Monday 16th September

8:30 – 9:30  Registration
9:30 – 10:00 Introductory Remarks

Session 1 – Chairs: Monica Bobra, Pete Riley

10:00 – 10:40 Barbara Thompson (NASA GSFC, USA)
*Frontiers in Data Science and Machine Learning in Heliophysics*

10:40 – 11:10 Coffee Break

11:10 – 11:30 Laura Hayes (NASA GSFC, USA)
*Predicting Global Navigation Satellite System (GNSS) Signal Disruptions Using Machine Learning Techniques*

11:30 – 11:50 Will Barnes (LMSAL, USA)
*Seeing the Trees through a Random Forest: Details of Active Region Heating Revealed through Forward Modeling and Classification*

11:50 – 12:10 John Armstrong (University of Glasgow, UK)
*RADYNVERSION: Learning to invert a solar flare atmosphere using invertible neural networks*

12:10 – 12:30 Varad Deshmukh (University of Colorado at Boulder, USA)
*Leveraging Topological Data Analysis and Deep Learning for Solar Flare Prediction*

12:30 – 14:30 Lunch

Session 2 – Chairs: Enrico Camporeale, Farzad Kamalabadi

14:30 – 15:10 George Karniadakis (Brown University, USA)
*Physics-informed neural networks*

15:10 – 15:30 Ryan McGranaghan (ASTRA, USA)
*What is the social engineering challenge of data science for Heliophysics and how do we solve it?*

15:30 – 15:50 Hazel Bain (CRES CU Boulder & NOAA Space Weather Prediction Center)
*Solar Energetic Particle Forecasting Using Machine Learning Classification Techniques*

15:50 – 16:30 Coffee Break
16:30 – 16:50  Tarik Salman (University of New Hampshire, USA)
*Forecasting Periods of Strong Southward Magnetic Field Following Interplanetary Shocks*

16:50 – 17:10  Ruizhu Chen (Stanford University, USA)
*Estimating the Sun’s Far-Side Magnetic Flux from EUV flux by deep learning*

17:10 – 17:30  Paul Wright (Stanford University, USA)
*DeepEM: A Deep Learning Approach for DEM Inversion*

18:30 – 20:00  Reception

**Tuesday 17th September**

8:30 – 9:30  John Armstrong (University of Glasgow, UK)
*Tutorial on ML, part 1*

**Session 3 – Chairs: Stefan Lotz, Sophie Murray**

9:30 – 10:10  Robert McPherron (University of California, Los Angeles, USA)
*Early Studies in Space Physics Using Machine Learning*

10:10 – 10:30  Monica Bobra (Stanford University, USA)
*An Overview of Solar Flare Prediction Using Machine Learning Techniques*

10:30 – 11:10  Coffee Break

11:10 – 11:50  Naoto Nishizuka (NICT, Japan)
*Solar Flares and Eruptions Predicted by Deep Neural Networks: Deep Flare Net (DeFN)*

11:50 – 12:10  Michael Kirk (NASA GSFC, USA)
*Using Deep Learning to Segment Features in Solar EUV Images*

12:10 – 12:30  Dattaraj Dhuri (TATA, Mumbai, India)
*Machine learning reveals systematic accumulation of electric current in lead-up to solar flares*

12:30 – 14:30  Lunch

14:30 – 17:30  Poster session A (with coffee)
Wednesday 18th September

Session 4 – Chairs: Simon Wing, Bala Poduval

8:30 – 9:30  Monica Bobra  (Stanford University, USA)
Tutorial on ML, part 2:

- resources for machine learning in heliophysics and astrophysics;
- open source software for machine learning, parallel computing, and heliophysics;
- best practices for scientific reproducibility (how to publish research code and how to publish open source software).

9:30  –  10:10  Cyril Furtlenher  (INRIA, France)
A machine learning approach to solar wind speed forecasting from solar images

10:10 – 10:30  Constantinos Papadimitriou  (National Observatory of Athens Greece)
Investigating dynamical complexity in the topside ionosphere using information-theoretic measures

10:30 – 11:10  Coffee Break

11:10 – 11:30  Savvas Raptis  (KTH, Sweden)
Classification of Magnetosheath Jets using Neural Networks and High Resolution OMNI (HRO) data

11:30 – 11:50  Mayur Bakrania  (MSSL, UK)
Using Big Data Techniques to Classify Solar Wind Electron Populations

11:50 – 12:10  Pete Riley  (Predictive Science Inc., USA)
A Metric-Based Assessment of New Solar Wind Forecast Models incorporating Data Assimilation

12:10 – 12:30  Romain Dupuis  (KU Leuven, Belgium)
Identifying specific features for the study of magnetic reconnection from PIC simulations using unsupervised learning at the particle scale

12:30 – 14:30  Lunch

Session 5 – Chairs: Giovanni Lapenta, Michael Kirk

14:30 – 15:10  Peter Wintoft  (Swedish Institute of Space Physics, Sweden)
Space weather - Dynamical systems modeled by neural networks

15:10 – 15:30  Abigail Azari  (University of Michigan, USA – Metcalf award speaker)
Multivariate Supervised Classification for Instabilities at Saturn: A Comparison of Methods for Automated Event Detection in Magnetospheres
15:30 – 15:50  **Vincent Génot** (IRAP, France)
Automated detection and dynamics of Martian plasma boundaries

16:30 – 17:10  **Joe Borovsky** (Space Science Institute, USA)
Vector-Vector Correlations: The Solar Wind and the Magnetosphere

17:10 – 17:30  **Lika Guhathakurta** (NASA, USA)
NASA Frontier Development Lab: Applied AI for Science & Exploration

**Thursday 19th September**

*Session 6 – Chairs: Hazel Bain, Jacob Bortnik*

8:30 – 9:10  **Dan Baker** (University of Colorado Boulder, USA)
Heliophysics Data Science: Past Experience and Future Prospects

9:10 – 9:30  **Rakesh Sarma** (CWI, Netherlands)
On improvement of Phase Space Density estimation with Bayesian Inference and Deep Learning

9:30 – 9:50  **Timo Laitinen** (University of Lancashire, UK)
Bayesian analysis of solar wind turbulence for solar energetic particle transport

9:50 – 10:10  **Irina Zhelavskaya** (GFZ Potsdam, Germany)
A combined neural network- and physics-based approach for modeling the plasmasphere dynamics during extreme geomagnetic storms

10:10 – 10:30  **Gonzalo Cucho-Padin** (University of Illinois, USA)
Dynamic Tomographic Estimation of Global Exospheric Hydrogen Density and its Response to Geomagnetic Storms

11:10 – 11:50  **Adam Lesnikowski** (Nvidia, USA)
Data-Driven Datasets: Deep Active Learning and Beyond

11:50 – 12:10  **Sigiava Aminalragia-Giamini** (SPARC, Greece)
High quality particle fluxes from space radiation monitor data using Artificial Intelligence and Machine Learning methods

12:10 – 12:30  **Egor Illarionov** (Moscow State University, Russia)
Segmentation of solar disk images with a convolutional neural network

12:30 – 14:30  Lunch
14:30 – 17:30  Poster session B (with coffee)
18:30 – 19:30  Boat trip
19:30        Social Dinner

Friday 20th September

Session 7 – Chairs: Mark Cheung, Enrico Camporeale

8:30 – 9:00  Early career awards
9:00 – 9:20  Adeline Paiement (Université de Toulon, France)
            Detection and parameter estimation for type II solar radio bursts
9:20 – 9:40  Eoin Carley (Trinity College Dublin, Ireland)
            Using supervised machine learning to automatically detect type II and III solar radio bursts
9:40 – 10:00 Marcus Hughes (University of Colorado Boulder, USA)
           Denoising off-disk regions for solar knowledge discovery
10:00 – 10:20 Carlos Jose Diaz Baso (Institute for Solar Physics, Sweden, Stockholm)
            Solar image denoising with convolutional neural networks
10:20 – 10:40 Derek Lamb (Southern Research Institute, Boulder, USA)
            Comparing Statistical and Neural Network Approaches to Flux Emergence Identification
10:40 – 11:20 Coffee
11:20 – 11:40 Jorge Amaya (KU Leuven, Belgium)
            Automatic unsupervised classification of the solar wind using Self-Organizing Maps
11:40 – 12:00 Gregal Vissers (Stockholm University, Sweden)
            Classification and tracking of ultraviolet reconnection bursts as tracers of lower-atmosphere field evolution
12:00 – 12:20 Meetu Verma (AIP Potsdam, Germany)
            Classification of High-resolution Solar Ha Spectra using t-SNE
12:20 – 12:40 Adjourn

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Examining the EUV intensity in the open magnetic field regions associated with coronal holes.

40) Andy Smith
The Rate of Change of the Surface Magnetic Field in the UK: Sources and Forecasting.

41) Maher A Dayeh
Forecasting the spectral indices of Energetic Storm Particle events.

42) Raluca Ilie
Forecasting the magnetospheric plasma conditions using Machine Learning Techniques and Cluster RAPID data.

43) Magnus Wik
Forecasting the AU and AL indices using recurrent networks.

44) Benoit Tremblay
Emulating Numerical Simulations of the Sun to Infer Synthetic Plasma Motions at the Photosphere and in the Upper Convection Zone.

45) Ruggero Vasile
Understanding geomagnetic activity through supervised learning.

46) Matthias Waidele
Helioseismology of Sunspots: Surface effects of simple fluxtubes.

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Inferring initial conditions of coronal mass ejections using a fast data generative model and approximate bayesian computation.

48) George Wilkie
Neural-network informed parameterization of diffusion in the radiation belts.

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50) Taras Yakobchuk
Scattering linear polarization of late-type active stars.

51) Kiley Yeakel
Automatic Determination of In-Situ Magnetospheric Regions Around Saturn.

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**Poster session B**

1) Tanja Amerstorfer
Automated CME tracking within heliospheric images.

2) Matthew R. Argall
Automated magnetopause detection to facilitate diffusion region studies with MMS.

3) Simon Wing
Untangling the solar wind drivers of the radiation belt electrons.

4) Vincent Barra
Image-to-image translation model to generate magnetogram out of EUV images.

5) Sabrina Bechet
Data homogenization for a network of ground-based synoptic imaging telescopes.

6) Monica Bobra
HelioML: Machine Learning, Statistics, and Data Mining for Heliophysics.

7) Jacob Bortnik
Neural network based reconstruction of inner magnetospheric density, waves, and energetic electron fluxes.

8) Luca Bucciantini
Machine learning on the ROSETTA/RPC-MIP and CLUSTER/WHISPER spectra. Preparation of BepiColombo and JUICE.

9) Suhaile Binti Buhari
Spatial Relation Between Large Scale Wave Structures (LSWSs) Prior to the Onset of Successive Equatorial Plasma Bubbles (EPBs).

10) Enrico Camporeale
On the generation of probabilistic forecasts from deterministic models.

11) Angelica M. Castillo
Data assimilation of LEO satellite data into VERB-3D simulations.

12) Alemayehu Cherkos
Effect of viscosity on propagation of MHD waves in astrophysical plasma.

13) Eurico Covas
Spatial-temporal forecast of the sunspot butterfly diagram.

14) Daniel da Silva
Case Study of Applying Neural Network to Remove Non-Linear Instrument Noise.

15) Curt A de Koning
Noise Analysis and Noise Reduction of Differenced STEREO/COR2 Images.

16) Andrea Diercke
Automatic extraction of Polar Crown Filaments using machine learning techniques.

17) Laurel Farris
Enhanced chromospheric 3-minute oscillatory power associated with the 2011-February-15 X2.2 flare.

18) Bea Gallardo-Lacourt
Automatic Polar Cap Boundary Identification Using Redline Imaging Data.

19) Philippe Garnier
Automatic detection of magnetopause reconnection diffusion regions.

20) Forrest Gasdia
VLF Mapping of the D-region Ionosphere Using an LETKF.

21) Andrei Gorobets
Small-scale magnetism of the quite Sun: quantifying temporal dynamics.

22) L. F. Guedes dos Santos
Using Image Recognition and Supervised Learning to Identify Flux Ropes.

23) Verena Heidrich-Meisner
How similar are time series of elemental abundances of different low first ionization potential elements?

24) Jürgen Hinterreiter
Statistical study on CME arrival prediction using ELEvoHensemble modeling.

25) Robert Jarolim
Multi-Channel Coronal Hole Detection with a Convolutional Neural Network.

26) Kimoon Kim
Generation of COMS VIS images from COMS IR images at night by Deep Learning.

27) Michael Kirk
Extracting Science from the AIA Trash Pile with Machine Learning.

28) Othniel Konan

29) Alexandros Koukras
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