

Carnegie Mellon–Portugal Program

Report on First Year Project Reviews

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Review Team:

Professor P. R. Kumar (University of Illinois), Chair

Prof. Gilles Barthe (Madrid Institute for Advanced Studies (IMDEA))

Directors:

Prof. João Barros, Director of ICTI@Portugal

Prof. José Moura, Director of ICTI@Carnegie Mellon

Summary

The panel reviewed 10 projects that broadly fall within the scope of ICT. The projects are generally in the area of systems (CS), and they are conducive to being accomplished in reasonable time.

The projects seem timely with respect to the current state of research in Portugal, in two critical aspects. The research within Portugal in the areas of the projects is very strong. The review committee was very impressed by the strength of the Portuguese researchers in the projects that were reviewed. Indeed, the strength of the Portuguese teams has ensured that the projects have been genuinely collaborative.

Carnegie Mellon is generally world-class in the areas covered by the projects, and so they allow Portuguese researchers to experience best practices in systems development as it is done at Carnegie Mellon University. In particular, due to the strengths across both sides of the Atlantic, the projects are ripe for collaboration that is sensitively tuned to the subtleties that distinguish world-class research. There is indeed strong evidence of collaboration between Portuguese institutions and Carnegie Mellon University.

In many projects, the Portuguese teams have access to Portuguese data (hospital data, employment tables, datasets of mobile operators) of the sort that is not easily available elsewhere. This data is tailored to Portuguese conditions and it is therefore expected that the ensuing results of the research will be ultimately most beneficial to Portugal. The availability of such data is also an attraction to Carnegie Mellon researchers.

The industrial partners in the projects, mostly from Portugal, are more strongly involved in the projects than one would have expected, since such industrial interactions are hard to foster in a short timeframe. This speaks to the strength of the already existing Portuguese research. Several projects also found

new industrial partners after they started. The industrial partners are both contributing to the projects and benefitting from them. Out systems, for example, is at exactly the right stage of their development for the INTERFACES project. Novabase is very committed to the AEMINIUM project. Portuguese hospitals are interested in the VitalResponder technologies. LOGICA is investing in a new research lab in Madeira connected to the SIN AIS project. BioDevices is developing their next product using technology developed under the VitalResponder project. In other instances, even non-Portugal based companies have contributed Portuguese data to the project, e.g., Vodafone.

A unique aspect of the Portugal–Carnegie Mellon collaboration is the role of the dual-degree PhD programs. This is a great strength of the program, since it ensures that post-graduate students are primed with the best practices. It furthermore induces deeper collaboration between post-graduate students and Carnegie Mellon faculty. The students experience the world-class environment at Carnegie Mellon, while being solidly grounded in Portuguese institutions. About 2/3 of the overall Carnegie Mellon–Portugal project funding is allocated for the development of human resources (MS and PhD students), which seems well designed and appropriate. This includes a significant number of PhD students that are not enrolled in the dual-degree PhD programs, yet are deeply involved in the projects. While this review was not specifically aimed at the dual-degree program, the imprint of this was clearly visible in all the projects reviewed.

Another original aspect is the faculty exchange program, which enables deepening of the ties across the Atlantic. Carnegie Mellon faculty have visited Portuguese universities on a regular basis for periods of various durations.

There is clear evidence of genuine collaboration across projects. Most projects have very regular audio-conference meetings, which speaks to the strength of the collaboration.

The projects appear to have been carefully chosen in the call for proposals.

The review committee evaluated each project's progress using several criteria, including the following:

- (i) The quality of the scientific research.
- (ii) The extent of the collaboration between institutions in Portugal in the project.
- (iii) The collaboration with the industrial partner or partners in Portugal. (Within this category, the review committee also included non-academic institutions such as hospitals, etc).
- (iv) The collaboration between Carnegie Mellon and Portuguese institutions in the project.
- (v) The potential of the project to bring about lasting impact in Portugal.

For each project the review committee also sought to provide feedback that could potentially improve the project.

We note that project participants were recused from participating in the reviews of their own projects.

Project SINAIS

1) Goals of Research

This is an ambitious project that seeks to develop instrumentation to monitor energy consumption, inform residents about their consumption, and provide feedback for them to modify their behavior. One task focuses on similar issues concerning the use of public transportation. The team is very multi-disciplinary and international, featuring computer scientists, software engineering, fine arts, economists and psychologists, among others.

One major goal is to deploy smart meters, beginning with 30 homes in Madeira and 100 homes in the North of Portugal, subsequently scaling up to 100.000 homes in Évora (in collaboration with EDP).

2) Quality

The project is off to an excellent start in Year 1.

If the project is taken to the conclusion that it contemplates vis-à-vis combining human computer interaction and service design, it could potentially have a major impact on sustainability studies.

3) Industrial Collaboration:

The fact that Madeira is an island of about 300.000 inhabitants helped bring in a number of local companies. One of the companies, GreenWave, came to the project through Pittsburgh, because they already had a test site in Portugal. Logica opened a research lab in Madeira (1.3M EUR over three years). Connection with the industry was also related to the European Open Living Labs initiative.

Through industrial collaboration, equipment was installed in buses and GPS traces were taken over two weeks. The goal is to learn and predict transportation behavior. The software is supposed to suggest alternatives to consumers.

4) Collaboration with Carnegie Mellon

A significant number of PhD students of Carnegie Mellon are involved in the project even though they are not directly funded by the program. Two students have been admitted by both universities and are waiting for funding.

The collaboration includes usage studies in Madeira that follow up on technological development at Carnegie Mellon. Carnegie Mellon provided the metering technology. A social networking site, StepGreen, was developed at Carnegie Mellon. SINAIS is interfacing this web site with their devices. Carnegie Mellon faculty benefit from data, which in the US would be very hard to get (mostly for legal reasons).

5) Collaboration among universities in Portugal

The collaboration between Madeira and Porto seems promising.

6) Expected Lasting Benefits

A multinational company recruited two of the project's students to work in Madeira, and is further funding two PhD students. The team is developing a culture of high-quality people working together in an inter-disciplinary fashion.

Project WESP

1) Goals of Research

The focus of the project is to provide trust and privacy solutions from a complementary perspective: (a) empowering users to controls their privacy, (b) developing tools to protect users' privacy, (c) developing trustworthy services.

2) Quality

The project is off to an excellent start in Year 1.

There is strong will to develop expertise in a relevant crosscutting field.

3) Industrial Collaboration

The PI has secured funding of 40.000 USD from IBM. The review committee encourages the PI to reactivate successfully their relationship with PT Sapo.

4) Collaboration with Carnegie Mellon

Carnegie Mellon has lent 30 smart phones for research. Beyond technical expertise, Carnegie Mellon is providing experience in running projects, mentoring opportunities, and helping build networks of contacts. Usage studies are carried out in Madeira, whereas technology is developed mostly at Carnegie Mellon.

Two faculty from Portugal went to Carnegie Mellon on the faculty exchange program.

5) Collaboration among universities in Portugal

The review committee looks forward to stronger collaboration among researchers in Madeira and Minho.

6) Lasting Benefits

This project has helped retain in Madeira an international researcher who recently moved to Madeira. It will help in building up the establishment of research activities in Madeira.

Project Aeminium

1) Goals of Research

This project seeks to develop a new model of programming that is parallel by default. The methodology is to express computation using dependencies, not order. The goal is to ensure that correctness is a guaranteed property by virtue of the type system that is implemented.

2) Quality

The project is off to an excellent start in Year 1.

The result of the project is fundamental for programming multi-core computers. This is an area where Portugal cannot afford not to have a presence.

The review committee is very strongly impressed by the strength of the Portuguese research team.

3) Industrial Collaboration

The review committee was impressed by the excellent relationship built up with Novabase, a well-known Portuguese software company. A senior engineer from Novabase attended the review, indicating the strong commitment of the company to the project, which is also supported by a protocol signed by all parties.

4) Collaboration with Carnegie Mellon

This is a project where the teams in Portugal and Carnegie Mellon are collaborating on an equal footing with benefits to both parties. The review committee was impressed by the fact that the full team, including Carnegie Mellon's PI, attended the review. Joint publications already exist.

There are two dual-degree PhD students. The review committee notes with approval the ongoing collaboration with the team of the Interfaces project.

5) Collaboration among universities in Portugal

There is collaboration within Portugal between Coimbra on runtime environment and Madeira on formal methods.

6) Lasting Benefits

Expertise in programming multi-core computers is vital for Portugal.

Project Interfaces

1) Goals of Research

The project aims to develop new automated techniques for enforcing security, integrity and correctness of distributed, extensible, web based applications. The techniques rely on semantically rich notions of interface, advanced type systems and program logics.

2) Quality

The research is not only world class, but commercial success is very likely.

The review committee is very strongly impressed by the strength of the Portuguese research team.

3) Industrial Collaboration

Outsystems is a Portuguese software company which is working specifically in this area, and which is very committed to the project, even to the point of aligning their roadmap to the project. Their team member attended the review in person. There are in fact weekly meetings with Outsystems.

4) Collaboration with Carnegie Mellon

Two dual-degree PhD students are involved in the project. There are several joint publications with Carnegie Mellon. The project benefits from the vibrant culture on formal aspects of security at Carnegie Mellon.

5) Collaboration among universities

The collaboration between the New University of Lisbon and the University of Lisbon seems very active.

6) Lasting Benefits

The committee envisages both world-class research as well as commercial success in an important area.

Project Human Capital, Knowledge Based Firms, and the Entrepreneurial Life Cycle

1) Goals of Research

Portugal has a unique employer-employee database (Quadros de Pessoal). The goal of this project is to study this database and obtain conclusions concerning human capital, knowledge-based firms, and entrepreneurship. One goal is to study the impact of universities on startup creation, human capital and ownership experience.

2) Quality

The project is off to an excellent start in Year 1. The uniqueness of the database provides the team with an opportunity to do world-class research. The team has apparently already made some findings from the database. These include the fact that the establishment of a new university in a region has a positive effect on the creation of knowledge-based companies and negative effects on the levels of entry in low-tech industries. The team also found that a streamlined registration process does not have significant impact on the creation of successful companies (because it only helps marginally motivated entrepreneurs).

3) Industrial Collaboration

There is currently no industrial involvement in the project.

4) Collaboration with Carnegie Mellon

Six dual-degree PhD students and junior faculty hired under the program are involved in the project.

5) Collaboration among universities in Portugal

There is a symbiotic relationship among the three partner universities.

6) Lasting Benefits

The project is expected to carry out a thorough study of the database that is available in Portugal.

Project Technology, Management and Policy for the Telecommunications Industry

1) Goals of Research

This project studies regulation and policy for next generation networks. It addresses issues such as vertical integration, Internet penetration and diffusion across social networks.

2) Quality

The project is off to an excellent start in Year 1.

The preliminary findings on the impact of broadband penetration on school performance are very notable and possibly highly significant. Further research on time lags and levels of students involved is likely to generate deeper insights.

3) Industrial Collaboration

The team is interacting with Vodafone on a regular basis by means of weekly audio conferences, with the marketing department based in Lisbon. Vodafone has provided a 2.5 TB large data set for social networking research. There are also connections to the telecom regulator ANACOM.

4) Collaboration with Carnegie Mellon

The PI's collaboration with Carnegie Mellon is very good. The review committee encourages other team members to start collaboration.

5) Collaboration among universities

The project would benefit from closer collaboration among partners in Portugal.

6) Lasting Benefits

Useful policy recommendations are likely to have significant impact in Portugal.

Project REAP-PT

1) Goals of Research

The goal of the project is to develop software based on REAP in order to teach reading to students of Portuguese as a second language.

2) Quality

The project is off to an excellent start in Year 1.

The quality of the research is very impressive. The progress to date exceeds expectations. There are already working demos.

The review committee is very strongly impressed by the strength of the Portuguese research team.

3) Industrial Collaboration

The project received valuable data from Porto Editora. Further visionary partnership with Porto Editora and possibly other industrial partners may be valuable.

4) Collaboration with Carnegie Mellon

Carnegie Mellon students have come to IST for visits. REAP software has its origins at Carnegie Mellon. There are close interactions through student co-supervision in the dual-degree PhD program in Language Technologies.

5) Collaboration among universities

The project is led by INESC ID with focusing on linguistic support, and field trials by the University of Algarve, which receives a high number of students of Portuguese as a second language. The field trials are expected to involve more than 400 students.

The University of Lisbon got off to a late start due to its lack of a mechanism to support projects that have been approved yet are awaiting payment. This appears to be an unfortunate victim of purely bureaucratic practices, which it would be certainly good for administrators at the university level to focus on remedying.

6) Lasting Benefits

Even partial success in this venture would multiply the opportunities for foreigners to learn Portuguese using modern multimedia technologies.

Project STAR PT

1) Goals of Research

The goal of the project is to provide an end-to-end system for speech-to-speech translation between languages. The project addresses in a unified way the pipeline consisting of speech-to-text, machine translation, and text-to-speech.

2) Quality

The project is off to an excellent start in Year 1.

This is a very coherent and well defined project. It is proceeding on schedule with its goals.

The review committee is very strongly impressed by the strength of the Portuguese research team.

3) Industrial Collaboration

VoiceInteraction is a start-up that is interested in this project.

4) Collaboration with Carnegie Mellon

There are a number of dual-degree PhD students involved. The relationship between INESC/ID and Carnegie Mellon is very close.

5) Collaboration among universities

The project is led by INESC ID, linguistics is addressed at the University of Lisbon, and there is interaction with a computer scientist at UBI on translation. There is a co-supervised student shared by IST and the University of Lisbon.

6) Lasting Benefits

The benefits of automatic speech translation either to or from Portuguese cannot be exaggerated.

Project VITAL RESPONDER

1) Goals of Research

The goal of the project is to develop innovative technologies for the effective management of emergency scenarios. The primary technological mechanisms are wearable technologies and sensor-equipped intelligent buildings. Two highlights of the project are exploring the usage of the Vital Jacket for monitoring stress and fatigue related indicators in emergency workers under emergency situations, and building-wide sensor networks that help in the evacuation of buildings in emergency situations, and that provide emergency workers with real-time and accurate feedback on the origins and evolution of the emergency.

2) Quality

The project is off to an excellent start in Year 1.

This is a very ambitious project, with tangible benefits.

The review committee is very strongly impressed by the strength of the Portuguese research team.

3) Industrial Collaboration

The project actively involves BioDevices S.A, which develops and commercializes the Vital Jacket. Moreover, the project is actively seeking and maintaining collaborations with other companies, mostly in the medical sector, and hospitals.

4) Collaboration with Carnegie Mellon

The collaboration with CMU is particularly beneficial. The collaboration is currently centered on wireless communication issues related to the Twitter Jacket, and on ECG analysis. The latter collaboration is performed in the context of one dual Ph.D. project. A third collaboration track on HCI is envisioned.

5) Collaboration among universities

The collaboration among universities is excellent.

6) Lasting Benefits

Intelligent technologies have the potential to prevent emergency situations and to minimize their impact. The technologies developed in this project will have a significant impact on the management of emergency situations, and on the long-term monitoring of emergency workers.

Project DRIVE-IN

1) Goals of Research

The goal of the project is to improve security and efficiency of vehicular transportation using vehicular ad hoc networks (VANETs), and positioning technologies. The specific objectives of the project include the development of geo-optimized VANET protocols, the design and deployment of intelligent and collaborative car-routing strategies, the implementation of robust simulators that support large-scale simulations of VANETs, and large-scale experimentation with around 500 taxi drivers in Porto.

2) Quality

The project is off to an excellent start in Year 1.

This is a very ambitious project, with the potential for concrete impact in daily commuter life.

3) Industrial Collaboration

NDrive is a leading company in GPS-based navigation systems for cars. It is actively involved in the project, and provides essential support for the experimental aspects of the project. An API has been developed to facilitate the integration between research developments and NDrive products, and will significantly enable and stimulate technology transfer.

4) Collaboration with Carnegie Mellon

The collaboration with CMU is particularly active. Over 5 publications have been co-authored by CMU and Portuguese faculty, and 4 PhD students are involved in the dual-degree program. A further positive aspect of the project is the CMU collaboration with the car industry, notably GM.

5) Collaboration among universities

The collaboration among universities is excellent.

6) Lasting Benefits

Vehicular networks will improve the safety of transportation and alleviate traffic congestion, with a positive effect on energy consumption and quality of life.

