



RESEARCH & INNOVATION PROGRAMME
ON RAW MATERIALS
TO FOSTER CIRCULAR ECONOMY

Machine learning models for Hg prospecting in the Almadén mining district

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The goal of the project:

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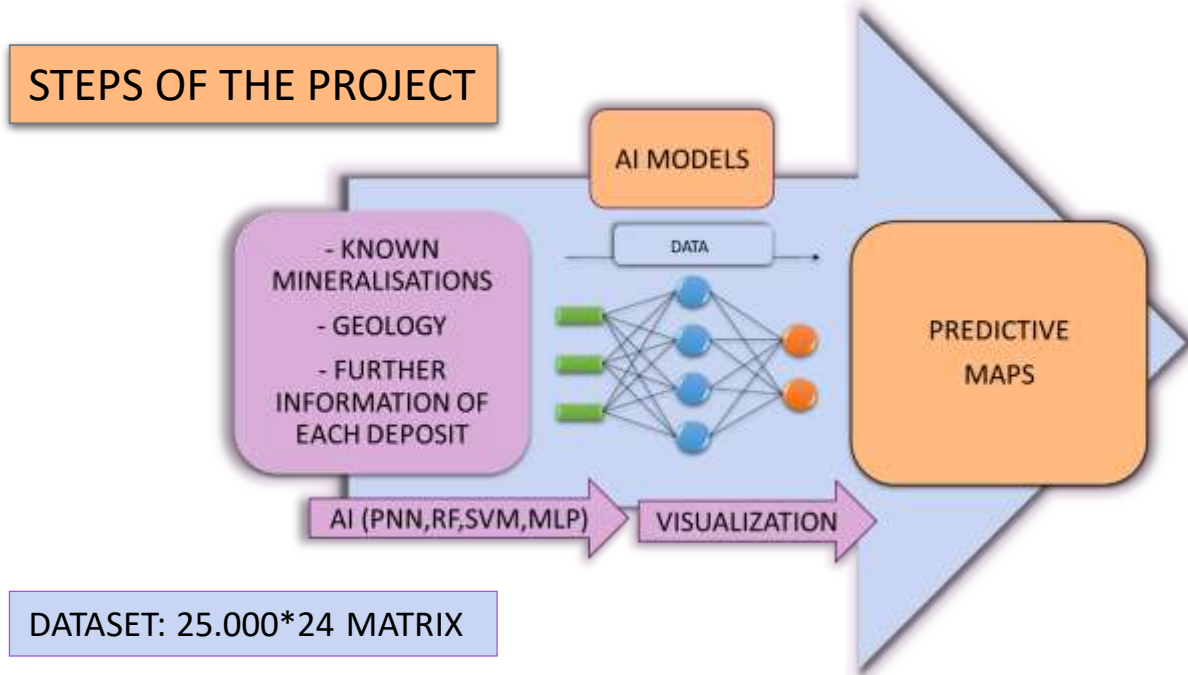
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The main goal of the Project is to create Machine Learning (ML) models capable of predicting mercury and antimony mineralizations. These predictions will then be used to visualise the results in what is often known as Prospective Maps.



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Dataset:

The ML models were trained using data from mercury mineralizations in the Almadén Syncline (Spain). The dataset consists of:

- 77 mineralizations:
 - 7 large mines
 - 1 unexploited deposit
 - 38 signs of mineralizations
 - 31 positive drill holes
- Geological map of the area
- Additional information which was generated by a group of experts in the geology of this area

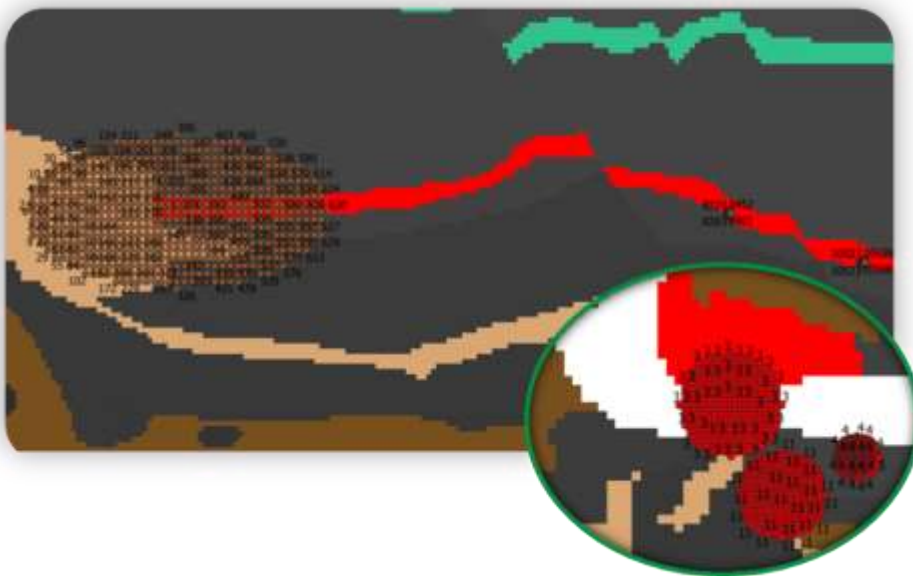


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Gridding:

The dataset was gridded in order to represent the information as an area rather than as a single point.

After that, it grew to a larger 25.000*24 matrix.



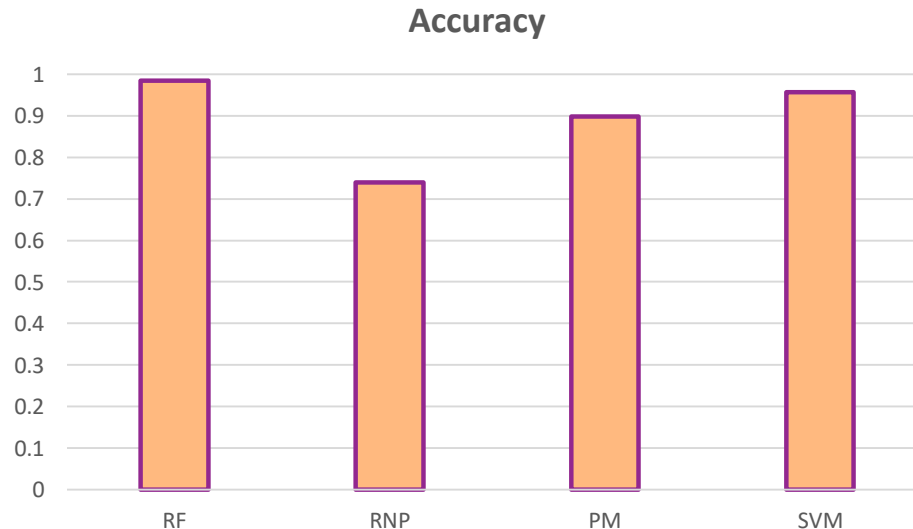
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ML Models:

The following ML were created and trained with mercury mineralizations data:

- PROBABILISTIC NEURAL NETWORK
- RANDOM FOREST
- MULTILAYER PERCEPTRON
- SUPORT VECTOR MACHINES

One of the conducted experiments was, giving a location and all the geological data related to it, asking each model for a prediction on what deposit those coordinates belonged to. The following figure represents the accuracy obtained by each model in this experiment.



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Conclusions and further research

The final goal is to prove if these models, which have been trained only with mercury, can also predict antimony mineralizations, which is a critical raw material with huge potential.

The data which will be used to test this is now being generated in the Guadalmez Syncline, South of Almadén one.

If this happens to be true, we believe this ML models will also be adaptable to other mineral deposits with similar characteristics, providing a powerful tool for modern mineral prospectivity.

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