# Gaspard Monge Program for Optimization, operations research and their interactions with data science

## 2024 Call for projects

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FM JH FONDATION MATHÉMATIQUE JACQUES HADAMARD

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# 1 General context

## 1.1 The PGMO program

The Gaspard Monge Program for Optimization, operations research and their interactions with data science (PGMO), was launched in 2012 by EDF and the Jacques Hadamard Mathematical Foundation (FMJH). PGMO is a new type of corporate patronage whose aim is to foster, liven up a mathematical community of researchers coming from academia and industry, working in the field of optimization, operation research and data science, and working on academic themes and industrial issues.

The objective is to support research projects through collaborative actions between academic researchers and industrial researchers, focused on solving industrial problems in the fields of energy and complex systems. These projects are encouraged to be a kick-off for a future partnership between academic and industrial researchers.

All results produced in the scope of projects supported by PGMO will be free and publicly available, respectful of the agreement creating PGMO. Reports, communications or papers will be freely published and free software production is encouraged.

## 1.2 Funding Sources of the present call: PGMO industrial sponsorship and FMJH Thematic Programs

PGMO accepted projects may be funded through either PGMO industrial sponsorship, or through a FMJH funding allocated to Thematic programs. In all cases, the team coordinating the project will ensure the management of the budget.

**PGMO Projects funded by industrial sponsorship resources** are open to all academic researchers with no restrictions of administrative or geographic location. If a team from a lab outside France wishes to submit a project, it may consider an association with a team in France. Agreement for supporting the project can be signed between FMJH and a lab outside France, provided this lab will ensure the management of the budget. In 2024, two types of projects will be funded by PGMO industrial sponsorship resources: IROE subprogram, and PRMO young researchers projects.

### PGMO Projects funded by FMJH Thematic Programs

Projects funded by FMJH in the framework of thematic programs are restricted to teams coordinated by a researcher belonging to one of the labs affiliated with FMJH:

`https://www.fondation-hadamard.fr/fr/fondation/les-institutions-membres/`

The team may however involve researchers from non-affiliated labs.

## 1.3 PGMO sub-programs

### 1.3.1 PRMO sub-program

The objective of PRMO is to support research in the field of optimization, operations research, and data science as well as to create and enliven a scientific community in that field, and to help develop teaching of optimization (Master degree and PhD). Projects supported through PRMO will have to be widely open. Cooperative projects between different teams from different horizons as well as projects leading to industrial applications will be encouraged.

The scientific program of PRMO encompasses the following themes: modelling, continuous optimization (convex and non-convex, non-smooth...), optimization of large systems (decomposition-coordination methods, centralized-decentralized optimization...), combinatorial optimization and operations research, optimization with uncertainty (stochastic, robust, stochastic optimal control...), global optimization (relaxation and approximation, semi-algebraic programming, stochastic algorithms...), game theory, as well as connected fields.

Projects at the interface of optimization and data science are encouraged, all while highlighting the contributions in optimization.

Projects of the PRMO sub-program may mix researchers from different fields, with a common research objective in the field of optimization and operations research. PRMO typically gives support for traveling, working meetings, internships.

PRMO young researchers projects may be individual or involve a small team led by a young researcher.

### 1.3.2 IROE sub-program

IROE focuses on problems related to energy, such as energy management questions. The objective is to support research projects, through collaborative actions between academic researchers and industrial researchers, focused on solving difficult optimization problems in the field of energy, those problems being described in the IROE appendix. Researchers interested in suggesting a project in the IROE sub-program are encouraged to carefully check this appendix or contact the dedicated correspondent.

The teams may benefit from the help of EDF experts during the setting up of the project as well as during its whole life. Such an active collaboration is strongly encouraged. In case, data or specific knowledge is transferred, a confidentiality agreement will have to be signed. The resulting agreement will seek to balance confidentiality with the overall aim of the program to publish scientific works.

### 1.4 PGMO coordination and animation

As an objective of PGMO is to foster and liven up a research community around optimization, operations research, and their interactions with data science, regular events will be organized.

Workshops or working sessions gathering project teams on close subjects may be organized, with the aim of discussing the methods proposed for solving the problems.

A conference (PGMO Days) is organized every year. Projects are expected to propose talks and/or posters during the conference. All projects will be asked to send a very synthetic summary of the project before the conference.

Larger projects are also invited to organize workshops. Workshop meetings may be held in the EDF'Lab premises or in a different location.

## 2 Rules of the present call for projects

Projects will be submitted, in a 1-step process, by filling an online form and submitting a single PDF document (see the document template) through the EasyChair platform:

`https://easychair.org/my/conference?conf=pgmo2024callforproje`

Submissions may be written in French or in English.

Projects asking for a renewal are required to provide an intermediary scientific and financial report (as a part of the single PDF document to be submitted).

More generally, all funded projects are required to provide intermediary scientific and financial reports each year, plus a final scientific and financial report after the project ended. These reports have to be uploaded on the PGMO reporting platform:

`https://www.fondation-hadamard.fr/fr/programmes/`
`les-programmes-thematiques/home/call-for-projects/project-reports/`

The summary is due 1 year after the reception of the funds, generally 16-18 months after the submission deadline.

A summary of the project (around half a page), which has to be understandable by non-specialists, is required. The quality of the submission documents will be taken into account for granting the financial support. This summary will be published on the PGMO website.

Additional rules may apply for some sub-programs (see the IROE appendix).

All submitted projects will be evaluated by the executive board and the scientific committee. In view of the recommendations of the scientific committee and of the executive board, the

steering committee will then decide which projects to support as well as the effectively allocated budget for each retained project.

## 2.1 Rules and Agenda

The scientific committee of PGMO retains the right to contact the project leaders and request a revised submission before the final evaluation.

| | |
|---|---|
| Publication of the call | February |
| Deadline for submission | May 3, 2024 |
| Notification of acceptance or rejection | July |

Duration of the projects may be 1, 2 or 3 years. However, PGMO will allocate a budget only for the first year of each project. Multi-year projects are required to ask for a renewal of their grant every year, using the same interface as new projects, other than clearly indicating "renewal". The PGMO board preserves the right to modify funding levels for subsequent years, even if the original submission was fully funded. In case of renewal, project leaders should clearly submit a scientific and financial report showcasing the findings and use of budget.

## 2.2 Categories of projects

Projects must rely on already available human resources (permanent researchers and possible, existing PhD students or postdocs); however, some projects may include the recruitment of some staff (interns and visiting scholars, post-docs, complements of funding for PhD students). Complete funding requests (for the full duration) of a PhD are not eligible.

Given the differences in the orders of magnitude of the financial supports that can be granted, PRMO projects are classified into three categories and IROE projects into three categories.

### 2.2.1 Categories of PRMO projects

1. **PRMO Standard projects** typically allow to fund:
   - Internships (3 to 6 months)
   - Short duration invitations for research visitors (travel and accommodation)
   - Travel (for the researchers in the project team)
   - Software, computers, data
2. **PRMO young researchers projects**
   We open 4 PRMO funding to promote the scientific activity of young researchers, of 5000 € each. These projects may be individual, they may also involve a small group

or mention external partners. The project leader must have been active for less than 6 years since his or her PhD defense: all researchers with a defense date posterior to January 1st, 2018 are generally eligible. In special situations (e.g., period of inactivity for force majeure), the eligibility will be appreciated by the PGMO scientific committee. The subject must be one of the PGMO's areas of interest and there are no geographical restrictions. The same expenses are eligible as for standard PRMO projects, and applicants should fill the same form, possibly providing a simplified description adapted to the smaller scale of the project.

3. **PRMO for Invited professors**.
   The professor will be invited by a laboratory near the Saclay area. The professor will have to participate in some PGMO events (like a seminar), and to give an advanced course in optimization in one of the institutions of the Saclay area. In particular, the audience of the course may include students of the Paris Saclay Optimization Master or of the Hadamard doctoral school. Proposals have to be submitted by the inviting institution (CV, course proposal and research project). Such submissions may be considered at any time. The financial support will be at most 5k€ per month.

### 2.2.2 Categories of IROE projects

1. **IROE A**: For exploratory projects with lower TRL (Technology Readiness Level). These can include methodological research of general interest in optimization provided the motivation and impact in the field of energy are present.
2. **IROE B**: For applied projects focused on the industrial topics from IROE appendix, necessitating the use of real data and/or inputs from EDF experts, applied research with higher TRL.
3. **IROE C**: For Postdoc funding or PhD co-funding. More precisely
   - Post-doctoral funding. The financial amount for the salary will typically be 50k€/year (including taxes and social security). Environment support (travel...) can also be asked, in the limit of 10k€/year. As the number of postdoctoral allocations is limited, co-funding may be appreciated but is not mandatory. It is expected that the postdoc candidate has completed his/her PhD in a different laboratory. The perspective of professional insertion of the candidate after this postdoc must be explained in the application. If a specific post-doc candidate considered by the team is already known, a curriculum vitae of the post-doc may be added to the application file, for the information of the scientific committee. There is no need, however, to know a potential post-doc at the time of submission, since the position of post-doc can always be advertised after the acceptance of the project.
   - PhD allocation. Complementary funding for PhD students having already a primary

funding (e.g. additional months of salary) can be asked. Environment support (travel, etc.) is also eligible in the limit of 10k€/year.

Teams willing to submit any IROE project are encouraged to contact the IROE correspondent (Wim van Ackooij, - see details below) prior to submission

### 2.2.3 Summary of categories

The following table provides an overview of typical funding amounts. Some submission categories have a fixed amount attributed to them, such as PRMO Young researcher, whereas others have a larger and freer range, for those projects, the actual amount funded may differ from what is requested - the decision being taken by the FMJH steering committee. The table below should therefore be understood in light of giving a general overview rather than being binding in any way, shape or form.

| | field | funding amount | constraints |
|---|---|---|---|
| PRMO prof | general | at most 5 k€ per month | lecture in the Saclay area |
| PRMO young | general | 5 k€ | "Young researcher" - see §2.2.1 |
| PRMO standard | general | typically 5k€- 10k€ | Coordinator from Saclay area |
| IROE A | energy related | $\leq$ 10k€ | lower TRL |
| IROE B | energy related | 10k€- 20k€ | higher TRL |
| IROE C | energy related | up to 60 k€ | Post-doc or PhD complement |

## 2.3 Important recommendations

Candidates for PGMO projects are invited to get in touch with the PGMO board (pgmo@fondation-hadamard.fr) who may help them to build their project before submission.

If necessary, in the case of category IROE B or C projects , it is possible to get in touch with the PGMO board (pgmo@fondation-hadamard.fr) for getting in touch with an appropriate expert from EDF.

Project teams are invited to consider the possibility of grouping with other teams who may work on a closely related topic. Projects grouping many teams of different laboratories are encouraged to favor exchanges between laboratories on close topics.

The participation of young researchers is highly encouraged.

Multidisciplinary research is encouraged.

Projects with several labs will have a unique leader, who will oversee the management of the allocated financial support.

PGMO being a program of the FMJH, whose headquarters are in the Saclay area, all project teams are asked to participate to research events in the Saclay area (e.g., the PGMO annual conference or PGMO seminars). Large project will have a part of their budget devoted to organizing events on the campus.

It is recommended that each researcher be not involved in more than 2 different PGMO projects. Project leaders are not allowed to lead more than 1 PGMO project.

For this call, owing to the current funding structure of PGMO, the PRMO call is funded through the thematic programs of FMJH. As a consequence, PRMO projects must be coordinated by a member of a lab affiliated to FMJH, the participation of additional members (outside the FMJH perimeter) is warmly welcomed.

All works published related to a PGMO supported project, all events organized, etc. must mention the support of PGMO, using the following formulae:

**IROE and PRMO young researchers projects**:

In French - "Ces travaux de recherche ont bénéficié du support du Programme Gaspard Monge pour l'optimisation, la recherche opérationnelle et leurs interactions avec les sciences des données de la FMJH".

Or in English - "This research benefited from the support of the FMJH Program Gaspard Monge for optimization and operations research and their interactions with data science"

**PRMO invited professors projects**:

Same acknowledgement formula as for the IROE projects, replacing " Ces travaux de recherche" or "This research" by "This lecture" or "Ce cours".

**PRMO projects funded by FMJH thematic programs**:

These projects will receive specific instructions concerning these acknowledgements.

Management fees cannot be funded by the PGMO. The former are considered as being part of the contribution of the partner laboratory to the project. Project leaders must get a formal authorization from their laboratory director (or equivalent) for managing their project.

## 2.4 Note on data sets

As far as possible, industrial sponsors will provide data and/or references to public data sets for the sake of publication and reproducible research. Projects must emphasize the link with real data. Projects based on public data or on the creation of public data similar to industrial or confidential data will be particularly welcome.

## 2.5 Agreement information

For each project, an agreement will be signed between the institution which will take in charge the management of the financial support and FMJH. Only research and teaching institutions may sign those agreements.

## 2.6 Contacts

PGMO coordinators: Stéphane Gaubert, Sourour Elloumi

IROE: Wim van Ackooij

FMJH administrator (in charge of handling the negotiation of agreements between FMJH and partners) and Managing assistant: Magali le Chaponnier

Email: pgmo@fondation-hadamard.fr

# 3 Scientific scope

## 3.1 PRMO

The scope of PRMO corresponds to the one described in Section 1. PRMO projects will be in the fields of optimization and operations research and will have to fulfill at least one of the following conditions:

- Research projects with young researchers or meant for attracting students or young researchers to optimization / operations research
- Collaborative research project or network between several different teams. Those projects will be asked, after 1-3 years of existence, to make a synthetic presentation of their work, which should be understandable by non-specialists of the field, and which should identify further research perspectives in other fields of optimization, as well as new applications.
- Multidisciplinary research projects between mathematics and computer science
- Research project with industrial or societal applications,
- Research project looking at interactions between optimization and other fields of mathematics
- Teaching of optimization project with, for instance, creation of multi-media documents or adapted pedagogic tools. It is recommended for this kind of projects to get in touch with PGMO board very early in order to make links with existing initiatives in that topic.

Scientific quality will be a leading criterion.

## 3.2 IROE

IROE is meant for solving difficult problems in the field of energy. A detailed description is provided in the IROE appendix.