Approximating System Reliability Using Information Derived from Support Vector Machine Models

Yuan Fuqing[1], Uday Kumar[1], Claudio M. Rocco S.[2] and Krishna B. Misra[3]

[1]*Division of Operation and Maintenance Engineering,*
Luleå University of Technology, SE-971 87 Luleå, Sweden
Email: yuan.fuqing@ltu.se / Uday.Kumar@ltu.se
[2] *Facultad de Ingeniería, Universidad Central de Venezuela*
Caracas, Venezuela
E-mail: croccoucv@gmail.com
[3]*RAMS Consultants, 71 Vrindaban Vihar, Ajmer Road,*
Jaipur-302019, Rajasthan, India
Email: kbmisra@gmail.com

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Support Vector Machine (SVM) is a data mining technique that has been successfully used in classification problems, starting from a known training data set (TDS). In systems modeled as networks, SVM has been used to classify the state of a network as failed or operating and jointly combined in a Monte Carlo sampling approach to approximate the network reliability. The analytical expression of the binary function (failed/operating) produced by SVM is difficult to be understood, since it generally involves the evaluation of non-linear operators, which consider a subset of the TDS, called Support Vectors (SV) and sampled system states. In this paper a different approach is proposed to assess system reliability. Information about path and cut sets is obtained directly from SV, without considering the analytical expression of the binary function produced by SVM. From here the system reliability is approximated directly. Several examples illustrate the approach.