

# Carnegie Mellon | Portugal Program

## Faculty Exchange Program

### Final Report

Cristina Marta Castilho Pereira Santos Gomes

Assistant Professor

Instituto Superior Técnico, Universidade Técnica de Lisboa

Period of Visit: March 1, 2012 – May 31, 2012

Hosting department: Chemical Engineering

My stay at Carnegie Mellon University, now coming to its end, is taking place in the Process Systems Engineering (PSE) group of the Chemical Engineering department, the research center being CAPD - Center for Advanced Process Decision-making. CAPD is the largest research group in the United States in PSE, whose goals are to understand and aid complex design and operation issues faced by the industry as well as develop and advance modeling, solution methods and computer tools for PSE. The CAPD consortium has currently 22 members (chemical and petroleum industries and a number of engineering and software companies).

During this period I met with Professor Ignacio Grossmann on a weekly basis to address a research topic on scheduling of multistage batch scheduling processes. The work encompasses the development and comparison of different models for representing the problem and development of solution methods to address large-size industrial problems. In the next months I will carry on with this research, in collaboration with Professor Ignacio Grossmann, with a view to publishing a paper in an international journal. Beyond this, participating in the activities of CAPD was very enriching for me as an academic because I gained knowledge of the research work developed in the group on modeling and optimization, which bears close relationship with the one I develop in the Operations Research and Systems Engineering field. Contact with the best practices in organizing and managing a world-class research group was also a very significant experience for me.

The following is a list of the academic activities and meetings that I took part in or will take part (this includes a poster presentation and two talks):

- Participation in CAPD Annual Review Meeting and associated initiatives (March 11-14), namely in the poster session of March, 12 with the work: "Optimal scheduling in discrete parts manufacturing: A case study of the Portuguese mould industry", Marta C. Gomes, Ana Barbosa-Póvoa, Bárbara S. Virgílio.

- Seminar “How to get a PhD: A reflection and discussion of the PhD process”, Marta C. Gomes:
  - a) Group meeting of Professor Ignacio Grossmann’s PhD students and visitors, May 21.
  - b) Seminar for PhD students of the ECE department (including students of the Carnegie Mellon-Portugal program), May 25.
- I audited some of the classes of the course on “Advanced Process Systems Engineering” with Professor Ignacio Grossmann.
- CAPD short course: I audited the modules “Optimization modeling” (May 10-12) and Mixed-integer models for planning and scheduling (May 14).
- I attended several seminars of the PSE group and of the Chemical Engineering department as well as one seminar of the Robotics Institute.
- I was present in a PhD thesis proposal and a final PhD exam of two students supervised by Professor Ignacio Grossmann.
- I interviewed some graduate students to learn more about their activity as Teaching Assistants at Carnegie Mellon (Sérgio Pequito in the ECE department, Scott Kolodziej and Bruno Calfa in the PSE group of the Chem. Eng. department).
- I attended the Commencement Cerimonies (Graduation) in the weekend of May 19-20, a landmark moment in what concerns Carnegie Mellon values and culture.

Regarding the Carnegie Mellon - Portugal Program, I took part in all events announced during my stay:

- PhD students research presentations, March 20.
- End of the semester celebration, April 27.
- Meeting with the Board of Directors, May 15.

The Faculty Exchange Program aims at providing the experience of cultural immersion in a top United States university for Portuguese academics. Having pursued my PhD studies in Portugal, this experience of a novel and very stimulating academic environment was invaluable for me.

Of the many features observed that make the Carnegie Mellon environment unique the ones that impressed me the most are: the culture of communication (the huge number of talks always taking place, not only by academics but also by speakers from the industry, government agencies and other organizations; the constant providing of information on the activities developed and the achievements of students and staff, information provided online but also in paper format); the emphasis placed in development of leadership qualities; the mutually beneficial relationship between the PSE group and its industrial partners; the excellence in teaching (with a university center dedicated to improving it) and the

integration of graduate students in the teaching process; the multicultural environment and the vibrant student organizations of many kinds; the alumni lifelong relationship with the university and its nurturing.

Undoubtly this experience will have a positive effect in my teaching and research practices at IST in the future. Finally I expect that some of the many contacts I made here may lead to scientific collaborations in the future, besides the one already started with Professor Ignacio Grossmann.

Pittsburgh, May 22, 2012