

AI4Minerals Innovation Program
Bureau de Recherches Géologiques et Minières

Formalization of the Program

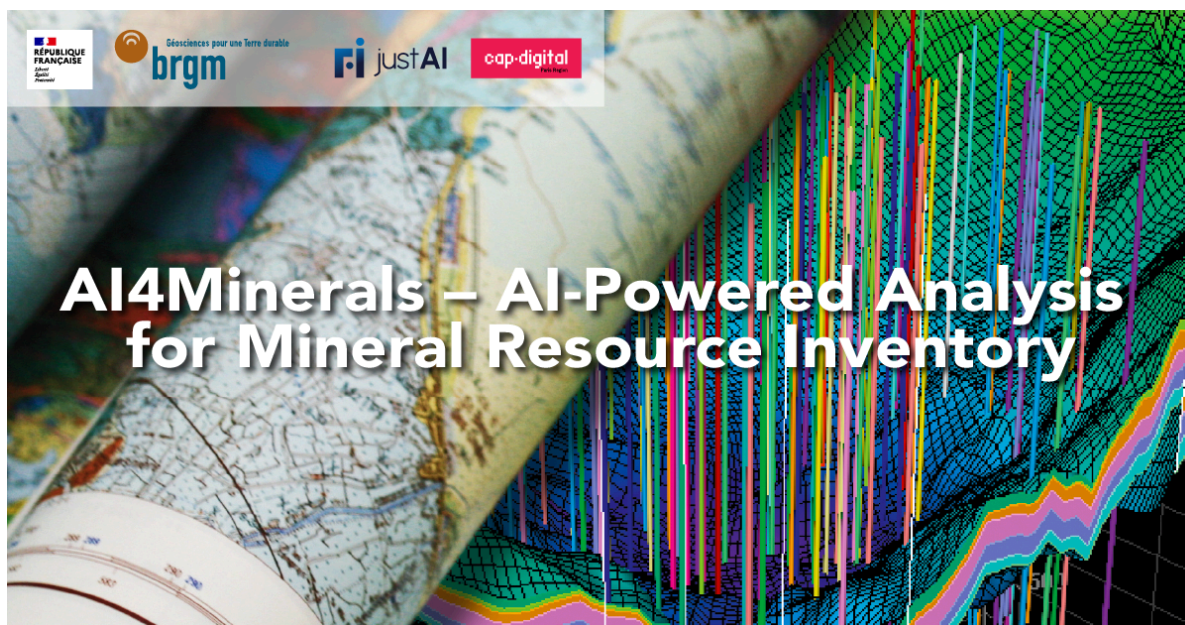


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Presentation of the BRGM

The BRGM (Bureau de Recherches Géologiques et Minières), the sponsor of this innovation competition, is the French public institution of reference in the fields of Earth sciences for the sustainable management of resources and risks of soil and subsoil. With internationally recognised expertise, the BRGM conducts research and innovation to address environmental, economic and social challenges.

Background and objectives

In a context of energy transition and industrial sovereignty, France is strengthening its strategy to secure supplies of critical mineral resources. In response, the BRGM is piloting an ambitious national programme aimed at updating knowledge of the geological potential of strategic metals. This programme, worth 63.3 million euros over five years, provides for a large-scale inventory of the subsoil in part of the metropolitan and overseas territories, targeting around fifty critical elements.

In this context, the BRGM is launching an innovation program aimed at mobilising artificial intelligence players, including those who are not specialised in geoscience, to test innovative data analysis approaches applied to mining exploration.

The program is based on several thousand geochemical samples, from which multivariate anomaly maps are produced to efficiently guide exploration efforts. The expected results must combine technical rigor, geoscience relevance and quality of interpretation.

This project is part of a demanding methodological framework, marked by an absence of 'ground truth' with strong uncertainty: few direct drilling data, a majority of indirect data and still partial knowledge of the targeted elements.

Main objectives :

- Generate an anomaly map for each of the 49 chemical elements present in the provided dataset. There are three types of anomalies:
 - Range anomaly: value that strongly distinguishes itself from others in a series, often the maximum
 - Spatial anomaly: high value (or low) compared to neighboring points without necessarily being the extreme value of the series
 - Relationship anomaly: combination of abnormal values between elements
- Use statistical, spatial or machine learning approaches to identify potential areas of interest from heterogeneous and noisy data.

Bonus (optional but valued):

- **Bonus 1:** Propose a methodology for integrating geophysical data in order to enrich, explain or confirm the detected anomalies.
- **Bonus 2:** Provide a metallogenic or anthropic interpretation of anomalies (for example: distinguish a natural signal of interest from pollution of agricultural origin).

One of the objectives of the competition is to identify 2-3 partners with whom the BRGM could structure long-term R&D collaborations, beyond this experimental phase.

Expected contributions and deliverables from candidates for the evaluation

Candidates must propose a rigorous and documented approach to exploit the data made available. They will have to demonstrate their ability to adapt analysis methods to a context of uncertainty and produce understandable and useful deliverables for the BRGM's business teams.

Expected contributions include in particular:

- A presentation of the use case explaining the understanding of the problem
- The code that allowed the project to be executed, in the form of a Jupyter Notebook
- A documented methodological report on the experiments made, the algorithmic choices and the scaling
- The enriched and interpreted maps
- Innovative, explicit and interpretable analysis methodology, mobilizing techniques adapted to the noisy and incomplete nature of the data
- A partnership proposal with the BRGM (intellectual property, business model, ...)

Information and data made available to candidates

- **Formalization of the program** (document being read)
- **Dataset:**
 - **Digital Terrain Model (DTM):** Altimetric data at appropriate resolution, integrating hydrographic elements (watercourses, drainage), usable for spatial analysis and interpretation of anomalies.
 - **Geochemical analyses:** Coordinates (X, Y) and measured concentrations for approximately 49 chemical elements on approximately 1,000 samples of surface sediments that will be made available to the candidate structures.
 - **Geological map:** Information on the nature of the subsoil, lithology and geological structures at a scale of 1/50,000 (Ambazac leaf).

- **Geochemical data from the old mining inventory representing several thousand samples (option)**
- **Drilling data (option)**
- **Explanatory note:** Document describing the context, the format and the operating procedures of the data provided.
- **Jupyter Notebook**

Short-term and longer-term scope

The experimentation proposed in this program focuses, in the short term, on a defined study area: the geological cut of Ambazac. The candidates will work on a complete dataset made available by BRGM, in order to produce anomaly maps, test innovative methodologies and document their results.

At the end of the programme, BRGM's ambition is to identify 2 to 3 partners with whom to structure long-term R&D collaborations beyond this experimental phase. This partnership could extend the approaches developed to other territories, with a view to gradually covering the national scale. This subsequent phase will be the subject of a specific partnership agreement with the selected company(ies) and BRGM.

As a reward for the winners of the competition

#Funding

At the end of this application phase, a jury may select 1 to 3 structures among the finalists. These laureates will be invited to enter into discussions with the BRGM in order to structure a research and development partnership. A budget will be allocated for this first phase of collaboration.

#Partnership Agreement #Business Opportunities

The latter may give rise to a complementary phase, aimed at extending approaches to other territories and deepening the solutions developed. This suite will be the subject of a specific amendment, the terms of which will be defined with the selected partners.

Terms of participation

Who can participate? This innovation program is aimed at companies of any size and nationality, preferably European with AI expertise.

Are notably targeted:

- SMEs, startups or consulting companies involved in the fields of data science, machine learning, geomatics, or multivariate or 3D data processing;
- companies specialized in mining exploration by AI or in Earth Analytics;
- AI engineering structures operating in a rapid prototyping (PoC) logic, capable of developing demonstrators on sectoral use cases

Candidates must be able to produce technical deliverables, formalise their methodological approach and propose a perspective of collaboration with the BRGM as mentioned in the expected deliverables above.

If you wish to join a consortium:

- You must fill out this [form](#). Your information will appear in this [file](#) which lists all the information of the structures wishing to set up a consortium
- You are then free to contact the structures that interest you or to respond to any requests you may receive

How to submit an application? The structures wishing to submit a response can proceed as follows:

- Go to the [program page](#) and download all the documents gathered in the wetransfer link
- Fill out the [application form](#)
- Attach to this form your draft response (PDF)
- Your response can be written in French or in English
- Other documents can be sent by email if needed: openinnovation@capdigital.com.

Reminder of the different stages::

- 1. Delivery of deliverables: the participants transmit their code (Jupyter notebook) as well as a written report presenting their analyses and conclusions.
- 2. Individual evaluation: each deliverable is analyzed independently by the experts of the pre-selection committee according to the defined evaluation grid.
- 3. Pre-selection committee: confrontation of evaluations and validation of the structures selected for the final jury.
- 4. Preparation for the interview: the candidates selected for the interview will receive the points to clarify for the jury and a preparation session will be organized with Cap Digital.
- 5. Interviews: the selected candidates are interviewed to evaluate their abilities to deepen certain dimensions of the project, particularly those not evaluated during the challenge (for example: building an R&D partnership, business understanding, ability to communicate with non-AI specialists, etc.).
- 6. Deliberation and choice of future partners: a collective exchange allows to finalize the ranking of candidates based on interviews and deliverables.
- 7. Back to the participants: the final ranking is established. A feedback is sent to each participant to highlight their commitment and provide them with areas for improvement.

Provisional calendar

- **8 July 2025 at 11:30:** presentation webinar of the innovation program in the presence of the BRGM and opening of the application platform
- **September 1, 2025 at 12 PM:** closing of the project innovation program
- **Week of September 22, 2025*:** pre-selection committee and announcement of the preselected candidates on file
- **Week of September 29:** pitch training session for shortlisted candidates
- **Week of 13 October*:** selection panel followed by the announcement of the shortlisted companies
- **From October 20:** start of the collaboration phase

*the exact days will be communicated soon

Evaluation criteria for applications

Criteria	Description	Weight
Mastery of data reading tools	Ability to read files in geojson format, mainly via Python or suitable tools	5% , this skill is partly covered by the notebook provided. It could also be acquired quickly if a partnership with the BRGM is set up
Exploratory analysis & understanding of geological issues	Understanding of variables, ability to describe the dataset, detect possible inconsistencies or gaps	20% , this step constitutes an essential basis for the identification of anomalies. Poor management can compromise the entire analysis. During this evaluation, assessing the understandings of variables in a geological sense will also be important and will allow to differentiate the participants
Data Cleansing	Identification and processing of missing or inconsistent values (data types, simple anomalies, etc.)	0% during the challenge, but will be discussed during the interview , in order to evaluate the cleaning reflexes in a real context
Initial viewing	Graphic proposals highlighting the first trends: correlations, 2D spatial projections, etc.	15% , this step allows to quickly identify possible anomalies or groupings
In-depth analysis	Definition of anomaly analysis metrics, mobilization of skills in data analysis and minimal understanding of geological issues	30% , this criterion will be the most discriminating because little addressed in the reference notebook
Justification of choices	Ability to motivate analytical and visual choices, both from a data point of view, geological profession and interdisciplinary communication (data/geology). The choices in terms of performance and sobriety of the methods will also be evaluated.	25% , this criterion makes it possible to evaluate the ability to argue decisions and adapt one's language to varied interlocutors
Quality of the presentation	Formal quality of deliverables, whether maps or written reports (clarity, structure,	5% , reflects certain transversal skills that can make the difference between candidates

	readability)	at the equivalent technical level
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Rating methods

Each criterion will be rated out of 10.

The final grade will be a weighted average according to the percentages indicated above.

A minimum eligibility score may be defined during the program, depending on the expectations of the BRGM, the overall level and the number of participants.

Transparency and fairness

The evaluation will be based on the following principles:

- The evaluation criteria, as well as their weighting, will be made known to all candidates before the start of the program.
- Each participant will be evaluated according to a unique scoring grid, ensuring no distinction based on background, experience or status.
- The members of the jury undertake to preserve any impartiality in the evaluation, including in case of previous personal or professional relationships with certain candidates.
- The feedback sent to participants will be intended to value their commitment and encourage their progress, including for those whose application would not be selected.
- Any complaint may be subject to a collective examination by the jury.
- Finally, BRGM reserves the right to publish all evaluation criteria and anonymized examples of deliverables in a spirit of transparency and equal opportunity.