## List of Figures

1.1 Failure prediction based on the occurrence of errors (A, B, C)  
1.2 Illustration of prediction methodology  
1.3 Machine learning approach  
1.4 Dependencies among components  
1.5 Mapping of Errors, faults and failures  
1.6 Faults can become visible at four stages  
1.7 Distinction between root cause analysis and failure prediction  
1.8 Permanent, intermittent and transient faults  
1.9 Fault model  
1.10 Service Failure Modes  
1.11 Phases of proposed methodology  
2.1 A taxonomy for System trend analysis approaches  
2.2 Failure prediction by Function approximation  
2.3 Failure prediction by classification  
2.4 Failure prediction using time series analysis  
2.5 Failure prediction using signal processing  
2.6 Failure prediction based on the frequency of occurrence  
2.7 Failure prediction by recognition of failure-prone error patterns  
3.1 Gaines Optimized HMM  
3.2 Hidden markov Model  
3.3 Forward Procedure  
3.4 Backward Procedure  
3.5 Two State automata  
3.6 Three State automata  
3.7 Four state automata  
3.8 Five state automata
3.9 Six state automata
3.10 Seven state automata
3.11 Eight state automata
3.12 Nine state automata
3.13 Reasonable Measure
4.1 Training Gaines Optimized HMM
4.2 4 State HMM (1)
4.3 4 State HMM (11)
4.4 4 State HMM (14)
4.5 4 State HMM (17)
4.6 4 State HMM (30)
4.7 4 State HMM (45)
4.8 4 State HMMs Probability
4.9 A trellis visualizing the computation of \( \xi_i(j) \)
5.1 Reasonable Measure
5.2 Minimum Message Length
6.1 Precision of Gaines Optimized HMM and Random predictor
6.2 Recall of Gaines Optimized HMM and Random predictor
6.3 FPR of Gaines Optimized HMM and Random predictor
6.4 F-Measure of Gaines Optimized HMM and Random predictor
6.5 FNR of Gaines Optimized HMM and Random predictor
6.6 FPER of Gaines Optimized HMM and Random predictor