PhD Position

Data Mining and Information Visualization for Facilitating the Medical Analysis of Patient Movement

Keywords

Big And Heterogeneous Data, Data Mining, Information Visualization, Visual Analytics, Movement Analysis, Medical Analysis

Supervisors

• Jérôme Azé, Professor at LIRMM, University Montpellier, jerome.aze@lirmm.fr
  His research focuses on Data Mining\textsuperscript{1,2}.
• Arnaud Sallaberry, Assistant Professor at LIRMM, University Paul Valéry Montpellier, arnaud.sallaberry@lirmm.fr
  His research focuses on Information Visualization\textsuperscript{3,4} and Visual Analytics\textsuperscript{5}.

Scientific domain

Visual analytics is the science of analytical reasoning facilitated by interactive visual interfaces. More precisely, "visual analytics combines automated analysis techniques with interactive visualizations for effective understanding, reasoning and decision making on the basis of very large and complex datasets"\textsuperscript{6}. Automated analysis techniques include statistics, mathematics, knowledge representation, management, and discovery technologies. In this project, we focus on combining data mining techniques with information visualization.

Context

Recent technologies such as Kinect, Wiiboard, Tablet, Joypad, eye tracking devices, etc., enable to record patient's behavior. For medicine, analyzing this behavior is a key to establish efficient diagnostics and better design recovery good practices. To perform a strong diagnostic, data generated by recording devices (body movements, eye movements, etc.) has to be analyzed taking account of the patient background (health problem, personal information, etc.). In this context, therapists are confronted to large amount of heterogeneous data and their analyses require automatic methods. The difficulty lies not in generating but rather in sifting through this mass raw of data in order to discover patterns. This thesis focuses on designing data mining and information visualization techniques to create interfaces helping healthcare professionals to understand the data.

Subject

A number of issues associated with the design of such interfaces will be examined in the context of this thesis in order to provide therapists with the tools necessary to perform their analyses (see for example the recent promising work of Bernard et al.¹). It is of utmost importance that these interfaces be as simple and intuitive as possible, as a misinterpretation of the data due to imperfect interface design could hamper the rehabilitation process. It is for this reason that an in-depth study of knowledge discovery methods must be undertaken by experts in data mining, information visualization and human-computer interaction, in close collaboration with therapists.

Partners

We will work in close collaboration with NaturalPad, a company currently developing a platform for therapeutic serious games, and M2H, a laboratory focusing on the study of movements for health. These organisms will be in charge of collecting the data. They will also help us to understand domain experts needs and to test our results.

How to Apply

An ideal candidate must have a Master's degree in computer science. Good programming skills and fluency in spoken and written English are required. Knowledge in Data Mining and/or Information Visualization, or in related fields is highly recommended.

Interested candidates are requested to send an application by e-mail to Dr. Arnaud Sallaberry, (arnaud.sallaberry@lirmm.fr) and Pr. Jérôme Azé (jerome.aze@lirmm.fr) with the subject field: [PhD position] Visual Analytics'. The application should consist of a motivation letter, a curriculum vitae including major achievements, and two or more recommendation letters.

Application deadline

May 1st, 2015