IX JORNADA DE JÓVENES INVESTIGADORES DEL I3A

Instituto Universitario de Investigación de Ingeniería de Aragón
Universidad Zaragoza

Towards Improving Agriculture Sustainability through Multifactorial Machine Learning

Francisco J. Lacueva[1], Rafael del-Hoyo[1], Juan José Barriuso[2], Sergio Ilarri[3]
[1] Instituto Tecnológico de Aragón, [2]Centro de Investigación y Tecnología Agroalimentaria de Aragón/Unizar,
[3] Instituto Universitario de Investigación, COSMOS-Computer Science for Complex System Modeling/Unizar

Motivation

Wine farms have to adapt their activities to achieve sustainable development goals. Our objective is to contribute to this adaptation by developing machine learning models to predict phenology and pest risk with the aim of reducing the application of phytosanitary treatments.

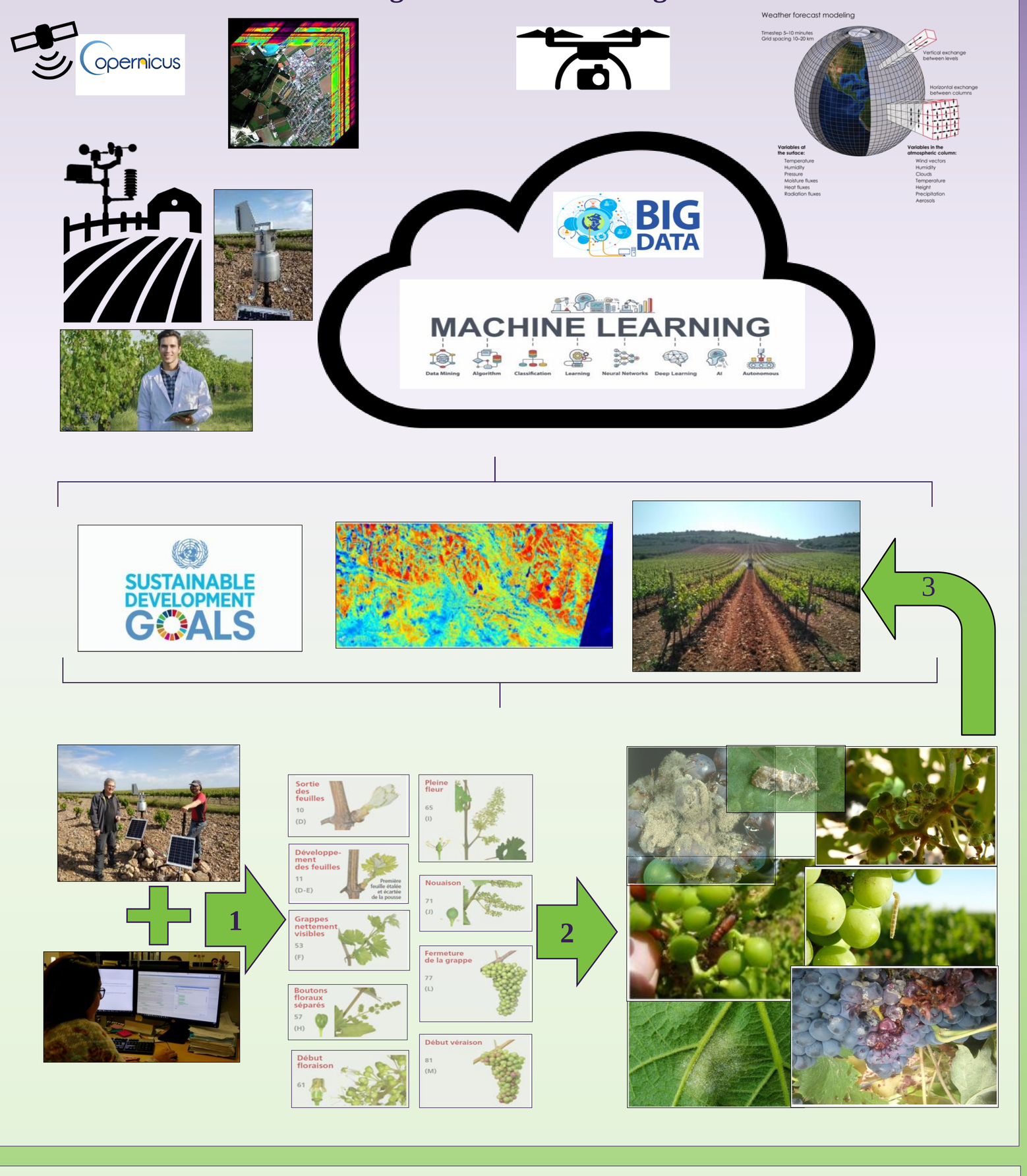
Goals and Approach

- To propose a methodology for the development of intelligent phenology and pest models of woody crops (peach trees —*Prunus persicae*— and grapevines —*Vitis vinífera*—).
- To create ML models to anticipate in a decisive time the phenological evolution of the species under analysis and of a subset of pests that can affect them.
- These models will allow users to determine if a phytosanitary treatment should be applied with the purpose of mitigating the pests: they will contribute to reduce the environmental impact of the farm and to increase its economic efficiency.

Current Status and Next Steps

- We have performed an extensive review of the state of the art covering the agronomist and data science approaches for creating phenology and pest predictions models [3].
- We identified the data sources to be considered, their well-known problems, and the most commonly-used ML algorithms and their purpose.
- We have started to sketch the methodology of our work.
- We are creating phenology models using human and (climatic) sensor observations. We started to train Random Forests (RF) and Artificial Neuronal Networks (ANN) models.
- We will create the pest models and finally we will add satellite images

Technologies for Sustainable Agriculture



References

[1]. PHAM, X, STACK, M., How data analytics is transforming agriculture. Business horizons, 2018, 61(1), p. 125-133. Available on line: doi: 10.1016/j.bushor.2017.09.011.

[2]. ZHAO, M., PENG, C., XIANG, W., DENG, X., TIAN, D., ZHOU, X., ZHAO, Z., Plant phenological modeling and its application in global climate change research: overview and future challenges, Environmental Reviews, 2013, p.1-14, Available on line: doi: 10.1139/er-2012-0036.

[3]. LACUEVA-PÉREZ, F. J., ILARRI, S.; BARRIUSO, J., LABATA G., DEL-HOYO-ALONSO, R., Multifactorial Evolutionary Prediction of Phenology and Pests: Can Machine Learning Help?. In: Proceedings of WEBIST 2020 (1), p. 75-82. Available on line: doi: 10.5220/0010132900750082

Contact

- Francisco J. Lacueva (fjlacueva@itainnova.es)
- Dr. Rafael del Hoyo (rdelhoyo@itainnova.es)
- Dr. Juan J. Barriuso (barriuso@unizar.es)
- Dr. Sergio Ilarri (silarri@unizar.es)

ITAINNOVA INSTITUTO TECNOLÓGICO DE ARAGÓN · cita CENTRO DE INVESTIGACIÓN Y TECNOLOGÍA AGROALIMENTARIA DE ARAGÓN · Universidad Zaragoza 1542 · COSMOS COMPLEXITY MANAGEMENT

Acknowledgements

- GRAPEVINE –hiGh peRformAnce comPuting sEr-vices for preVentIon and coNtrol of pEsts in fruitcrops.GRAPEVINE is co-financed by the Euro-pean Union's Connecting Europe Facility (CEF) –Telecommunications Sector Agreement under Grant Agreement No.INEA/CEF/ICT/A2018/1837816
- TIN2016-78011-C4-3-R (AEI/FEDER, UE)
- Government of Aragon (Group Reference T6420R, COSMOS research group)