Abstract:
In today’s fast paced world, people are facing serious challenges concerning their healthy lifestyle on a daily basis. These challenges are for instance: how to control one’s emotions in a demanding work environment, how to maintain or achieve a good mood, or more in general how to maintain or achieve an active, healthy lifestyle or achieving any goal related to general well-being. Mental processes of a human play a pivotal role in these challenges concerning a healthy lifestyle. In other words, the mind is behind all such processes and behavior, so for effective support the role of the mind should be an important concern. More specifically, to develop and propose a technological solution, for example, in terms of virtual coaching, a thorough comprehension of a human’s mental processes, physiological states, and physical and social environment is essential. In this thesis such mental processes are studied based on available findings and theories on the related cognitive, affective, and social phenomena. A particular emphasis is on emotions, emotions regulation at the affective level, beliefs and intentions at the cognitive level and emotion contagion, social support and comparison at the social level.

Over the years in the fields of computational modeling and AI, it has been realized that emotions facilitate humans in various tasks, for example, decision making and that they also serve social purposes. For example, when emotional responses compete with important goals or with socially more appropriate responses, often regulation of them takes place. Emotions and behaviors also have a contagion effect. In a social environment they spread from one person to another. Social networks on the one hand are the structure through which the contagion takes place, but on the other hand provide a way to help a person in terms of social support and comparison. The work presented in this thesis contributes on two fronts. The first is that several models of mental processes are studied and developed which can contribute towards the field of computational cognitive modeling. The other one is that a prototype of a virtual coaching system is presented which employs a computational model.

In the work reported in this dissertation, the ultimate aim was to study how to provide effective support by an intelligent system or virtual coach. The question of how to achieve this objective is answered by applying a two-step process: first it is explored how computational models can be developed and analyzed, and can be used to simulate, predict and reason about various human mental states. The second step is to explore how such models can be applied to provide support in practice and can be evaluated in intervention studies. A prototype of a coaching support system is proposed which employs mental processes, social phenomena, and context monitoring to stimulate physical activity behavior.