1139-93-656   **Juntao Chen*** (`jc6412@nyu.edu`) and **Quanyan Zhu** (`qz494@nyu.edu`). *Dynamic Cyber Risk Management with Uncertainty under Asymmetric Information.* Preliminary report.

With the massive connections between different agents in the Internet network, cyber threats become ubiquitous and raise critical concerns for resource owners, e.g., data storage and cloud service providers. To address this issue, the owners can outsource their cyber risk management tasks to the professional security entities. In this paper, we use a principal-agent framework to capture the service relationships between two parties, i.e., the resource owner and the cyber risk manager. Specifically, we consider a dynamic risk management problem with uncertainty where the owner only has the observations of cyber risk outcome rather than the effort that the manager spends on protecting the resources. Under this asymmetric information, the owner aims to minimize the cyber risks by designing a dynamic contract specifying the payment flows and preferred efforts by taking the manager's rational behaviour into account. We obtain the optimal contracts by reformulating the problem into a stochastic optimal control program which can be solved using dynamic programming. We further investigate some special cases where the form of solutions can be characterized. Finally, we discuss some features of the obtained optimal dynamic contracts. (Received February 20, 2018)