

Modeling and Inference for Networks with Repairable Redundant Subsystems

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We consider the problem of modeling the reliability of a network of subsystems where each subsystem has redundancy and is repairable. The motivation for this work is large-scale telecommunications networks.

The time to failure of the subsystem hardware is modeled by an appropriate Markov process, hence is a phase-type distribution. The network structure defines a failure rule in terms of the states of the subsystems, allowing computation by Monte Carlo simulation of the time to failure distribution of the network. This is illustrated by some simple examples. When data on the reliability of the subsystems are available, this can be incorporated via a Bayesian inference approach to modify the prediction of network reliability.

We discuss how inference for such a network may be implemented, and discuss extensions the model to include traffic load and the effects of software reliability.