fraction varied from 0.0093 to 0.029 in ashes and 0.010 to 0.065 in soils, though no consistent trend was observed between the ashes and soils. Notably, the ash samples displayed lower OC mobility compared with the soils beneath them. A negative correlation was found between the mobile OC fraction and bulk OC content. Wildfire increased the total amount of mobile OC substantially by 5.2–574% compared to the background soils. Electron paramagnetic resonance (EPR) spectra confirmed the presence of environmentally persistent free radicals (EPFRs), which correlated with observed redox reactivity. Additionally, X-ray absorption near edge structure (XANES) and X-ray fluorescence (XRF) imaging revealed that Fe(II) oxidation in soils beneath the ashes may have enhanced the OC mobility, likely driven by pyrogenic carbon and free radicals. These findings enhance our understanding of post-wildfire OC mobilization and the impact of ash–soil physicochemical properties on watershed health.

Forum Name: Soil Systems
Details:
RII Support: Partial
Federal Support Acknowledged:
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Title: Privacy-Preserving Artificial Intelligence on Edge Devices: A Homomorphic Encryption Approach

Report: 2025/2148788
Product Type: Conference Proceedings Article
Published Status: Published
Published Date: 2024-07-07
Peer Reviewed: Yes
URL: http://dx.doi.org/10.1109/icws62655.2024.00061
Title: Privacy-Preserving Artificial Intelligence on Edge Devices: A Homomorphic Encryption Approach
DOI: 10.1109/icws62655.2024.00061
Forum Name: 2024 IEEE International Conference on Web Services (ICWS)
Details:
  Publisher: IEEE
  Event: 2024 IEEE International Conference on Web Services (ICWS)
  Volume: 126
  Page: 395-405
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Federal Support Acknowledged:
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Title: Product Type: Workshop Title: Data Literacy, Python, and SQL Workshops for the 2024 HDRFS Cohort

Report: 2025/2148788
Product Type: Workshop Report
Published Status: Submitted
Published Date:
Peer Reviewed: No
URL:
Title: Product Type: Workshop Title: Data Literacy, Python, and SQL Workshops for the 2024 HDRFS Cohort
Abstract:

As part of the 2024 HDRFS program, Ilaria Vinci, designed and led a series of workshops aimed at enhancing data literacy and technical proficiency in Python and SQL for participants at various skill levels. Building on the success of the 2023 workshops, Ilaria expanded the curriculum to cover additional key topics in each area, ensuring a comprehensive learning experience. The workshops focused on fundamental and advanced data analytics concepts, including data manipulation, visualization, and querying databases using SQL. The structured approach allowed for incremental learning, addressing the diverse backgrounds of attendees and equipping them with the necessary skills to apply data analytics in their respective domains. By integrating real-world datasets and interactive exercises, the workshops promoted hands-on learning and critical problem-solving skills essential for data-driven decision-making.

RII Support: Primary
Federal Support Acknowledged: Yes
Attached Document:
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Title: Project Video: Harnessing the Data Revolution for Fire Science (HDRFS) Project Overview

Report: 2025/2148788
Product Type: Posted Content
Published Status: Published
Published Date: 2024-06-06
Peer Reviewed: No
URL: https://www.youtube.com/watch?v=NFUxCWcInWU
Title: Project Video: Harnessing the Data Revolution for Fire Science (HDRFS) Project Overview
Abstract:

RII Support: Primary
Federal Support Acknowledged: Yes
Attached Document:
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Title: Project Video: HDRFS Fire Ecology Green Boxes

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Product Type: Posted Content
Published Status: Published
Published Date: 2024-04-16
Peer Reviewed: No
URL: https://www.youtube.com/watch?v=TTEMJSmNVd8
Title: Project Video: HDRFS Fire Ecology Green Boxes
Abstract:

RII Support: Primary
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Attached Document:
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Mayara Cueto-Diaz / Nevada System of Higher Education
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Title: Project Video: HDRFS Water Drop Test Drone

Report: 2025/2148788
Product Type: Posted Content
Published Status: Published
Published Date: 2024-06-06
Peer Reviewed: No
URL: https://www.youtube.com/watch?v=7XvoZsby2VU
Title: Project Video: HDRFS Water Drop Test Drone
Abstract:

RII Support: Primary
Federal Support Acknowledged: Yes
Attached Document:
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Title: Project Video: Nevada's Undergraduate Research Opportunity Program (UROP)

Report: 2025/2148788
Product Type: Posted Content
Published Status: Published
Published Date: 2024-04-04
Peer Reviewed: Yes
URL: https://www.youtube.com/watch?v=fRlq5Cjdkkc
Title: Project Video: Nevada's Undergraduate Research Opportunity Program (UROP)
Abstract:

RII Support: Primary
Federal Support Acknowledged: Yes
Attached Document:
Contributors:
Mayara Cueto-Diaz / Nevada System of Higher Education
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Title: Remotely monitored Ponderosa pine forest after wildfire

Report: 2025/2148788
Product Type: Other Conference Presentation/Paper
Presentation Status: Submitted
Presented Date:
Peer Reviewed: No
URL:
Title: Remotely monitored Ponderosa pine forest after wildfire
Abstract:

Wildfires have increased in frequency and severity over the past four decades, leading to the conversion of forests into non-forest shrublands or grasslands. This shift particularly concerns Ponderosa pine forests, where post-fire recovery is uncertain. Remote sensing provides a valuable tool for monitoring vegetation recovery in these ecosystems. Our study aimed to understand why some burned Ponderosa pine forests fail to return to their pre-fire plant communities. Specifically, we addressed: 1) seasonal changes in Normalized Difference Vegetation Index (NDVI) values in burned Ponderosa pine forests, and 2) the temporal changes in object-based image analysis classification post-wildfire. To investigate these questions, we quantified NDVI changes and plant cover at two post-wildfire sites in Arizona and Nevada. Summer NDVI values suggest some vegetation recovery, but winter NDVI values derived from Landsat imagery indicate a persistent transition in plant communities 10- and 20 years post-wildfire. Higher-resolution imagery further reveals that Ponderosa pine cover remains below 10% at both sites, underscoring a significant shift away from the pre-fire plant community. These findings highlight the long-term ecological consequences of increasing wildfire severity.

Forum Name: UNLV Life Sciences Colloquium
Details:
UNLV Life Sciences graduate student colloquium
RII Support: Primary
Federal Support Acknowledged: Yes
Attached Document:
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Title: Review of Flash Flood Susceptibility Modeling Derived from Machine Learning Algorithms with Input Data from Remote Sensing Sources

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Title: Review of Flash Flood Susceptibility Modeling Derived from Machine Learning Algorithms with Input Data from Remote Sensing Sources
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Attached Document:
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Title: SANS-CNN: An automated machine learning technique for spaceflight associated neuro-ocular syndrome with astronaut imaging data

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URL: https://doi.org/10.1038/s41526-024-00364-w
Title: SANS-CNN: An automated machine learning technique for spaceflight associated neuro-ocular syndrome with astronaut imaging data
Abstract:

Spaceflight associated neuro-ocular syndrome (SANS) is one of the largest physiologic barriers to spaceflight and requires evaluation and mitigation for future planetary missions. As the spaceflight environment is a clinically limited environment, the purpose of this research is to provide automated, early detection and prognosis of SANS with a machine learning model trained and validated on astronaut SANS optical coherence tomography (OCT) images. In this study, we present a lightweight convolutional neural network (CNN) incorporating an EfficientNet encoder for detecting SANS from OCT images titled “SANS-CNN.” We used 6303 OCT B-scan images for training/validation (80%/20% split) and 945 for testing with a combination of terrestrial images and astronaut SANS images for both testing and validation. SANS-CNN was validated with SANS images labeled by NASA to evaluate accuracy, specificity, and sensitivity. To evaluate real-world outcomes, two state-of-the-art pre-trained architectures were also employed on this dataset. We use GRAD-CAM to visualize activation maps of intermediate layers to test the interpretability of SANS-CNN’s prediction. SANS-CNN achieved 84.2% accuracy on the test set with an 85.6% specificity, 82.8% sensitivity, and 84.1% F1-score. Moreover, SANS-CNN outperforms two other state-of-the-art pre-trained architectures, ResNet50-v2 and MobileNet-v2, in accuracy by 21.4% and 13.1%, respectively. We also apply two class-activation map techniques to visualize critical SANS features perceived by the model. SANS-CNN represents a CNN model trained and validated with real astronaut OCT images, enabling fast and efficient prediction of SANS-like conditions for spaceflight missions beyond Earth’s orbit in which clinical and computational resources are extremely limited.

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Title: Sensitivity of backscattering to spherical particle physical properties: Size, refractive index, and shape deviations

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Title: Sensitivity of backscattering to spherical particle physical properties: Size, refractive index, and shape deviations
DOI: 10.1016/j.jqsrt.2024.109204
Forum Name: Journal of Quantitative Spectroscopy and Radiative Transfer
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Title: Smoke-shading drives thermally forced circulations resulting in hazardous smoke inundation.

Report: 2025/2148788
Product Type: Other Conference Presentation/Paper
Presentation Status: Submitted
Presented Date:
Peer Reviewed: Yes
URL:
Title: Smoke-shading drives thermally forced circulations resulting in hazardous smoke inundation.
Abstract:

On 11 Sept. 2022 hazardous near-surface smoke concentrations, locally exceeding 1000 ug m-3, inundated Reno, NV. The smoke arrived due to cross-mountain transport of a surface-based smoke layers originating from the Mosquito fire, burning on the west slopes of the Sierra Nevada (near Auburn, CA). This study demonstrates that the mechanism for the cross-barrier smoke transport was a thermally-driven circulation caused by differential airmass heating due to reduced insolation in the smoke layer, and thus reduced daytime sensible heating. In this case the thermally driven circulation superimposed on the normal diurnally-varying thermally-driven circulations in the Sierra Nevada (e.g., the Washoe Zephyr), with the superposition resulting in a much stronger than normal cross mountain wind system. Our analysis traces the coherent progression of the thermally-driven smoke front through a network of hundreds of citizen operated air quality sensors (i.e., the PurpleAir™ network). We show that the smoke front originated in nocturnally-pooled smoke near Auburn, CA then progressed eastward across the Sierra crest passing through the town of Truckee, CA before arriving in Reno, NV in the late afternoon. Evaluated over a set of >300 spatially distributed sensors the smoke frontal passage is consistently marked by rapid rises in PM2.5, often exceeding 400 ug m-3 in under 30 minutes, large drops in temperature (>10° C in some cases), and a rapid increase in post frontal winds (Fig. 1a,b). While the smoke front progressed as a coherent airmass boundary, we find that the magnitude of the jump in smoke concentration decreases with time, suggesting that entrainment of clear air slowly dilutes the frontal boundary with time. We also examine vertically pointed Doppler lidar observations and co-located sonic anemometer turbulence data as the smoke front passed over the University of Nevada, Reno. These data reveal that the smoke front exhibits the canonical structure and dynamics of a gravity (a.k.a. density) current, marked by a surface-based flow of cold (dense) air, an elevated frontal head with a narrow leading updraft, and interfacial wave mixing along the top of the smoke layer (Fig. 1c,d). The flow behind the front was vigorous (>10 m/s) and was characterized by strong mechanically generated turbulence. Similar smoke fronts were observed over subsequent days and along different portions of the Sierra Nevada, demonstrating that this differential heating mechanism and thermally driven circulations is an important consideration for smoke transport modeling and in evaluating local and regional smoke impacts associated with large wildland fires.

Forum Name: 21st Conference on Mountain Meteorology. American Meteorological Society.
Details:
https://www.ametsoc.org/index.cfm/ams/meetings-events/ams-meetings/21st-conference-on-mountain-meteorology/
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Attached Document: SMOKE_DENSITY_CURRENT_MOUNTAIN_MET.pdf
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Authors Imported from DOI:

Title: Sparse transformer with local and seasonal adaptation for multivariate time series forecasting

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Peer Reviewed: Yes
URL: https://doi.org/10.1038/s41598-024-66886-1
Title: Sparse transformer with local and seasonal adaptation for multivariate time series forecasting
Abstract:

Transformers have achieved remarkable performance in multivariate time series(MTS) forecasting due to their capability to capture long-term dependencies. However, the canonical attention mechanism has two key limitations: (1) its quadratic time complexity limits the sequence length, and (2) it generates future values from the entire historical sequence. To address this, we propose a Dozer Attention mechanism consisting of three sparse components: (1) Local, each query exclusively attends to keys within a localized window of neighboring time steps. (2) Stride, enables each query to attend to keys at predefined intervals. (3) Vary, allows queries to selectively attend to keys from a subset of the historical sequence. Notably, the size of this subset dynamically expands as forecasting horizons extend. Those three components are designed to capture essential attributes of MTS data, including locality, seasonality, and global temporal dependencies. Additionally, we present the Dozerformer Framework, incorporating the Dozer Attention mechanism for the MTS forecasting task. We evaluated the proposed Dozerformer framework with recent state-of-the-art methods on nine benchmark datasets and confirmed its superior performance. The experimental results indicate that excluding a subset of historical time steps from the time series forecasting process does not compromise accuracy while significantly improving efficiency. Code is available at https://github.com/GRYGY1215/Dozerformer.

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Title: Speed Up Federated Learning in Heterogeneous Environments: A Dynamic Tiering Approach

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Published Date: 2024-01-01
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Title: Speed Up Federated Learning in Heterogeneous Environments: A Dynamic Tiering Approach
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Title: The 2021 Bootleg Fire: A Hydrological Perspective through Remote Sensing and Machine Learning

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Title: The 2021 Bootleg Fire: A Hydrological Perspective through Remote Sensing and Machine Learning
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Title: The Effects of Wildfire on Water Availability in Semi-Arid Great Basin Shrublands

Report: 2025/2148788
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Published Status: Submitted
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Title: The Effects of Wildfire on Water Availability in Semi-Arid Great Basin Shrublands
Abstract:

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Title: The influence of antecedent moisture content (AMC) on infiltration into water repellent soil: Laboratory experiments and model calculations

Report: 2025/2148788
Product Type: Conference Proceedings
Published Status: Submitted
Published Date:
Peer Reviewed: No
URL:
Title: The influence of antecedent moisture content (AMC) on infiltration into water repellent soil: Laboratory experiments and model calculations
Abstract:

The sensitivity of infiltration rate to antecedent moisture content (AMC) in wettable soils is well-established with a low AMC promoting a higher initial infiltration rate. For water repellent soils, such as those found on fire-affected landscapes, we know little about how AMC may affect infiltration. Here we seek to understand how AMC affects infiltration for sub-critically water repellent soils (soils for which water forms a contact angle <90°). We conducted laboratory experiments using uniform #40-70 quartz sand with different degrees of water repellency from which we development a process-based model for simulating sorptivity and infiltration rate as a function of AMC. The experiments exhibited a highly non-linear relationship between contact angle and initial saturation degree (as a direct measure for AMC). We found the observed contact angle of water repellent sand was highest for air-dry conditions (as expected) but decreased rapidly with increasing initial saturation degree (AMC). Sorptivity of water repellent sand (which integrates wettability, pore sizes and AMC), exhibited a local minimum at the air-dry condition; a maximum for initial saturation degrees between 3% and 6%; then again a local minimum for initial saturation degree near 40%. Using the developed model along with measured contact angles and associated sorptivity values, maximum infiltrates were associated with an initial saturation degree around 5%. Thus, for water repellent soils, the maximum infiltration rates are associated with slightly moist rather than air-dry AMC. Model simulations also agreed well, qualitatively, with field-measured sorptivity data collected from a fire-affected, water repellent loam in Wyoming, USA. This research was supported by the U.S. National Science Foundation under Grant Nos EAR#1324894 and OIA-2148788 as well by the US Army Corps of Engineers under Grant Numbers DACW42-03-2-0000 and W912HZ17C0037.

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Title: The Role of Wildfire on Water Cycling in Semi-Arid Shrubland Plants in the Great Basin

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Title: The Role of Wildfire on Water Cycling in Semi-Arid Shrubland Plants in the Great Basin
Abstract:

The Role of Wildfire on Water Cycling in Semi-Arid Shrubland Plants in the Great Basin Sydney S. Corcoran, M.S. Hydrologic Sciences University of Nevada, Reno 1664 North Virginia Street Reno, Nevada 89557 scorcoran@unr.edu 402-218-0534 Abigail Sandquist, University of Nevada, Reno Scott Allen, University of Nevada, Reno Wildfires in the Great Basin are becoming more frequent and intense, yet their impacts on vegetation communities and the regional water balance remain poorly understood. It is known that deep-rooted sagebrush recovers slowly after fire, while shallow-rooted forbs and annual grasses proliferate after disturbances. Vegetation with deeper root systems typically rely on stored water, a greater capacity to deplete soil water reserves. In this study, we measured predawn water potential and soil moisture—proxies for water stress—at eight paired burned and unburned sites that experienced fire within the past 15 years. Preliminary findings indicate that unburned, shrub-dominated sites exhibit higher water stress due to greater depletion of soil moisture reserves.

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Attached Document: Corcoran, Sydney_NWRAStudentPosterAbstract.pdf
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Title: Title: Structured Support Series for Data Analytics Certification Students: Mentoring, Collaboration, and Engagement - To enhance student engagement and learning outcomes in the Data Analytics Certification program

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Other Type Description: Other
Published Status: Submitted
Published Date:
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URL:
Title: Title: Structured Support Series for Data Analytics Certification Students: Mentoring, Collaboration, and Engagement - To enhance student engagement and learning outcomes in the Data Analytics Certification program
Abstract:

Initiative engaged 2024 DA Cert students and included the organization of a dedicated Discord communication channel, designed to facilitate structured discussions on coding challenges, collaborative problem-solving, FAQs, and project showcases. This platform enabled continuous peer-to-peer and mentor-guided interactions, ensuring a dynamic learning environment. By offering tailored support and fostering an interactive community, this initiative significantly improved student retention, motivation, and skill development throughout the certification program.

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Federal Support Acknowledged: Yes
Attached Document:
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Title: Towards Perpetually-Deployable Ubiquitous Aerial Robotics: An Amphibious Self-Sustainable Solar small-UAS

Report: 2025/2148788
Product Type: Conference Proceedings Article
Published Status: Submitted
Published Date:
Peer Reviewed: Yes
URL: https://2025.ieee-icra.org/
Title: Towards Perpetually-Deployable Ubiquitous Aerial Robotics: An Amphibious Self-Sustainable Solar small-UAS
Abstract:

This work deals with the problem of unlocking perpetual deployment capabilities for small-UAS robotics across the diverse settings of the real world and their challenges, encompassing considerations for marine environments alongside the more common terrestrial ones. Via the progress made within this scope, a step towards truly ubiquitous and self-sustainable aerial robotics is accomplished. The work consists of the development of the Gannet Solar-VTOL, a waterproof small-UAS that is capable of resting on the surface of water for prolonged periods of time and over varying temperature ranges, while harvesting solar power to recharge itself. Equally importantly, it integrates a field-proven Self-Sustainable Autonomous System architecture that allows it to hibernate and sustain its battery charge overnight or during periods of solar illumination scarcity, as well as to assess mission-critical parameters (e.g., water surface turbulence, ambient temperature of battery compartment) on the low-power side of the Power Management Stack, and react appropriately. Finally, the robot is equipped with an onboard camera and a Neural Processing Unit that allows it to perform in-field environmental monitoring operations (e.g., wildfire detection). This paper experimentally demonstrates the aforementioned capabilities, and concludes with a presentation of the amphibious small-UAS' long-term deployment within a marine environment in the N.Nevada region, spanning over 3 consecutive days.

Forum Name: IEEE International Conference on Robotics and Automation (ICRA)
Details:
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Title: UAV-based Foliage Plant Species Classification for Semantic Characterization of Pre-Fire Landscapes

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Title: UAV-based Foliage Plant Species Classification for Semantic Characterization of Pre-Fire Landscapes
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Christos Papachristos / University of Nevada-Reno
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Title: Undergraduate Robotics Education with General Instructors Using a Student-Centered Personalized Learning Framework

Report: 2025/2148788
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Published Date: 2025-06-23
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URL: https://nemo.asee.org/public/conferences/344/papers/41962/view
Title: Undergraduate Robotics Education with General Instructors Using a Student-Centered Personalized Learning Framework
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Title: Urban Indoor Air Quality Disparities Amplified by Wildfire Smoke: Insights from the Mosquito Fire Episode in Reno, Nevada

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Product Type: Other Conference Presentation/Paper
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Presented Date:
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URL:
Title: Urban Indoor Air Quality Disparities Amplified by Wildfire Smoke: Insights from the Mosquito Fire Episode in Reno, Nevada
Abstract:

Urban Indoor Air Quality Disparities Amplified by Wildfire Smoke: Insights from the Mosquito Fire Episode in Reno, Nevada L.-W. Antony Chen* , Alireza Rezaee, Olufunminire Onamuti University of Nevada Las Vegas, Las Vegas, NV, USA *Corresponding email: Antony.Chen@unlv.edu Wildfire smoke is a significant environmental hazard, particularly affecting air quality in the Western United States. The smoke consists of a complex mixture of gases and fine particles, primarily PM2.5. When wildfire smoke blankets urban areas, it not only elevates ambient PM2.5 concentrations but also disparities in PM2.5 exposure due to heterogeneous spatial distributions. This disparity is likely even more pronounced in indoor environments, as buildings with poor sealing or inadequate filtration may be more affected by smoke compared to those with well functioning air handling systems. Using the PurpleAir® network, this study investigates outdoor and indoor PM2.5 exposure and disparities during a persistent smoke episode in Reno, Nevada, caused by the Mosquito Fire in September 2022. Hourly PM2.5 data were retrieved from 42 outdoor and 19 indoor sensors operational between September and November 2022. Daily air quality index (AQI) values were calculated and categorized into six exposure levels: Good, Moderate, Unhealthy for Sensitive Groups, Unhealthy, Very Unhealthy, and Hazardous. The number of sensors in each exposure level further inferred exposure disparity, as measured by the Gini Index (GI). During September, in periods without wildfire smoke, the outdoor GI was consistently 0 (no disparity), while the indoor GI was < 0.08, with several indoor AQI readings above the "Good" level. When smoke hit Reno (9/7-9/17, 2022), 33 outdoor sensors reported AQI values of "Very Unhealthy" and above, with the outdoor GI ranging from 0.02 to 0.17 and stabilizing around 0.05 most of the time. In contrast, indoor AQI values were generally below the "Very Unhealthy" level, but the indoor GI ranged from 0.09 to 0.30, exceeding 0.25 most of the time. This study provides evidence that natural disasters such as wildfires can exacerbate health disparities related to housing conditions in urban areas, thus informing public health actions towards vulnerable populations. Keywords: Air quality sensor, Gini Index, wildfire smoke, indoor exposure

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Honolulu, HI
Hawai#i Convention Center
July 7-11, 2024
RII Support: Partial
Federal Support Acknowledged: Yes
Attached Document: IA 2024 Abstract-Chen.pdf
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Authors Imported from DOI:

Title: Using Time Domain Reflectometry to characterize fire impacts on soil moisture in an ecosystem in Nevada

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Published Status: Published
Published Date: 2025-01-30
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Title: Using Time Domain Reflectometry to characterize fire impacts on soil moisture in an ecosystem in Nevada
Abstract:

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Attached Document: NWRA25_Poster_Croskery&al.pdf
Contributors:
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Title: Variability in Soil Infiltration and Water Drop Penetration Time (WDPT) for Soils in Open and Under-Shrub.

Report: 2025/2148788
Product Type: Conference Proceedings
Published Status: Published
Published Date: 2025-01-30
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URL:
Title: Variability in Soil Infiltration and Water Drop Penetration Time (WDPT) for Soils in Open and Under-Shrub.
Abstract:

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RII Support: Primary
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Title: vFirelib: A GPU-based fire simulation and visualization tool

Report: 2025/2148788
Product Type: Journal Article
Published Status: Published
Published Date: 2023-07-01
Peer Reviewed: Yes
URL: http://dx.doi.org/10.1016/j.softx.2023.101411
Title: vFirelib: A GPU-based fire simulation and visualization tool
DOI: 10.1016/j.softx.2023.101411
Forum Name: SoftwareX
Details:
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Title: Video Analysis of Water Drop Penetration Time Using Temporal Action Localization for Evaluating Soil Water Repellency

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Title: Video Analysis of Water Drop Penetration Time Using Temporal Action Localization for Evaluating Soil Water Repellency
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Title: Wildfire Detection and Segmentation: A Comprehensive Review

Report: 2025/2148788
Product Type: Report
Published Status: Submitted
Published Date:
Peer Reviewed: No
URL:
Title: Wildfire Detection and Segmentation: A Comprehensive Review
Abstract:

Wildfires are increasingly recognized as one of the most pressing natural disasters, significantly impacting ecosystems, human health, and economic stability. The frequency and intensity of these events have escalated due to factors such as climate change, urban encroachment into wild-land areas, and unsustainable land management practices. This paper presents a comprehensive survey of current methodologies for wildfire detection and segmentation, focusing on advancements in machine learning and remote sensing technologies. Traditional methods often fall short in addressing the complexities associated with real-time detection and high-dimensional remote sensing data. In contrast, recent developments in deep learning, particularly Convolutional Neural Networks (CNNs) and U-Net architectures, demonstrate substantial improvements in detection accuracy and segmentation precision. Moreover, we discuss the role of transfer learning and data augmentation techniques in improving model generalization across varying environments. Despite the advancements, challenges remain, including the need for real-time monitoring capabilities and the reliance on labeled training datasets. The findings underscore the importance of a collaborative approach involving researchers, practitioners, and policymakers to develop innovative solutions for effective wildfire management. By providing a detailed analysis of current trends, gaps, and future research directions, this paper aims to contribute to the ongoing efforts to mitigate the devastating impacts of wildfires.

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Attached Document: SURVEY_D4.pdf
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Title: Wireless Faster Data for Science

Report: 2025/2148788
Product Type: Website
Published Status: Published
Published Date: 2023-09-11
Peer Reviewed: No
URL: https://fasterdata.es.net/wfd/
Title: Wireless Faster Data for Science
Abstract:

An Expert Guide supporting scientific use of wireless data backhaul tools and methods to connect to Research and Education networks. Performance Tuning, Tools and Techniques with the goal of reducing making wireless sensors easier to deploy, manage, and operate.

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Title: Working Session at Great Plains Network Annual Meeting: Regional CI Coordination Best Practices

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Title: Working Session at Great Plains Network Annual Meeting: Regional CI Coordination Best Practices
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Title: ZeRO++: Extremely Efficient Collective Communication for Large Model Training

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Published Status: Published
Published Date: 2024-01-24
Peer Reviewed: Yes
URL: https://openreview.net/forum?id=gx2BT0a9MQ
Title: ZeRO++: Extremely Efficient Collective Communication for Large Model Training
Abstract:

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