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STATEMENT OF RESEARCH

Symbolic systems, whether natural or artificial, serve the purpose of creating a repository of information, using objects and events to represent other objects and events forming discrete mental or machine representations; each of them allows us to represent the world to ourselves and communicate information about the world to others. Today, we are in the middle of an information revolution. The computer that was originally built for computing numbers has evolved into a device for computing with all types of information, words, numbers, graphics, and sounds. Thus, with the commoditization of computers and invention of the Internet, the computer has turned into a communication device, transmitting information between people. It has become the new medium for signaling. We live in a data age, where every action is recorded, transmitted, replicated, and shapes who we are. As information travels faster, the world seems smaller, and our understanding of the external world and self is evolving. The volume of data stored electronically is rapidly increasing in zettabytes, the digital universe is exploding, and our traditional notions of identity, reality, truth, information, knowledge, and communication are changing. We now constantly exchange information in the presence of an inevitable and often unnoticed audience.

My research concerns the use of formal methods in artificial intelligence, specifically the application of logic and game theory to modeling knowledge representations and information transmission in multi-agent communication systems. In my Ph.D. thesis, I have mostly focused on problems concerning information exchange in two-player signaling games in the presence of an audience, presenting a formal framework, and incorporating key elements in communication such as knowledge states, relationships and trust, and ethics. I have supplemented the traditional model of signaling games with the following innovations: I have considered the effect of the relationships, whether close or distant, among players. I have considered the role that ethical considerations may play in communication. I have shown that communication requires awareness of self knowledge and knowledge of others. Finally, in my most significant innovation, I have introduced a third player in a traditional two-player signaling game called an audience. I have shown how the audience's presence may affect the sender's signal and/or the receiver's response.

The study of communication being an interdisciplinary field, my research is at the interface of logical AI with linguistics, psychology, philosophy, political science, logic and mathematics.

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