**Biomass and Soil Moisture Retrievals from Remote Sensing Data using Machine Learning Methods - Review**

***A. Iftikhar1,2, F. Greifeneder 3, J.Stamenkovic 4, M. Neumann 5,***

 ***C. Notarnicola 3***

***1*** *Department of Geography, University College Cork, Cork, Ireland*

***2****Spatial Analysis Unit, Teagasc, Dublin, Ireland*

***3****Institute for Applied Remote Sensing, EURAC, Bolzano, Italy*

***4****École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland*

**5***Jet Propulsion Laboratory, California Institute of Technology, USA*

The vast increase in remote sensing data from both space-borne and airborne platforms, as well as from UAV and ground measurements has governed the interest of scientific community towards new and more efficient retrieval methodologies. Special importance is put on the large extent and the high sampling rate (spectral, temporal and spatial) of remote sensing images. In addition, the launch of the Sentinel constellations will provide the users with high volume of new data, with increased temporal and spatial resolution and, what is very important, free of charge. In order to analyze these data and to obtain relevant information, such as essential climate variables (ECV), clearly defined methodologies need to be proposed and exploited. Special attention is given to machine learning methods, due to their capability to handle non-linear problems and to process both small and large number of data samples. The main objective of this work is to provide a review of the current state of research related to the retrieval of two important land bio/geophysical parameters, vegetation biomass and soil moisture, from remote sensing data, using machine learning methods. Furthermore, the potential added value of the synergy of multi-sensor is investigated. In this scope two different environmental conditions are assessed, agricultural areas and mountain grassland.