

**MASTER'S THESIS (Spring 2010)****TOPIC:** *A Multi-State Bayesian Network for Shill Verification in Online Auctions***PRESENTOR:** Ankit Goel**ADVISOR:** Dr. Haiping Xu**DATE & TIME:** Friday, May 28, 2010 at 1:00PM**LOCATION:** Dion 311**COMMITTEE MEMBERS:** Dr. Ramprasad Balasubramanian and Dr. Jan Bergandy**ABSTRACT**

Online auction systems have dramatically changed the way people do business by providing a global stage for buyers and sellers to get together for the purpose of trade. People from different places can use the Internet to trade goods they might not easily have available locally. Auction companies like eBay have the world's fastest growing database of users today. But with this broad sense of virtual market, it also comes the biggest associated problem, namely the trust. Trust between buyers and sellers are very hard to build and monitor. Shill bidding stands at the top of the trust issues for online auctions, and is also the most elusive one due to a lack of information on both parties in lieu of privacy. Shill bidding is the act of intentionally driving up the price of an item in an auction, so as to maximize the seller's gains. In this thesis, we introduce a novel approach to verifying shill bidders in online auctions using a multi-state Bayesian network. A Bayesian network can handle incomplete user information by considering conditional dependencies between different variables, and provide a reasonable probability for a bidder being a shill bidder. We collected auction data from eBay for calculating the conditional probability tables of the Bayesian network, and constructed both a bi-state and multi-state Bayesian network. We present formulas for calculating the probabilities of being a shill bidder and a normal bidder. To illustrate the effectiveness of our approach, we use a case study for shill verification and demonstrate that a multi-state Bayesian network performs better than a bi-state Bayesian network. In addition, we developed a Bayesian network toolkit that is capable of performing the related calculations and operations, and automatically gathering the needed data from eBay.