RMIAnalyst Post Doctoral Offer

Context

The Mars Science Laboratory is a NASA mission operated by the Jet Propulsion Laboratory (JPL) that landed the Curiosity rover, a mobile robotic space probe, to the surface of Mars in 2012. Since then, Curiosity has explored various geological settings within Gale crater using its payload of scientific instruments on a daily basis. The RMI (Remote-Micro Imager) camera, integrated into the ChemCam instrument suite aboard the rover, provides high-resolution contextual images to document the instrument's main measurements: the chemical composition derived from LIBS (Laser-Induced Breakdown Spectroscopy), in particular with images taken before and after laser shots. The RMIAnalyst project aims to create a tool that can automatically analyze images to either provide operators with similar situations encountered in the past of the mission, or assist in classifying geological features present in the images.

Assignment

The contract term is 12 months with MAD-Environnement, with a planned start date between January 1, 2026, and March 30, 2026. Deadline for application is December 31, 2025. The expected salary is 3k€ per month (before taxes) / 2.6k€ per month (net of taxes) with a potential bonus at the end of the contract. The position will be based in Toulouse at the Institute for Research in Astronomy and Planetology (IRAP) and near Bordeaux at MAD-Environnement company. On-site working hours may be completed at either of the two locations, at the candidate's discretion at the start of the contract, subject to the condition of regular remote meetings to ensure communication between teams.

Main Activities

The candidate will investigate the scientific opportunities brought by several Computer Vision and Deep Learning methods when applied to the RMI dataset. A special emphasize will be given on Autoencoders and Vision Transformers methods, either by designing specific architectures trained from scratch or by using existing models (e.g. DINO ViT and MARS ViT-mae). The candidate will contribute to the development of the mathematical assessment of the model's accuracy, using geological expertise available on the RMI dataset, with a particular focus on data transformation and transfer to the operational tool. From a research perspective, he will also evaluate the potential of a multiscale approach from the mosaic to the precise area around the laser shot. Following this work, semi-supervised approaches could be proposed or implemented by the candidate.

Expected Skills

- PhD in Machine Learning or in Astrophysics with an applied Machine Learning component.
- programming skills in Python with experience in scikit-learn, open-CV and pytorch libraries.
- expertise on machine learning, convolutions concepts, attention mechanism and multidimensional computation.

The candidate must speak English, but proficiency in French would also be an important asset.

Instruction to apply

To apply, contact each of the following people:

Olivier Gasnault, PI of the ChemCam instrument suite: Olivier.Gasnault@irap.omp.eu
William Rapin, ChemCam research scientist: william.rapin@irap.omp.eu
Florent Arrignon, RMIAnalyst developer: arrignon@mad-environnement.com