



## NSF Award Abstract - #0442154

### Surveillance, Analysis and Modeling of Chatroom Communities

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### Abstract

The aim of this proposal is to develop new techniques for information gathering, analysis and modeling of chatroom communications. First, the investigator and his colleague consider graph-less models to capture the structure of chatroom communications. In particular, the investigators study how to develop a multidimensional singular value decomposition approach for component analysis of chatroom communication data. Second, the investigators develop new visualisation techniques to display the structural information found in the first step. Internet chatrooms provide an interactive and public forum of communication for participants with diverse objectives. Two properties of chatrooms make them particularly vulnerable for exploitation by malicious parties. First, the real identities of the participants are decoupled from their chatroom nicknames. Second, multiple threads of communication can co-exist concurrently. Although human-monitoring of each chatroom to determine "who-is-chatting-with-whom" is possible, it is very time consuming, hence not

scalable. Thus, it is very easy to conceal malicious behavior in Internet chatrooms and use them for covert communications (e.g., adversary using a teenager chatroom to plan a terrorist act). This project aims at a fully automated surveillance system for data collection and analysis in Internet chatrooms to discover hidden groups. The surveillance is done in the form of statistical profiling for a particular chatter, a group of chatters, or for the entire chatroom. The statistical profiles are used to devise algorithms to determine chatters and their partners and answer to queries including (i) "in which chatrooms topic A is discussed", (ii) "who is chatting about topic A in chatroom X", (iii) "is topic A is a hot one in chatroom X" etc. Thus, the proposed system could aid the intelligence community to discover hidden communities and communication patterns in chatrooms without human intervention. This award is supported jointly by the NSF and the Intelligence Community. The Approaches to Terrorism program in the Directorate for Mathematics and Physical Sciences supports new concepts in basic research and workforce development with the potential to contribute to national security.

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