PROGRAM
WORKSHOP ON DATA SCIENCE AND CLIMATE CHANGE
INTERNATIONAL CONFERENCE ON DATA SCIENCE
ICDS 2023 CHILE

CHAIRS: RODRIGO SALAS, UNIVERSIDAD DE VALPARAÍSO, CHILE
ORIETTA NICOLIS, UNIVERSIDAD ANDRES BELLO, CHILE
ORGANIZERS: ALBA MARTÍNEZ RUIZ, PAULA FARIÑA, UDP, CHILE

NOVEMBER 7, 2023
AUDITORIUM FACULTY OF SOCIAL SCIENCES AND HISTORY[1]
UNIVERSIDAD DIEGO PORTALES

LOCAL TIME: SANTIAGO – CHILE, UTC -3

14.30 – 14.40	Welcome words. Chair Rodrigo Salas, Orietta Nicolis
14.40 – 15.10	Rodrigo Salas, Universidad de Valparaíso, Chile
15.10 – 15.20	Questions and discussion
15.20 – 15.50	Orietta Nicolis, Universidad Andrés Bello, Chile
15.50 – 16.00	Questions and discusión
16.00 – 16.30	Coffee break
16.30 – 17.00	Daira Velandia, Universidad de Valparaíso, Chile
17.00 – 17.10	Questions and discusión
17.10 – 17.40	Martha Bohorquez, Universidad Nacional de Colombia
17.40 – 17.50	Questions and discusión
17.50 – 18.20	Paulo Canas Rodrigues, Federal University of Bahía, Brazil
18.20 – 18.30	Questions and discussion

[1] Faculty of Social Sciences and History, UDP, Ejercito Street 333, Floor -1, Santiago, Chile

November 7, 2023

14.30 Welcome words. Chairs: Rodrigo Salas, Orietta Nicolis

14.40 HidroCL: Machine learning for short-term prediction of streamflow across Chile

Jorge Arévalo[1], Jorge Saavedra[1], Aldo Tapia[2], Luis de la Fuente[3], Pablo Alvarez[2], Fabian Reyes[2], **Rodrigo Salas**[1], Ana María Córdova[1]
[1] Universidad de Valparaíso, Chile
[2] Universidad de La Serena, Chile
[3] University of Arizona, USA

Abstract. Geomorphology and Climate show a large variability across Chile, shaping a variety of hydrological regimes. Furthermore, the country is highly dependent on its limited water resources, which are expected to get scarcer in vast areas due to consumption increases and the impacts of climate change. However, events of high precipitation still pose a high risk for society, as they can lead to streamflow increases, water turbidity, and even floods. Hence, models able to forecast streamflow in the short-term (5-days) are valuable tools for stakeholders. This work shows the first results of a model for the prediction of daily mean and maximum streamflow up-to 5 days in advance for hundreds of catchments across Continental Chile. This model is based on Long Short-Term Memory (LSTM) jointly trained over about 300 catchments with a varying time period of at least 12 years and validated for those catchments over independent time periods and a number of catchments not used for training. For this, a large dataset was compiled with more than 150 variables spatially aggregated over about 400 catchments, including forecasted meteorological forcings, observed ecological and hydrometeorological parameters, and static attributes. Results are discussed globally and locally compared to other forecasting models.

15.20 Predicting the label of seismic events using clustering methods and deep learning neural networks

Orietta Nicolis, Billy Peralta, Luis Delgado, Mailiu Diaz
Universidad Andrés Bello, Chile

Abstract. Earthquakes represent one of the most destructive natural phenomena worldwide, with a massive effect on the economy and human lives. Recently, the prediction of seismic events using machine learning models has gained relevance due to the availability of large amount of data as well as the improvement of computational methods, especially throughout deep learning neural network models. However, the success of these computational models strongly depends on the variables that are chosen as input. In this work we combine a clustering method for labelling earthquake events with a deep neural network approach. In particular, first, a new class of ST-BSCAN

density clustering algorithm is introduced for grouping seismic events with similar features and classifying them into categories labelled foreshock, mainshock and aftershock. Then, a LSTM and a transformer neural networks are used for predicting the label of the last event. The above methods are tested on the Chilean seismic catalogue. The results show that the neural network models can predict the label of the seismic event with an accuracy greater than 0.90.

16.30 Spatio-temporal analysis of drought variability in Chile

Daira Velandia, Diana Pozo, Benjamín Vargas
Universidad de Valparaíso, Chile

Abstract. Currently, Chile is facing a drought that has been accumulating over the years, called a mega-drought. This study analyzes the spatiotemporal characteristics of the meteorological drought in Chile using the Standardized Precipitation Indices (SPI), Standardized Precipitation, and Evapotranspiration Indices (SPEI) obtained from the Landsat-8 and Landsat-9 satellites for the period between 1990-2022. The Kriging method is applied to make predictions and obtain images without missing data. With the k-means and k-Means Spatio-Temporal (STKM) methods, marked groups of regions affected by drought are found differently over time.

17.10 Modelling climate variability and change using spatio-temporal functional data

Martha Bohorquez Castañeda
Universidad Nacional de Colombia, Colombia

Abstract. Human beings and their activities completely depend on the climate. To improve the understanding of the characteristics and evolution of climate, it is necessary to analyze the history of the climate variability and forecast their behavior. Thus, it is necessary to have methods that allow to manage efficiently long and dense series of correlated data. The spatio-temporal functional data framework provides several powerful methods to describe, model, predict and forecast efficiently data occurred in continuous space and time.

17.50 Spatio-temporal modelling of the Brazilian wildfires: The influence of human and meteorological variables

Paulo Canas Rodrigues
Federal University of Bahia, Brazil

Abstract. Wildfires are one of the most common natural disasters in many world regions and actively impact life quality. These events have become frequent with the increasing effect of climate change and other local policies and human behaviour. This study considers the historical data with the geographical locations of all the "fire spots"

detected by the reference satellites that cover the whole Brazilian territory between January 2011 and December 2020, comprising more than 1.8 million fire spots. This data was modelled with a spatial econometric model using meteorological variables (precipitation, air temperature, humidity, and wind speed) and a human variable (land-use transition and occupation) as covariates. We find that the change in land use from forest and green areas to farming has a significant positive impact on the number of fire spots for all six Brazilian biomes. (Joint work with Jonatha Pimentel and Rodrigo Bulhões)

SUPPORTING INSTITUTIONS - ENDORSEMENTS