**Ph.D. in Information Technology**
**Thesis Defense**

**July 6, 2022**
**at 14:00**
**online by Teams**

**Matteo CASTIGLIONI** – XXXIV Cycle

## Reducing the Gap Between Theory and Applications in Algorithmic Bayesian Persuasion

Supervisor: Prof. **Nicola Gatti**

**Abstract:**

This thesis focuses on the following question: is it possible to influence the behavior of self-interested agents through the strategic provision of information?
This sweet talk is ubiquitous among all sorts of economics and non-economics activities.
In this thesis, we model these multi-agent systems as games between an informed sender and one or multiple receivers.
We study the computational problem faced by an informed sender that wants to use his information advantage to influence rational receivers with the partial disclosure of information.
In particular, the sender faces an information structure design problem that amounts to deciding who gets to know what.
Bayesian persuasion provides a formal framework to model these settings as asymmetric-information games.
In recent years, much attention has been given to Bayesian persuasion in the economics and artificial intelligence communities due also to the applicability of this framework to a large class of scenarios like online advertising, voting, traffic routing, recommendation systems, security, and product marketing.
However, there is still a large gap between the theoretical study of information in games and its applications in real-world scenarios.
This thesis contributes to close this gap along two directions.
First, we study the persuasion problem in real-world scenarios, focusing on voting, routing, and auctions. While the Bayesian persuasion framework can be applied to all these settings, the algorithmic problem of designing optimal information disclose polices introduces computational challenges related to the specific problem under study. Our goal is to settle the complexity of computing optimal sender's strategies, showing when an optimal strategy can be implemented efficiently.
Then, we relax stringent assumptions that limit the applicability of the Bayesian persuasion framework in practice.
In particular, the classical model assumes that the sender has perfect knowledge of the receiver's utility.

We remove this assumption initiating the study of an online version of the persuasion problem. This is the first step in designing adaptive information disclosure policies that deal with the uncertainty intrinsic in all real-world applications.

**PhD Committee**

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