For an autonomous robot or software agent to participate in the social life of humans, it must have a way to perform a calculus of social behavior. Such a calculus must have explanatory power (it must provide a coherent theory for why the humans act the way they do), and predictive power (it must provide some plausible events from the predicted future actions of the humans).

This dissertation describes a series of contributions that would allow agents observing or interacting with humans to perform a calculus of social behavior taking into account cultural conventions and socially acceptable behavior models. We discuss the formal components of the model: culture-sanctioned social metrics (CSSMs), concrete beliefs (CBs) and action impact functions. Through a detailed case study of a crooked seller who relies on the manipulation of public perception, we show that the model explains how the exploitation of social conventions allows the seller to finalize transactions, despite the fact that the clients know that they are being cheated. In a separate study, we show that how the crooked seller can find an optimal strategy with the use of reinforcement learning.

We extend the CSSM model for modeling the propagation of public perception across multiple social interactions. We model the evolution of the public perception both over a single interaction and during a series of interactions over an extended period of time. An important aspect for modeling the public perception is its propagation - how the propagation is affected by the spatio-temporal context of the interaction and how does the short-term and long-term memory of humans affect the overall public perception.

We validated the CSSM model through a user study in which participants cognizant with the modeled culture had to evaluate the impact on the social values. The scenarios used in the experiments modeled emotionally charged social situations in a cross-cultural setting and with the presence of a robot. The scenarios model conflicts of cross-cultural communication as well as ethical, social and financial choices. This study allowed us to study whether people sharing the same culture evaluate CSSMs at the same way (the inter-cultural uniformity conjecture). By presenting a wide range of possible metrics, the study also allowed us to determine whether any given metric can be considered a CSSM in a given culture or not.