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A Cost-Benefit Analysis of Cyber Defense Improvements.

In the past few years, several major cybersecurity attacks on supervisory control and data acquisition (SCADA) devices have been reported. Such attacks can result in damages to the economy and have an impact on society. In 2010, Ten et al. presented an attack tree mode of impact analysis. We have implemented the attack tree structure developed by Ten, in concert with typical financial loss data to implement Monte Carlo techniques to generate a new cost-benefit analysis of various security improvement scenarios. Time to attack is modeled as an exponentially distributed random variable obtained via maximum likelihood analysis; financial losses are modeled using regression to generalized logistic functions via gradient descent. Under these conditions, hypothetical future losses are simulated for a variety of intrusion scenarios and improvement schemes. Our model incorporates budgetary constraints in an effort to advise the prioritization of system improvements, and we compare the results of genetic and differential evolution algorithms in determining an optimal budget allocation. (Received September 20, 2018)