



POEMA

H2020-MSCA-ITN-2018

**Polynomial Optimization, Efficiency through
Moments and Algebra**

PERSONAL CAREER DEVELOPMENT PLAN

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ESR Name:	Soodeh Habibi
Host Institution:	University of Birmingham
Advisor:	Professor Michal Kočvara
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Introduction

The Personal Career Development Plan (PCDP) describes both near and long term objectives of the fellow, to reflect on their progress, plan their future development, and take actions to realize their plans. The document must be completed and updated every 12 month by the fellow and his/her advisor. It will be monitored yearly by the Educational Committee who will also provide the feedback assessment results of the training programme on the occasion of the yearly meeting. Major deviations from the plan should be reported to the Educational Committee.

1 Individual Research Plan

1.1 Host Institution

University of Birmingham

1.2 PhD Advisor(s)

Professor Michal Kocvara

1.3 PhD Thesis Supervisor Committee (if applicable)

1.4 Short overall project description

“Algorithms and Software for Structured Semidefinite Optimization”

The purpose is decomposing SDP problems into problems with many small matrix variables or matrix constraints; then, solving them by general purpose SDP software. In order to do this, we will develop algorithms and software for matrix decomposition.

1.5 First secondment

Friedrich-Alexander University of Erlangen

1.6 Second secondment

IBM Research in Dublin

2 Research Outputs, Dissemination and Mobility

2.1 Research results

Designing new preconditioners for solving the Schur complement equation coming from the interior point method in solving SDP problems.

(Mention here your research results)

2.2 Research publications

No publications yet.

(Mention here your publications (ongoing, submitted, accepted, published))

2.3 Dissemination and networking

- Kick-off & Recruitment event, Paris, France, 25 April 2019 (presentation about my MSci project, interview)
- POEMA 1st Workshop, Florence, Italy, 15-17 January 2020
- POEMA Online Learning Weeks, 17.05.2020 – 16.09.2020
- POEMA ESR Days, 15-16 October 2020
- POEMA 2nd Workshop, 20.10.2020 – 11.12.2020 (presentation about my research project)
- POEMA 3rd Workshop, 29.01.2021 – 17.02.2021 (presentation about my research project)

(Mention here in particular:

- *presentations at conferences/workshops (network events, other events)*
- *participation to conferences/workshops (network events, other events, research visits, etc)*
- *list the anticipated networking opportunities for the new period*

According to the DoA, the ESR is also solicited to contribute as part of their dissemination activities: blogs and open discussion lists on global optimization...)

2.4 Software, Data, other

The tru and vib problems uploaded to POEMA database.

Provide (and update) a list of materials (data, software,...) that you have produced with the aim of making your research reproducible for other researchers within and/or outside the POEMA network.

No material yet.

3 Personal Training Plan

3.1 Scientific training courses

(List the courses that you have taken, including practical course information (organizing institution, number of equivalent ECTS credits, course dates) and the result of the course assessment (if applicable).)

Autumn semester 2019-2020, University of Birmingham:

Nonlinear Programming (10 credits)

Conic Optimization (10 credits)

(Give an overview of the courses that you are planning to take, including practical course information (organizing institution, number of equivalent ECTS credits, course dates) and a brief justification of why these courses are relevant for your research project and/or career development.)

Spring semester 2019-2020, University of Birmingham:

Multicriteria Decision Making (10 credits)

Heuristic Optimization (10 credits)

The University of Birmingham requires every PhD student to collect 50 ECTS credits. I have chosen teaching modules offered by the School of Mathematics that are closest to my research project. The final examinations for the 2019-2020 season will be in May 2020.

3.2 Complementary training courses

List the complementary training courses such as: teaching or software etc.,

See point 3.3.

3.3 Professional skill development

- *Management skills*
- *Communication skills*
- *Technical skills*
- *Additional skills*

I plan to attend training courses offered by the University of Birmingham regarding technical and communication skills. In particular workshops offered by the Birmingham Environment for Academic Research (BEAR) on high-performance computing.

4 Personal Career Development

4.1 Plan for the next period

Development of first version of an interior point algorithms and software for SDP problems resulting from polynomial optimization.

- Revision of an interior point (IP) algorithm for general linear SDP based on NT direction. This will closely follow papers on SDPT3 algorithm and software and form a basis for the next development.
- Development of a special version of the above algorithm for sparse data and low-rank dual solution. I will follow a recent paper by Zhang and Lavaei.
- Development and study of an iterative solver within the above IP method, in particular a suitable preconditioner for the sparse low-rank SDP problems.
- Study of structure of problems arising from various relaxations in polynomial optimization, as developed in other work packages.
- Further study of literature on chordal decomposition of SDP problems.
- Development of a decomposition strategy for SDP problems arising from polynomial optimization. This strategy will be implemented as a pre-processing of the above IP software.

4.2 Career objectives (Postdoctoral project, ...)

- *Career objectives, self-assessment and plans for the next period*

At this stage it is too early to make any post-doctoral plans. At the moment I plan to establish new contacts with the members of the POEMA network, the industrial partners and other participants of POEMA meetings.