

### **Big Data Analytics (Ramot)**

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### **Data Mining and Machine Learning; User-Oriented Security: A Multi-Disciplinary Approach**

The proposed research is an interdisciplinary project, aiming to develop an adaptive cyber-security system that is personally-adjusted to characteristics of a human user. The project is based on the rapidly developing literature on "usable security" which emerged from the realization that system security often depends on user behavior, and that many of the more severe security breaches occur because of users' actions, sometime erroneous ones. The project combines four different research approaches: Axiomatic modeling, Machine Learning, Optimization and Simulations. This group will develop models of optimal user behavior as a function of the system and the environmental properties. These models will provide indications of optimal system configurations for which user behavior will maintain high levels of security.

Behavioral research on security-related behaviors. This group will conduct a series of experiments to study users' security related behaviors in a laboratory setting with a specially developed experimental system. The aim of this research is to develop a predictive model of user behavior, based on empirical data.

Machine learning and categorization. This group will use machine learning techniques and statistical methods to identify and model user behavior including anomalies and to categorize users into classes according to their security-related behavior.

Development of security-related architecture. This group will develop architecture for system security that considers characteristics of individual users' behavior and adjusts the security settings to the user type and the usage scenarios.

These four groups will closely interact with each other. The output of the axiomatic models will serve as the basis to the behavioral research; the results of the behavioral experiments will be used as inputs for the machine learning and the categorization, and the design of the architecture will drive the development of the models and the design of the behavioral experiments.

The research should eventually lead to the development of a general and adaptive user-oriented security solution, using novel security architecture, based on both axiomatic and behavioral models. The new architecture will be compared to existing architectures and the possible advantages and shortcomings will be identified.

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