

Report of the CMU Faculty Exchange Program of:

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Host: Prof. Jelena Kovačević jelenak@cmu.edu (<http://jelena.ece.cmu.edu/index.html>)

Period: Pedro Quelhas (PQ) arrived on January 11th to CMU and left on April 2nd 2011.

Planned objectives:

- **Research:** Collaboration with host Prof. Jelena Kovačević (JK) on the use of multi-resolution approaches for image based critical diagnosis.
- **Teaching:** Collaboration in teaching activities in the scope of class 42-540 Introduction to Biomedical Signal Processing.

Summary of performed activities:

- **Teaching:** PQ prepared and taught a class on MatLab programming for Biomedical Engineering, a class on segmentation and provided support to students on a weekly basis for the preparation of the final project in class 42-540. Additionally, PQ co-supervised the midterm exam.
- As a result of the teaching activities within the scope of class 42-540, the implementation of similar subject at FEUP is being considered.
- **Research:** Within all available multi-resolution approaches for data analysis, the main research focus was on multi-scale local analysis tools (local interest features) coupled with the use of latent semantic analysis methods for data mining and support vector machines for classification.
- Current results show that by using latent semantic analysis for data mining classification accuracy improves; this may prove critical for real-world applications in image-based diagnosis.
- Additional collaboration with Gustavo Rohde (GR), Assistant Professor at the Bioluminescence lab lead to the preparation of a workshop proposal on advanced modeling of cell cultures for Bioluminescence knowledge mining. While ICCV 2011 committee refused the proposal, a resubmission is being considered.
- PQ presented an invited talk on his past research at the Bioluminescence day at CMU with the talk: "Gradient Convergence Filters for Cell Detection in Microscopy Images".
- Future collaborations are being considered between the Bioluminescence Lab at CMU (JK+GR) and the INEB Bioluminescence lab at FEUP (PQ). Both in the fields of methods for biology/cell image analysis and critical methods for image based diagnosis there is a good match between the two Bioluminescence labs.

In a more personal and subjective summary, the exchange provided PQ with new points of view on teaching and research. This provided the discussion of new methods with researcher in the same area. Overall the exchange created many new avenues of research and possible future collaborations.