Summary

It has been shown that social interactions can affect a person's behaviours, perceptions and emotions in many ways, from contagion of emotions to obesity spread. The quantification of the spread of behaviours, perceptions and emotions is a task that requires an understanding of the social contagion phenomenon, as well as good methods for data collection. Social contagion stands for the effect caused by our relationships, on our own identity, character, decisions, opinions, positioning, emotions, etc. It is a process that happens unconsciously and naturally throughout our entire lives.

Fortunately, the data provided by the new web technologies recently created, combined with the advances in devices such as smartphones, physical activity trackers and other sensors, are a good source for investigation into how people affect each other, and how their connections are shaping their behaviours, perceptions and emotions. On the other hand, understanding human behaviour in order to model and predict future states can be considered a very complex task, as it requires a multidisciplinary approach and very strong methods to validate the whole process.

This thesis aims to understand, model and predict different sorts of behaviours, perceptions and emotions through cognitive models and social contagion in social networks. The models developed here can be applied broadly, for example from the promotion of a healthy lifestyle to the reactions to web media posts.

We firstly explore a social contagion model that accounts for the spread of behaviours, perceptions and emotions in social networks. The model uses differential equations and a temporal-causal approach to describe the different scenarios studied. The model is then used for validation attempts in different data sets. The data sets used here contain physical activity behaviour information of different groups of people and the social network of the individuals participating in the experiments. Besides validating the model, we also try to simulate possible interventions and verify what are the side effects of changing the network states. We also use statistical analyses to explain changes in the behaviour of different groups of people, i.e. connected and non connected individuals.

Many tasks were necessary to create a realistic representation of the social contagion effect in the data collected. We used parameter tuning in many cases to define the traits of the individuals in the network, or to adjust speed factors, thresholds and other characteristics required for the chosen models. In addition, social network analyses were performed in a few studies to understand the dynamics of the social networks where the spread was happening.

After exploring the social contagion model for physical activity behaviour, we show that it is possible to extend the mathematical model to other scenarios where the social contagion phenomenon is relevant. The first context is the spread of messages in disaster situations. This scenario is built on a context of how people receive a notice about some ongoing disaster, and how the sender and the means affect the credibility of the message transmitted. The second context is in a web media (Twitter) interaction with political posts, and how the posts affect the positioning of a person.

This thesis provides a significant contribution to the state of the art on social contagion modeling and on behavioural informatics studies. It also presents methods useful to tackle the challenges of data collection, analysis and fine tuning of models for the spread of behaviour in social networks. Therefore, we believe that many aspects of it can be derived from this work in potential applications aiming to improve the lifestyle of different groups of people by understanding, modeling and the simulation of temporal-causal network models.