CMU | Portugal Faculty Exchange – Final Report

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Introduction

This report is organised in three main sections, describing the activities and impressions gathered during the 4,5 month faculty Exchange at Carnegie Mellon University during Spring and Summer semester 2011. First, I describe activities related to teaching followed by research. Finally, section General Impressions collects several practices that caught my attention during this stay and that I believe should be adapted to the portuguese context and adopted in the future.

Teaching

My Experience

I participated in the undergraduate Electrical and Computer Engineering (ECE) course "Introduction to Communication Networks" (18-345) by closely following the classes and the activities related to the course. I had the opportunity to teach two classes: "Introduction to Transport Protocols" and "Wireless Networks".

Additionally, I attended the lectures of the Machine Learning graduate course in Computer Science (CS), by Tom Mitchell.

Course Organisation

Professors at CMU organise the courses, give the lectures and supervise the roll-out of homeworks, assignements, quizzes and exams, while the actual execution and student support are provided by PhD students as a PhD requirement. Hence, professors are required to spend less time with students and in time-consuming, mechanical tasks, like exam supervision or correction. Workforce for the support is free and always available, though sometimes there is the need to involve senior undergraduate students.

Pedagogy/ Teaching Methods

Teaching in general is very open and focused on transmitting fundamental concepts. Actual systems and technologies are presented as examples of specific mechanisms and principles, identifying technology components as implementations of abstract concepts. Visualisation of simple models of algorithms, protocols and mechanisms, as well as their basic behaviours, are often used in class and explained in detail to solidify concepts.

Contents are presented from a problem solving perspective, i.e. the problem is described in detail before any solution is presented. As a consequence, the motivation for a solution is clear and students can follow the reasoning process and how it leads to the solution.

Lecturers do not go into very specific technological details or into mathematical derivations in class, encouraging students to do so at home, or requesting it as homeworks. Students are encouraged to prepare for next class by reading text books and support material al home, what they actually do, to a great extent. Hence, students commonly participate actively in lectures, asking questions and sometimes starting discussions among themselves.

Professors superficially introduced in class contents that are expected to be previously known from requisite classes, recalling basic concepts and explicitly encouraging students to review the subjects at home. In my opinion, this plays a major role in keeping students on-board, reducing their barrier to ask questions and to recall previous subjects.

Moreover, professors in general avoid giving the impression that a question is "too basic" or an answer is wrong, but instead analyse them as suggestions in terms of their advantages and disadvantages, giving the students a good insight into reasoning and being constructive. This practice not only keeps students involved and motivated in a course, but also lowers the social barrier for students to ask questions and intervening.

Cheating and Fraud

There is no tolerance towards cheating or any kind of fraud, and students are warned about it from the beginning. Ethically reprovable practices are explained to students, who must sign a declaration on how they were informed about the policy and agree to comply to it. CMU can thus refuse to graduate students caught infriging that statement.

I am strongly in favour of the introduction of a similar practice in UP. I believe that any one caught cheating should be warned once and expelled on any re-incidence. I also favour the introduction of a written document on cheating and fraud policy that students must sign at the beginning of each course (1st cycle, 2nd cycle, 3rd cycle). It would not only mark the seriousness of such policies, but also guarantee that students are aware of behaviours that configure fraud, and is likely trigger reflection about the matter. Moreover, it would clarify before the student how seriously the university takes this matter.

Research

My Experience

I had regular meetings with Peter, discussing adaptation of communication protocols in vehicular ad-hoc networks (VANET) and trying to obtain a better understanding the VANET wireless channel. Using the results of VANET measurements carried out in Porto before and during the stay, I explored machine learning techniques (SVM, PCA, other feature reduction techniques)

as means to represent relevant characteristics of wireless VANET links. We are currently looking into visualisations of wireless link quality in an urban areas for gaining better insight into urban propagation in urban environments.

Additionally, I researched literature on VANET connectivity and propagation models, as well as ad-hoc and sensor networks and I am currently writing a doctoral workplan on "Mobile Gateways for VANET Sensing" to be submitted to the current FCT call by a PhD student candidate. This work may be mentored by Prof. Ozan Tonguz (ECE) and will complement on-going work on using VANET for sensing purposes.

Weekly group meetings

Group meetings were held once a week during the semester, at lunch time accompanied by free pizza. During each meeting, two students had 30min each to present their recent work and received feedback from the team members. These meetings were held independently of the presence of all professors involved in the group, started on time and never lasted more than one hour. Professors were present whenever in office. Since the effort was admissble, the presence of every team member was assured. The practice is common in other groups at CMU in time, periodicity and incentives.

In my opinion, this is a very healthy practice that fosters group communication and represents a soft peer-pressure to move forward. It is extremely helpful for training speaking skills, early stage discussion and feedback, and also for fighting procrastination.

Open Door Policy

All faculty members, when in office and not in meetings have the doors open, welcoming anyone to come inside for discussion. If one actually does come in, they are usually open to ad-hoc discussion usually up to 20 minutes. This encourages both graduate students and other faculty to drop by and discuss their work.

In my opinion, this is a good practice that should be encouraged, but that is only possible if people refrain from being loud in corridors. At CSD, a set of rules for healthy discussion and living together hangs around all common areas, so that people are encouraged to discuss, but reminded that other should not be disturbed.

Research Organisation

Research groups are constituted by a several professors collaborating and their respective students, whereby co-supervisions are common. Each professor by himself typically has a group of 4 to 6 students, sometimes with post-doctoral researcher, with quite clearly defined research areas. Large-scale research endeavours are build through cooperation among several professors, enabling great flexibility to address novel topics and easing multi-disciplinary research. Collaborating professors and students meet regularly to keep their lines aligned and avoid misunderstandings and conflicts of interest, saving the need to solve the latter by avoiding them in the first place. In general, the flexibility, openness and strong communication of professors and

researchers in general is remarkable and potentiates the creation of novel research areas and innovation.

CSD Black Friday

Black Friday is an event that takes place once at the end of each semester, during which the performance of each PhD student in the department is discussed among all members of the department. Subsequently, each student receives feedback regarding his progress, recommendations on which missing steps towards the PhD should be accomplished next, and so on. The official feedback letter is proposed by the supervisor and reviewed by the responsible for the event before the event. In practice, the supervisor gives feedback on the progress to the group, and the discussion is mainly very short for students that are progressing well (2-5 min per student). Only students that are identified by the supervisor as showing little progress or problematic behaviour are discussed in detail. Students that are not showing enough progress receive feedback warning them that they are lagging and letting them know that they will be expelled if they do not comply with the attached requisites list.

I believe that this event is important for two reasons: it provides feedback to students on their progress, and it provides some homegenisation of the progress evaluation for different supervisors. It also offers support to junior faculty members when they come across difficult situations. It has the downturn of consuming some time (here 1,5 days) for all department members twice a year. Nevertheless, I believe that it would be positive to introduce such a mechanism in doctoral programs.

General Impressions

Seminars

During the semester there are numerous opportunities for attending presentations and seminars on a wide range of topics related to ECE and CS. Additionally, seminars organised for presentation of graduate student work within some courses are widespread, giving students the chance to practice their speaking skills and others the possibility to see practical work on specific subjects. Moreove, all faculty candidates are invited to give talks, which are disseminated within the department as seminars, and further enjoy strong participation from faculty members.

Student Awards

There is a wide range of student competitions and awards for practical projects implemented by students, whereby undergraduate and graduate students have separate awards. Students are encouraged to vote for such projects, ensuring a wide participation and acknowledgement to the participating students. Faculty members actively help to raise awareness of such competitions. An award ceremony completes the picture. This kind of events encourage students to be inventive and innovative.

Whiteboards

Whiteboards are omni-present, and they are almost always in use by groups of students and researchers to support discussion. They actually encourage discussion and deepening the toughts about ideas, getting them closer to projects. In my opinion they represent a high return investment with low budget and low maintenance costs.

Team Feeling

The CSD uses the general mailing list to spread news about successes of alumni, as well as researchers and faculty who previously worked here. Each success is seen as a success of the team and emphasised as such. Hence, even with the very wide degree of freedom of each member and de-centralised operation, there is a constant effort to build and maintain a strong team feeling. Similarly, news of recognition of CDS contributions, as a whole or of any of its members in particular, including staff, are regularly spread per email among CSD faculty and staff, with statements of appreciation for everyone's engagement.

Alumni Relationship

There is a clear involvement of alumni in funding activities and projects within CMU. Several awards are named after their sponsors, as are benches, gardens, buildings around campus. Alumni contribute financially to the well-being of the university in amounts that range from a few thousand to million dollars, and they all get credit for it.

In my opinion, the relationship between alumni and the University in Portugal needs to be strenghtened, and it should become a matter of honour to alumni to sponsor activities and events, or simply donate equipment or money to the university where they received education. For this to be possible, the relationships between professors and students should improve and become more respectful. Additionally, an effort to involve alumni in the life of the university should be undertaken, considering all alumni, and not only the ones that occupy today positions of interest for the university.