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MARIE SKLODOWSKA-CURIE ACTIONS

**Individual Fellowships (IF)**
**Call: H2020-MSCA-IF-2015**

PART B

"YourAcronym"

**This proposal is to be evaluated as:**

**[Standard EF]**

## Table of Contents

## 0 List of Participants

| **Participants** | **Legal Entity Short Name** | **Academic** | **Non-academic** | **Country** | **Dept. / Division / Laboratory** | **Supervisor** | **Role of Partner Organisation** |
|---|---|---|---|---|---|---|---|
| Beneficiary | | | | | | | |
| - Lancaster University | ULANC | ✓ | | United Kingdom | Department of Mathematics and Statistics | Prof. David Leslie | Host |
| Partner Organisation | | | | | | | |
| - NAME | | | | | | | |

Data for non-academic beneficiaries

| **Name** | **Location of research premises (city / country)** | **Type of R&D activities** | **No. of fulltime employees** | **No. of employees in R&D** | **Website** | **Annual turnover (approx. in Euro)** | **Enterprise status (Yes/No)** | **SME status (Yes/No)** |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

# 1 Excellence

*What they want to see: Convincing presentation of state of art; clear justification for timeliness and relevance; quality and innovative research; detail on methodological approach; host's training expertise; capacity for researcher to gain new knowledge; specifics on complementary skills development (in particular leadership); clarity and specifics on how Researcher will reach independence.*

*Please note that the principles of the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers promoting open recruitment and attractive working conditions are expected to be endorsed and applied by all beneficiaries in the Marie Sklodowska-Curie actions.*

## 1.1 Quality, innovative aspects and credibility of the research (including inter/multidisciplinary aspects)

*You should develop your proposal according to the following lines:*

- *Introduction, state-of-the-art, objectives and overview of the action*
- *Research methodology and approach: highlight the type of research and innovation activities proposed*
- *Originality and innovative aspects of the research programme: explain the contribution that the project is expected to make to advancements within the project field. Describe any novel concepts, approaches or methods that will be employed.*

*Explain how the high-quality, novel research is the most likely to open up the best career possibilities for the Experienced Researcher and new collaboration opportunities for the host organisation(s).*

## 1.2 Clarity and quality of transfer of knowledge/training for the development of the researcher in light of the research objectives

*Outline how a two way transfer of knowledge will occur between the researcher and the host institution, in view of their future development and past experience: (please see Section 5.2 of this Guide):*

- *Explain how the Experienced Researcher will gain new knowledge during the fellowship at the hosting organisation(s)*
- *Outline the previously acquired knowledge and skills that the researcher will transfer to the host organisation*

The overall training objective is to signifantly develop Dr Gabillon's scientific, organisational, communication and technology transfer skills. This will let him continue building his portfolio of outstanding research to attain a position of independence and gain recognition in the international research community.

The proposed project is primarily a research project. Its main training objectives are to enhance the fellow's scientific skills. Dr Gabillon is already an expert in the modern theory of bandit algorithms and reinforcement learning. Therefore this project's main training objective will be to enhance the fellow's skills and knowledge in advanced statistical methods, and in adaptive clinical trial design(?!) Game theory too. What research knowledge will be learned and from who (including places you might visit). BLAH

Lancaster University is a world-leader in industrially-inspired statistics. Learn from STOR-i, and DSI. Work with SME's from Infolab. BLAH

In addition, Dr Gabillon will be given the opportunity to:

1. Receive training on preparing funding applications by co-authoring proposals for UK and EU funding agencies with Prof. Leslie.
2. Gain further experience of developing industry/academia partnerships by working with Prof. Leslie, Prof. Eckley and other staff in STOR-i in technology transfer activities.
3. Attend staff training workshops designed specifically for early-career researchers, such as XXX and YYY.

4. Exercise public speaking by presenting research results to varied audiences.
5. Participate in the organisation of workshops in Lancaster and at the Royal Statistical Society.
6. Opportunity (but not obligation) to participate in teaching and research supervision of undergraduate and graduate students. The fellow will benefit from peer observation and constructive feedback.
7. Attend a wide range of Data Science, Statistics and Operations Research seminars at Lancaster.
8. Gain experience of research planning and decision-making.

Throughout the fellowship, Dr Gabillon will adhere to the "European Charter for Researchers", and the training objectives will be managed through a Personal Career Development Plan that Prof. Leslie and the fellow will write together. This plan will be revised regularly throughout the fellowship to ensure that all objectives are met. In addition, Dr Gabillon will have regular meetings with the host supervisor to discuss his research and to receive advice.

Lancaster is the leading UK institution in bandit theory, with expertise in index policies (Glazebrook, Kirkbride, Jacko, Vilar), Thompson sampling and contextual bandits (Leslie). Gabillon brings expertise from another aspect of online learning and decision-making with expertise in the design and analysis of algorithmic approaches to learning, which will complete the portfolio of bandit research at Lancaster. (Are you happy with this description?) Furthermore, Gabillon's expertise on best-arm identification and combinatorial aspects of learning problems perfectly complements current research interests of the Supervisor.

### 1.3 Quality of the supervision and the hosting arrangements

*Required sub-heading:*

***Qualifications and experience of the supervisor(s)***

*Information regarding the supervisor(s) must include the level of experience on the research topic proposed and document its track record of work, including the main international collaborations. Information provided should include participation in projects, publications, patents and any other relevant results.*

***Hosting arrangements***[1]

*The text must show that the Experienced Researcher should be well integrated within the hosting organisation(s) in order that all parties gain the maximum knowledge and skills from the fellowship. The nature and the quality of the research group/environment as a whole should be outlined, together with the measures taken to integrate the researcher in the different areas of expertise, disciplines, and international networking opportunities that the host could offer.*

*For GF both phases should be described - for the outgoing phase, specify the practical arrangements in place to host a researcher coming from another country, and for the incoming phase specify the measures planned for the successful (re-)integration of the researcher.*

*Describe briefly how the host will contribute to the advancement of their career.*

**Qualifications and experience of the supervisor(s)**

Prof. Leslie leads the statistical learning research group in the Department of Mathematics and Statistics, Lancaster University. He is a world leading researcher in statistical learning, Bayesian inference, decision-making, and game theory, with 19 refereed journal articles and collaborators from France, USA and Australia. His research on contextual bandit algorithms[2] is used by many of the world's largest companies to balance exploration and exploitation in real time website optimisation. He is expert in the mathematics of learning in games,[3] stochastic approximation theory,[4] and the mathematics of statistically-inspired reinforcement learning.[5] Prof. Leslie is the holder of a Google Faculty Award which funds a student

[1] The hosting arrangements refer to the integration of the Researcher to his new environment in the premises of the Host. It does not refer to the infrastructure of the Host as described in Criterion Implementation.

[2] **MayEtAl2012**.

[3] **LeslieCollins03**; **LeslieColline05**; **LeslieCollins06**; **ChapmanEtAl2013**; **PerkinsLeslie2014**.

[4] **LeslieCollins03**; **PerkinsLeslie2012**; **PerkinsLeslie2014**.

[5] **LeslieCollins05**; **LarsenEtAl2010**.

to investigate multiple-action selection in bandits. Prior to his relocation to Lancaster, he was a senior lecturer in the statistics group of the School of Mathematics, University of Bristol. He continues to be co-director of the £1.5m EPSRC-funded cross-disciplinary decision-making research group at the University of Bristol, and was also on the management team of the £5.5m ALADDIN project, a large strategic partnership between BAE Systems and EPSRC, involving researchers from Imperial College, Southampton, Oxford, Bristol and BAE Systems.

Prof. Leslie's mentoring approach is one of 'guided freedom' in which the mentee takes responsibility for their own research, while regular discussions ensure that dead ends are avoided and promising openings are exploited. In the 10 years since taking up a Faculty position, he has supervised 17 PhD students, 2 post-doctoral fellows, numerous MSc and undergraduate dissertations, and an undergraduate secondment from ENS Lyon.

**Hosting arrangements**

Dr Gabillon will be embedded within the statistical learning group which is lead by Prof. Leslie. This is a team of 5 academic staff and around 5 PhD students within the Department of Mathematics and Statistics. The Researcher will participate in weekly research group meetings and benefit from advice from the senior scientists in the group, including the Supervisor, on research direction and management, personal development, workshop organisation, teaching, and other aspects of academic life. The group also has extremely strong links with both the Data Science Institute, XXX, and the STOR-i Centre for Doctoral Training, YYY. These exciting initiatives will clearly provide multiple further opportunities to develop informal mentoring relationships in addition to the formal process which takes place for all staff at the University of Lancaster (WHICH IS WHAT?).

Dr Gabillon will also work with the Medical and Pharmaceutical Statistics Research Unit within the Department of Mathematics and Statistics to develop best-arm identification approaches to clinical trials.

### 1.4 Capacity of the researcher to reach and re-enforce a position of professional maturity in research

FOR VICTOR TO DO THE FIRST DRAFT

*Applicants should demonstrate how their proposed research and personal experience can contribute to their professional development as an independent/mature researcher.*

*Please keep in mind that the fellowships will be awarded to the most talented researchers as shown by the proposed research and their track record (Curriculum Vitae, section 4), in relation to their level of experience.*

## 2 Impact

*What they want to see: worthwhile outreach; good communication strategy (are there existing connections that will be exploited?); adequate discussion of impact on researcher's career; impact of how outreach activities will be assessed; strategies for exploitation of outcomes.*

### 2.1 Enhancing research- and innovation-related skills and working conditions to realise the potential of individuals and to provide new career perspectives

*Explain the expected impact of the planned research and training, and new competences acquired during the fellowship on the capacity to increase career prospects for the Experienced Researcher after this fellowship finishes.*

*Demonstrate also to what extent competences acquired during the fellowship, including any secondments will increase the impact of the researcher's future activity on European society, including the science base and/or the economy*

Dr Gabillon is already a leading researcher in the mathematics of bandit algorithms and reinforcement learning. This fellowship provides a training opportunity in two key additional research competences. Firstly, the Researcher will develop an in depth knowledge of cutting edge statistical theory, and bring that to bear on bandit algorithms. Training will be received from leading scientists in statistics and operations research at Lancaster University, including Profs. Leslie, Fearnhead and Glazebrook. Secondly, training from the clinical trials team at Lancaster University, and in particular Prof. Jaki, will allow the researcher

to develop a new and exciting research stream. Bandit theory is currently applied almost exclusively to web optimisation problems, but recent theoretical gains should be used to design more efficient clinical trials, one of the early motivations of the theory. However very few people are working in this space, and the Researcher's skill set combined with Lancaster University's expertise in clinical trial design, provide an opportunity for pioneering and socially-beneficial work to be carried out. Clearly, being a key researcher in such an exciting field will provide enormous career-enhancement prospects for the Researcher.

In addition to research opportunities, Dr Gabillon will be embedded within Lancaster University's mechanisms for collaborating with industrial partners. He will develop skills in how to manage the industry/academia relationship to ensure mutually beneficial outcomes. This relationship-management will be a key skill for academics in the future; Lancaster University, and particularly the Department of Mathematics and Statistics, is currently a world-leading institution in developing such relationships, and the Researcher will both be introduced to prospective partners and receive mentoring as he develops his own relationships. (HOW MANY COMPANIES HAVE INTERACTED WITH STORI IN THE LAST YEAR?)

??? Learning about inter-disciplinary work through collaborating with clinical trials people???

??? The experience of working across disciplines in an international team of early career researchers in the Data Science Institute will allow Dr Gabillon to build an international network that will be invaluable in future career???

??? Broad range of skills will form foundations for a future research career ???

### 2.2 Effectiveness of the proposed measures for communication and results dissemination

*The new knowledge generated by the action should be used wherever possible to advance research, to foster innovation, and to promote the research profession to the public. Therefore develop following three points.*

- *Communication and public engagement strategy of the action*
- *Dissemination of the research results*
- *Exploitation of results and intellectual property rights*

*Concrete plans for the above must be included in the Gantt Chart (see point 3.1). The following sections of the European Charter for Researchers refer specifically to public engagement and dissemination:*

**Public engagement** *Researchers should ensure that their research activities are made known to society at large in such a way that they can be understood by non-specialists, thereby improving the public's understanding of science. Direct engagement with the public will help researchers to better understand public interest in priorities for science and technology and also the public's concerns.*

**Dissemination, exploitation of results** *All researchers should ensure, in compliance with their contractual arrangements, that the results of their research are disseminated and exploited, e.g. communicated, transferred into other research settings or, if appropriate, commercialised. Senior researchers, in particular, are expected to take a lead in ensuring that research is fruitful and that results are either exploited commercially or made accessible to the public (or both) whenever the opportunity arises.*

Need to think about public engagement. I'm thinking of setting up a "Data Science Network" around Lancaster to help generate both enthusiasm and contacts within local companies. Now might be a good time to make that public!

The excellent and innovative research generated in this project will of course be published Open Access in leading international journals and conferences. Prof. Leslie currently works directly with several companies, both small and large, and Dr Gabillon will be mentored to develop similar relationships. We will discuss results directly with companies in Lancaster University's Knowledge Business Centre, an innovation hub providing a gateway for business/academic interaction which allows the transfer of expertise between Lancaster's academics, regional businesses and community partnerships through training and technology transfer activities A particularly successful mechanism deployed extensively at Lancaster is an industrially-sponsored MSc or PhD project which allows the supervisor's research to be both developed and deployed

directly within a company; the Researcher will be encouraged to join appropriate supervisory teams to help both disseminate the project's research and develop an industrial research network to enhance his future career. The Research Support Office of Lancaster University has extensive experience of industrial engagement and will assist in the management of IP and any patents that may arise from the research.

## 3 Implementation

*What they want to see: Specific tasks and clearly defined outputs/deliverables; host institution has capacity to support Researcher; coherent workplan (why is the scheduling correct); metrics to assess progress; clear management structure (ie what is done beyond regular meetings with supervisor); risk management and contingency plans; quality management procedures*

### 3.1 Overall coherence and effectiveness of the work plan, including appropriateness of the allocation of tasks and resources

DEPENDS ON SECTION 1: VICTOR TO DO FIRST VERSION

Describe the different work packages. The proposal should be designed in such a way to achieve the desired impact. A Gantt Chart should be included in the text listing the following:

- Work Packages titles (for EF there should be at least 1 WP);
- List of major deliverables;[6][7]
- List of major milestones;[8]
- Secondments if applicable.

The schedule should be in terms of number of months elapsed from the start of the project.

### 3.2 Appropriateness of the management structure and procedures, including quality management and risk management

Develop your proposal according to the following lines:

- Project organisation and management structure, including the financial management strategy, as well as the progress monitoring mechanisms put in place;
- Risks that might endanger reaching project objectives and the contingency plans to be put in place should risk occur.

### 3.3 Appropriateness of the institutional environment (infrastructure)

- *Give a description of the main tasks and commitments of the beneficiary and partners (if applicable).*
- *Describe the infrastructure, logistics, facilities offered in as far they are necessary for the good implementation of the action.*

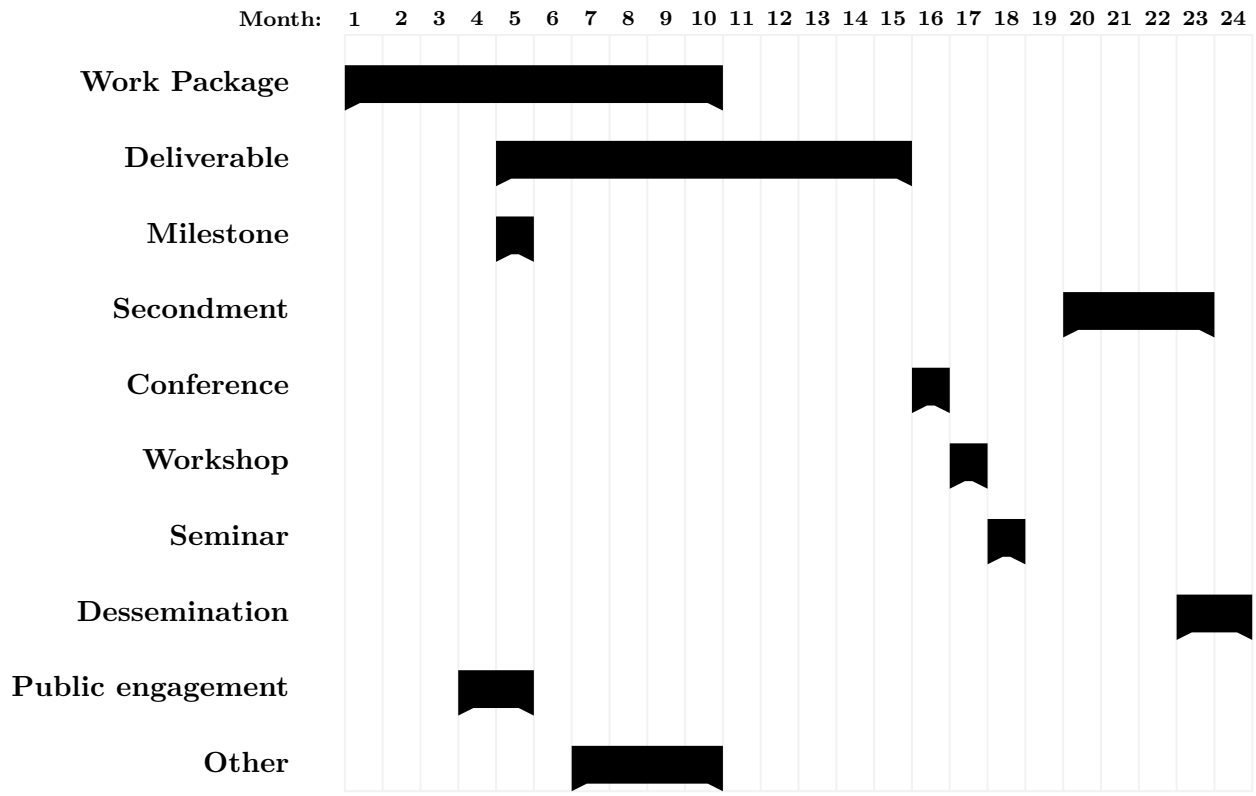
The Researcher will be hosted in the Department of Mathematics and Statistics at Lancaster University. Prof. Leslie will provide the main mentorship and research supervision of the project. In addition, supervision for WPX will also be provided by Prof. Jaki The Department has extremely strong links with research groups in Operations Research in Lancaster University Management School through the STOR-i Centre for Doctoral Training, and with Computer Science through the Data Science Institute. Therefore multiple researchers in cognate areas will contribute to the project with informal mentorship and research leadership. In terms of physical resources, the Department will provide high quality office space and standard IT facilities to allow the Researcher to carry out the project. IS BIG COMPUTING NEEDED/AVAILABLE?!

[6] A deliverable is a distinct output of the action, meaningful in terms of the action?s overall objectives and may be a report, a document, a technical diagram, a software, etc.

[7] Deliverable numbers ordered according to delivery dates. Please use the numbering convention <WP number>.<number of deliverable within that WP>. For example, deliverable 4.2 would be the second deliverable from work package 4.

[8] Milestones are control points in the action that help to chart progress. Milestones may correspond to the completion of a key deliverable, allowing the next phase of the work to begin. They may also be needed at intermediary points so that, if problems have arisen, corrective measures can be taken. A milestone may be a critical decision point in the action where, for example, the researcher must decide which of several technologies to adopt for further development.

Gantt chart Reflecting work package, secondments, training events and dissemination / public engagement activities



### 3.4 Competences, experience and complementarity of the participating organisations and institutional commitment

*The active contribution of the beneficiary to the research and training activities should be described. For GF also the role of partner organisations in Third Countries for the outgoing phase should appear. Additionally a letter of commitment shall also be provided in Section 7 (included within the PDF file of part B, but outside the page limit) for the partner organisations in Third Countries. NB: Each participant is described in Section 5. This specific information should not be repeated here.*

The Department of Mathematics and Statistics at Lancaster University was ranked fifth equal in the United Kingdom in the most recent Research Excellence Framework. The Department has a thriving research environment, with 50 faculty, 11 post-doctoral fellows, and 72 PhD students. The Department has numerous government- and industry-funded research projects, many of which relate to either industrially-motivated statistics or clinical trials, and are related to the currently-proposed project. The skill set of the Researcher complement those of the Beneficiary by providing expertise in current algorithmic approaches to bandit algorithms and reinforcement learning, whereas expertise currently in Lancaster focusses strongly on more traditional mathematical approaches. In contrast the host institution provides expertise in statistical methodology appropriate to online inference and in clinical trials, and a strong track-record of working with industry to ensure exploitation of fundamental theoretical research.

## 4 CV of the Experienced Researcher

This section should be limited to maximum 5 pages and should include the standard academic and research record. Any research career gaps and/or unconventional paths should be clearly explained so that this can be fairly assessed by the independent evaluators. The Experienced Researchers must provide a list of achievements reflecting their track, and this may include, if applicable:

1. Publications in major international peer-reviewed multi-disciplinary scientific journals and/or in the leading international peer-reviewed journals, peer-reviewed conference proceedings and/or monographs of their respective research fields, indicating also the number of citations (excluding self-citations) they have attracted.
2. Granted patent(s).
3. Research monographs, chapters in collective volumes and any translations thereof.
4. Invited presentations to peer-reviewed, internationally established conferences and/or international advanced schools.
5. Research expeditions that the Experienced Researcher has led.
6. Organisation of International conferences in the field of the applicant (membership in the steering and/or programme committee).
7. Examples of participation in industrial innovation.
8. Prizes and Awards.
9. Funding received so far
10. Supervising, mentoring activities

## 5 Capacities of the Participating Organisations

All organisations (whether beneficiary or partner organisation) must complete the appropriate table below, which will give input on the profile of the organisation as a whole. Complete one table of maximum one page for the beneficiary and half a page per partner organisation (min font size: 9). The experts will be instructed to disregard content above this limit.

| **Beneficiary X** | |
|---|---|
| **General Description** | |
| **Role and Commitment of key persons (supervisor)** | (Including names, title, qualifications of the supervisor) |
| **Key Research Facilities, Infrastructure and Equipment** | (Demonstrate that the team has sufficient facilities and infrastructure to host and/or offer a suitable environment for training and transfer of knowledge to recruited Experienced Researcher) |
| **Independent research premises?** | |
| **Previous Involvement in Research and Training Programmes** | |
| **Current involvement in Research and Training Programmes** | (Detail the EU and/or national research and training actions in which the partner is currently participating) |
| **Relevant Publications and/or research/innovation products** | (Max 5) |

| **Partner Organisation Y** | |
|---|---|
| **General Description** | |
| **Key Persons and Expertise (supervisor)** | |
| **Key Research facilities, infrastructure and equipment** | |
| **Previous and Current Involvement in Research and Training Programmes** | |
| **Relevant Publications and/or research/innovation product** | (Max 3) |

# ENDPAGE

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PART B

"YourAcronym"

**This proposal is to be evaluated as:**

**[Standard EF]**