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Long-term Failure Prediction based on an ARP Model of Global Risk Network[1] XIN LIN, ALAA MOUSSAWI, BOLESLAW SZYMANSKI , GYORGY KORNISS, Rensselaer Polytechnic Institute — Risks that threaten modern societies form an intricately interconnected network. Hence, it is important to understand how risk materializations in distinct domains influence each other. In the paper [2], we study the global risks network defined by World Economic Forum experts in the form of Stochastic Block Model. We model risks as Alternating Renewal Processes with variable intensities driven by hidden values of exogenous and endogenous failure probabilities. Based on the expert assessments and historical status of each risk, we use Maximum Likelihood Evaluation to find the optimal model parameters and demonstrate that the model considering network effects significantly outperforms the others. In the talk, we discuss how the model can be used to provide quantitative means for measuring interdependencies and materialization of risks in the network. We also present recent results of long-term predictions in the form of predicated distributions of materializations over various time periods. Finally we show how the simulation of ARPs enables us to probe limits of the predictability of the system parameters from historical data and ability to recover hidden variable.

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[2]Szymanski et al., Sci. Rep. 5:10998 (2015)

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