Gaspard Monge Program for Optimization, operations research and their interactions with Data Science

2017 Call for projects

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1 Introduction

The Gaspard Monge Program for Optimization, operations research and their interactions with Data Science (PGMO), launched by EDF and the Jacques Hadamard Mathematical Foundation (FMJH), 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 FMJH-EDF agreement creating PGMO. Reports, communications or papers will be freely published and free software production is encouraged.

PGMO is organized in 3 sub-programs (the first one is more general, the two other ones are more specialized):

- Mathematical Optimization Research Projects (PRMO)
- Optimization and Energy Research Initiative (IROE)
- Research Initiative in Industrial Data Science (IRSDI)

1.1 Funding Sources : PGMO, LMH, Icode

PGMO accepted projects may be funded through either PGMO own fundings, LMH Labex funding or Icode Institute fundings. In all cases, the team coordinating the project will ensure the management of the budget.

PGMO

Projects funded by PGMO own 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, they 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.
Projects requiring PGMO funding are eligible to all 3 sub-programs (PRMO, IROE, IRSDI).

LMH

Projects funded by LMH Labex are restricted to academic teams belonging to Paris-Saclay Idex.
Projects requiring LMH funding are only eligible to all PRMO sub-program.
https://www.fondation-hadamard.fr/en/LMH

Icode (Energy Challenge)

iCODE is the Institute for Control and Decision of the Idex Paris Saclay. It was launched in March 2014 and aims are fostering research, spin-offs creation, training and diffusion of Control and Decision in Paris-Saclay. The scientific topics addressed by iCODE are organized in four challenges, among them the Energy Challenge which focuses on decision support for energetic transition.
The Energy Challenge launches a call for projects which is operated by PGMO, and linked to the IROE call for projects. Projects requiring Icode funding are then only eligible to IROE sub-program.
Projects funded by Icode are restricted to academic teams belonging to Paris-Saclay Idex.
http://www.icode-institute.fr/en

1.2 PGMO sub-programs : PRMO, IROE, IRSDI

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 developing teaching of

optimization (master degree and PhD). Projects supported by PGMO 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 PGMO encompasses the following themes : modeling, 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 : statistical learning, data science…

Projects at the interface of optimization and data science are also encouraged.

The typical projects supported by PGMO in that sub-program consist of projects mixing researchers from different fields, with a common research objective in the field of optimization and operations research and may support for instance traveling, working meetings, internships.

IROE sub-program

IROE focuses on energy, mainly energy management. 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.

Project asking for Icode-Enery funding should focus on the following topics : optimal command, distributed command, synchronisation, robust command … for solving problems related to Decision support for the energetic transition. Details are described in the IROE appendix.

Realistic data sets may be provided, and the teams will benefit from the help of EDF experts during the setting up of the project as well as its whole life.

A confidentiality agreement concerning data sets and some specific EDF knowledge will have to be signed. It will nevertheless be possible (after notifying EDF) to publish results based on EDF data.

Teams willing to submit a project within the IROE scope are encouraged to contact the IROE responsible prior to submission.

IRSDI sub-program

IRSDI focuses on the methodological developments and applications of the data science methods to industrial problems, mainly in the fields of energy and complex systems. An appendix lists suggestions of problems to be addressed.

Each proposal is formed by a pair given by an academic team and a partner company. The academic team must clearly identify a scientific leader, whose lab will manage the funding for the rest of the team. The partner company must identify a corresponding member and will have to write a support letter describing the industrial challenges to be addressed, the data sets to be studied and the expected benefits of the collaborative research to be undertaken. The true research (and not only development) nature of the project should be underlined.

The partner companies do not necessarily need to be EDF or Thales, though these two companies are extremely willing to build partnerships through this sub-program.

Teams willing to submit a project within the IRSDI scope are encouraged to contact the IRSDI responsible prior to submission.

1.3 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 will be organizing, with the aim of discussing the methods proposed for solving the problems.

in particular, an optimization seminar is organized every month in the PGMO offices at Ecole Polytechnique. All project teams of the PRMO and IROE sub-programs are asked to present their work in that seminar, at least once during the project. This seminar is widely open to the whole optimization community.

A conference is organized every year at fall. Projects are expected to propose talks and/or posters during the conference. Before the conference all projects will be asked to send a very synthetic summary of the project.

Big size projects are also invited to organize workshops.

Workshop meetings may be hold in the EDF'Lab premises. PGMO projects may also use the PGMO office in Ensta ParisTech, as well as offices in EDF'Lab.

2 Rules of the present call for projects

Projects will be submitted, in a 1-step process, by filling an online form on the FMJH website : http://www.fondation-hadamard.fr/pgmo/call, and by submitting a pdf document (see document template) in the easychair platform. Submissions may be written in French or English.

Projects asking renewal are asked to provide an intermediary scientific and financial report.

A summary of the project (around ½ 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.

Additional rules may apply for some sub-programs (see the IROE and IRSDI 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 and the budgets allocated to those projects.

2.1 Rules and Agenda

Beware: since last year, the submission process for PRMO and IROE projects consists of one unique step. However, 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	March 24, 2017
Deadline for submission	May 14, 2017
Notification of acceptance or rejection	July 2017

Duration of the projects may be of 1, 2 or 3 years. The PGMO will allocate a budget only for the first year of each project. The funding of each subsequent year can be lowered by the PGMO board. In all cases, pluriannual projects are required to ask for a renewal of their grant every year, using the same interface as new projects. A yearly evaluation (scientific and financial) will be made for each project, which may lead to renew or not the financial support.

Anyway, the support for PhD will be secured for 3 years.

2.2 Categories of projects

Projects must rely on research personnel funded elsewhere (permanent researcher, PhD student, postdoc, ...), specifically recruited staff (Internship, PhD students and postdocs) or visiting scholars. Given the differences of

possible financial supports, projects are classified into three categories.

Category A projects will match most of the supported projects.

Category B projects (a limited number will be granted) deal with full funding PhD or post-doctoral fellowship contract. It is recommended that teams interested in Category B write a variant of their proposal based on a Category A project.

Category C projects are meant for invited professors. PGMO may only fund 6 months visiting professor, these projects are then primarily reserved for laboratories attached to Saclay campus.

PRMO projects are only eligible to A or C category. IRSDI projects are only eligible to the A category. IROE projects may be of any category.

Category A :

- **Internship** (3 to 6 months)
- Short duration invitations for research visitors (travel and accommodation)
- Travel (for the researchers in the project team)
- Software, computers, data

Category B :

- **PhD allocation**. The financial amount for the salary will be 33k€/year (including taxes and social security). Environment support (travel…) can also be asked, in the limit of 10k€/year. PRMO project are not eligible to PhD allocations. As the number of those allocations is limited, co-funding is wished.
- **Post-doctoral**. The financial amount for the salary will be 50k€/year (including taxes and social security). Environment support (travel…) can also be asked, in the limit of 10k€/year. PRMO project are not eligible to postdoctoral allocations. As the number of postdoctoral allocations is limited, co-funding will be appreciated. It is expected that the postdoc candidate has completed his PhD in a different laboratory. The perspective of professional insertion of the candidate after this postdoc must be explained in the application.

Category C :

- **Invited Professor**. This professor will be invited by a laboratory near the Saclay area. He will have to participate to some PGMO events (like the seminar), and to give an advanced course in optimization, either in the Paris Saclay Optimization Master or 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.

2.3 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.

In the case of IROE projects, it is asked to get in touch with the PGMO board (pgmo@fondation-hadamard.fr) for getting the help of an EDF expert.

In the case of IRSDI projects, it is encouraged to get in touch with the PGMO board (irsdi@fondation-hadamard.fr) for to get some pre-submission feedback on the proposal.

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

Young researchers participation is highly encouraged.

Pluridisciplinarity is encouraged.

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

PGMO being a program of the FMJH, which is part of the FCS (Fondation de Coopération Scientifique Campus Paris Saclay), all projects teams are asked to participate to research events in the Saclay area (e.g., the PGMO seminar and the annual conference). Big size project will have a part of their budget devoted to organizing events on the campus.

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

All works published related to a PGMO supported project have to mention the support of PGMO, using the following formula:

In French « Ces travaux de recherche (congrès, ateliers, …), 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' et du soutien d'EDF et/ou Thales ».

Or in English : « This research (meeting, workshop …), benefited from the support of the FMJH 'Program Gaspard Monge for optimization and operations research and their interactions with data science', and from the support from EDF and/or Thales».

Those acknowledgements may be changed in case another company joins PGMO.

Projects cofunded by LABEX Hadamard or by ICODE will receive specific instructions concerning the redaction of acknowledgements.

Management fees shall not be funded by the PGMO. The former are considered as being part of the contribution of the partner laboratory to the project. Project leaders shall 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 institution may sign those agreements.

2.6 Contacts

PGMO coordinators : Stéphane Gaubert, Gilles Stoltz, Pierre Carpentier, Sandrine Charousset

FMJH administrator (in charge of negociating agreements between FMJH and partners): Ariane Littardi

Management 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.
- Pluridisciplinary project 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 criteria.

The PRMO projects will be funded by two sources: 1) general PRMO funding, 2) special Labex Hadamard funding. The PRMO projects having a mathematical orientation and a leading partner in a laboratory from Paris Saclay are eligible to the Labex funding. They will be co-examined by the Labex Hadamard instances. The general PRMO funding has no restrictions on the localization of the laboratory of the leading partner.

3.2 IROE

IROE is meant for solving difficult problems regarding management of energy. A detailed description is provided in the IROE appendix. Specific topics related to Icode are also described in the same appendix.

3.3 IRSDI

IRSDI is meant for solving difficult problems regarding data science for industry. A detailed description is provided in the IRSDI appendix.