



ERCIM "ALAIN BENSOUSSAN"
FELLOWSHIP PROGRAMME



Scientific Report

First name / Family name	Rita/Pimentel
Nationality	Portuguese
Name of the <i>Host Organisation</i>	RISE SICS VÄSTERÅS
First Name / family name of the <i>Scientific Coordinator</i>	Markus/Bohlin
Period of the fellowship	01/05/2018 to 01/05/2019

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

During my Pos Doc at RISE, I worked in four different projects. Two of them were in close collaboration with Mälarenergi. On one project, I participated in the control of the inventory of waste. I mostly analysed data from different sources in the company to try to define a cost function which takes into account smell issues. It was very difficult to find patterns in the data, particularly because it is not straightforward to define how to measure the impact of bad smell. Thus, in this moment we are discussing other approaches to define the best policy for the company. On the other project, I applied machine learning techniques to define the hot water time delay in the network, in particular, for areas far away from the boilers. Based on the previous results, I also made predictions for the supply temperature in these areas. In fact, we defined a new methodology to deal with this type of problems, which can be generalize to other contexts.

The third project that I worked is in the field of software testing. I developed an economic model to measure the impact of the implementation of a new methodology for scheduling test cases. This methodology, called sOrTES, is based on a test case prioritization. A case

study is developed with Bombardier. I am still working in this project and two more contributions are planned. Namely, to use a classification approach to split the test cases into two groups: dependent and independent and to identify unique requirement coverage based on the traceability matrix between requirements and test cases in order to include this feature in sOrTES.

Furthermore, I also participated in a small project where the main goal is to explore future scenarios related with technology. My part of the project was called “Unboxing AI for employees”. In a very creative way, we discussed and tried to understand better what will be the changes and the implications of having more and more artificial intelligence in our work environment.

Finally, I also contributed to the writing of two proposals, which were both funded. Currently, I am collaborating on the writing of three other proposals, two to be submitted in April and another in May.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

During the one-year fellowship I worked in parallel in projects in RISE but also in projects still from my Ph.D. I was able to have a paper published in the context of one of the projects I have been working in RISE:

- *sOrTES: A Supportive Tool for Stochastic Scheduling of Manual Integration Test Cases*, IEEE Access, 2019, co–authors: Sahar Tahvili, Wasif Afzal, Macus Ahlberg, Eric Fornander, Markus Bohlin, <http://dx.doi.org/10.1109/ACCESS.2019.2893209>.

I also had a paper accepted for a MIT book on Innovation:

- *Product Innovation of an Incumbent Firm: A Dynamic Analysis*

The following paper is under review:

- *Study of the particular solution of a Hamilton–Jacobi–Bellman equation for a jump–diffusion process*, RevStat – Statistical Journal

These papers were submitted, and are waiting for an answer:

- *Technology adoption in a declining market*, Management Science
- *Quasi-analytical solution of an investment problem with decreasing investment cost due to technological innovations*, Journal of Economic dynamics and control

Finally, these papers are still being prepared to be submitted:

- *Add-or-replace decision: the capacity choice effect*, The Rand Journal of Economics
- *Classifying dependent and independent manual integration test cases using IFROWANN algorithm*, Engineering Applications of Artificial Intelligence

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

Due to budget constraints, I only attended to one international conference to present the research from my Ph.D.:

- *Capacity optimization for innovating firms*, Informs Annual Meeting, Phoenix, USA, November 2018

RISE gave me the opportunity to participate in two courses related with Amazon Web Services (AWS) in Kista (Stockholm). The courses lasted for a week in November 2018:

- AWS Technical Essentials
- Architecting on AWS

When I was in Trondheim (Norway), during my REP, I was invited to give a seminar:

- *Scheduling of manual integration test cases using machine learning*, Department of Industrial Economics and Technology Management (NTNU), March 2019.

I also took the chance to be in a seminar at Mälardalen University (Västerås):

- *Finite difference and Monte Carlo methods and their applications in engineering*, Nebojsa Raicevic, April 2019.

IV – RESEARCH EXCHANGE PROGRAMME (REP)

During my one-week REP, I used the time essentially to advance or finalize some joined projects with my co-authors at NTNU and to start building a new scientific project in credit and market risk.

Maria Lavrutich and I finalized our revision in the joined paper *Technology adoption in a declining market*, which was submitted in April. I also had a meeting with Verena Hagspiel, who is my co-author in the paper *Add-or-replace decision: the capacity choice effect*, to update her about my new findings.

I was invited by Maria Lavrutich to give a seminar in the Department of Industrial Economics and Technology Management, about one of the projects that I am working at RISE. The title was *Scheduling of manual integration test cases using machine learning*.

Finally, Maria Lavrutich and I started to build up a consortium to apply for a project in "Risk management: Credit, market and their interactions". We decided to submit to a call from The Research Council of Norway

(<https://www.forskningsradet.no/en/Funding/IKTPLUS/1254038220884/p1184150364108?visAktive=true>).

The main activities regarding to this were:

- Write a draft of the proposal;
- Do some literature review;
- Meet with Sjur Westgard, who is also a Professor at NTNU and has contacts in the bank industry. He will be the project manager;
- Meet with a stakeholder from a Norwegian bank to identify the needs and how we can contribute in the advance of the research in this area.