



CMU | Portugal

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Faculty Exchange Program Final Report

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Host: David Garlan, Professor, ISR - Institute of Software Research, Computer Science School, CMU

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I would like to start by thanking Prof. David Garlan for hosting me, and all the people of the Institute of Software Research with whom I was involved in one way or the other. A special thanks goes to Eduardo Miranda and David Root, Matt Bass and Bradley Schmerl for their role in some of the activities I have undertaken. Prof. David Garlan and his colleagues were always making sure that I could have the best possible experience while I was in CMU. My stay in Carnegie Mellon was a great opportunity to learn best practices in both teaching and research, to understand the mechanics of a top research group and University, and to understand the key factors necessary to achieve such success.

Context:

Carnegie Mellon University is considered one of the top Universities in the world in the fields of Computer Science and Software Engineering. It features not only top-class degrees, but also top-class research and top-class connections with institutes that are somehow connected to them, such as the Software Engineering Institute (SEI) and the Robotics Institute. In the case of the SEI, I was able to witness first-hand its strong research ties with the research group of Prof. Garlan. I am a professor and researcher in the SSE (software and systems engineering) group in University of Coimbra, the training that I get from this stay at CMU is very important for me and for my organization.

Activities:

Course and teaching training, understanding methods for teaching and organizing courses – This is a fundamental activity for faculty. I was fortunate enough to be able to attend courses on Managing Software Engineering Projects, Models of Software Systems and some classes of course Engineering Scalable Software Systems. This is an activity that I kept from day 1 to the last day of my stay, and certainly a crucial outcome of my stay. It has given me an understanding of how those courses are organized, and also trained me in the contents of those courses. I am sad that I could not attend the course on Software Architectures, since it is taught in the second semester and would certainly be very important as well for my training. But, apart from that, the course and teaching training I obtained was extremely important. Next, I give a few more details on two courses:

Management of Software Engineering Projects: I frequently supervise industrial projects as part of my academic activity, and there is intense debate in my University about methodology and

documentation in those projects. The course on Management of Software Engineering Projects is very important in that sense. It answers a lot of questions, including: what are the best practices concerning how to organize, manage and document software projects? In terms of course organization, it gives me insight into how to improve materials, activities and interactions with students. It also gave me tons of complementary reading material (books).

Models of Software Systems: Software reliability has always been a major theme in software engineering, and it has also always been a major research topic in my research group (SSE). The formal methods and the breadth of models that are taught in this course are very interesting and elegant approaches for modeling, checking and proving software systems. A typical piece of software is a complete spaghetti mess, which makes it difficult to guarantee its reliability. This is what led Software Engineers to do research on this subject. There will be three major outcomes for me and for my research group from this course: being able to better formalize my reasoning and my research results; having a new set of tools to reason on software systems reliability; planning research in advancing how we think and conceive software systems.

Research meetings – the ABLE group, Professor's David Garlan research group, is very active in applying their top-tier knowledge in research topics that range from security to self-adaptability in different contexts that range from DoD projects to resource provisioning, cloud, mobile technologies and cyber-physical systems. They have many research meetings, there are in particular two weekly meetings on pre-arranged topics, with a presentation and discussion of detailed research issues. Those meetings also serve to review the work of PhD students and to discuss possible avenues for their next steps. Those are the SAM meetings on Wednesdays and the ABLE meetings on Fridays. I have had the privilege to attend all those meetings, and also to give presentations concerning my research and a paper that I was presenting in a workshop of BigData 2014 conference. I have met and attended presentations from many researchers (phd students, post-phd, staff) in those meetings. I have attended at least 20 such meetings. Besides those meetings, I also attended less frequent meetings in cyber-physical systems and other subjects.

Another very important meeting that I have attended every week was the SSSG meeting, a meeting targeted at all the faculty and community of ISR. This meeting was particularly interesting, since every week a set of two presentations from phd students, researchers and invited people are given, and we are asked to help the PhD students by giving them written feedback on how to improve their presentations and their work. I have attended at least 24 of those presentations, all of them very interesting.

Invited Keynotes, interviews and other events – CMU being a vibrant place with a lot of important activity, I had the opportunity to attend a vast number of keynotes and other events during my stay. I was amazed at the quality of some of those in particular. I was fortunate to be here during the commemorations of the 25th anniversary of the school of computer sciences, and I was also fortunate to attend the talks of the technical people from the Jet Propulsion Lab (JPL). The JPL gave two talks that were especially interesting: one about a software fault experienced in a Mars Rover, and one about JPL reliable flight-control software architecture. Those talks were amazing, and provide very interesting insights.

I was also amazed with a keynote explaining the BitCoin phenomena, another talk about IBM research on cognitive systems and a talk on software review. These are just examples of the more than 20 talks I attended beyond those of the research group and faculty and that really made a difference to me.

Preparing collaboration by means of research project - research cannot be done without money and without PhD students, and the first pays the second. I, and most of my colleagues in U. Coimbra, have had major difficulties in this respect. Economic activity and financing by companies is not vibrant in Portugal, so we had to shift our attention from research to spending our precious time applying to projects to try to find financing for research, and financing is too scarce. The CMU-Portugal program is another possible source of interesting projects and financing. We set a goal of applying for a collaborative project with CMU. For the financing to be acceptable, it has to be an entrepreneurship project. Some of the activities during my stay were therefore related to setting up a possible project. I had to understand what the CMU-ABLE group

is doing, try to find some match, present our current work with a company, write a proposal draft, submit the draft to the company and get approval from the company administration. I have been through all these steps, and we have a preliminary 'conditional yes' from the company. Now I will refine the proposal, give all partners for extensive change and write the final proposal. In spite of all the work and this being important to create future activity, there are still risks associated with the need for the company to remain in the train.

Networking – I have met with a very large number of people while I was in CMU. First of all, I have met with most of the people who were in CMU under the CMU-Portugal program. I have met portuguese undergrad and grad students who were in CMU for short stays, learning what they were doing while here. I have also met the entrepreneurs from the companies who were spending time training here at CMU. I have met colleagues who were in the faculty-exchange program like me. I have met CMU faculty and researchers, and a large number of CMU PhD. I have also met the staff from the CMU-Portugal program, in particular Lori Spears, Sara Brandão and Alexandra Vieira, I thank them for their help.

Other activities – During my stay at CMU I also had to keep supervising the work that was going on in U. Coimbra. I had to continue work on projects with industry and research projects that were going on. During my stay at CMU a project on assistive technologies coordinated by me – SmartGuia: indoor localization for Blind people inside buildings – won a 3rd prize in a competitive challenge in Portugal. We have been planning the deployment and budget for that project, as well as developing several modules that need to be out. During the last few years I have intensified collaborating extensively with a large number of organizations (e.g. in the assistive technologies domain, we work with an hospital, associations for blind people, cerebral palsy, autism, elderly), and researchers from my University, other Universities and research centers. Applying for projects is an important way to foster the collaboration. During my stay in CMU I was also discussing project proposals with prospective partners and trying to match those with CMU faculty that I could contact to setup a project.

Conclusion

The objectives foreseen for this visiting period included: 1) Learning about contents and methods of courses; 2) Learning about research activities in the Institute of Software Research; 3) Researching; 4) Preparing common projects, collaborations and other activities; and 5) Attending lectures and Seminars. All those objectives were fulfilled. I attended many classes of courses of great utility to me, to my research group and to my University. I was able to meet and discuss issues with several PhD and Post-Doc researchers, as well as other Professors. I participated in research meetings and brain stormings. I have learnt about research in software architectures, self-adaptive systems, data privacy and security. I have learnt best practices concerning research, understanding the topics and research and how they are organized to achieve top results. I also planned for joint participation in future research projects.

My goal in Portugal will be to incorporate some of the best practices that I found interesting in my classes and in the supervision of students. The experiences I had can be of use to my research group, to my University and to Portugal scientific infrastructure.

Finally, I would like to thank the Departamento de Engenharia Informatica (DEI) U. Coimbra for my sabbatical leave, and the CMU-Portugal program for supporting my visit and providing me with the opportunity for further research cooperation.

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