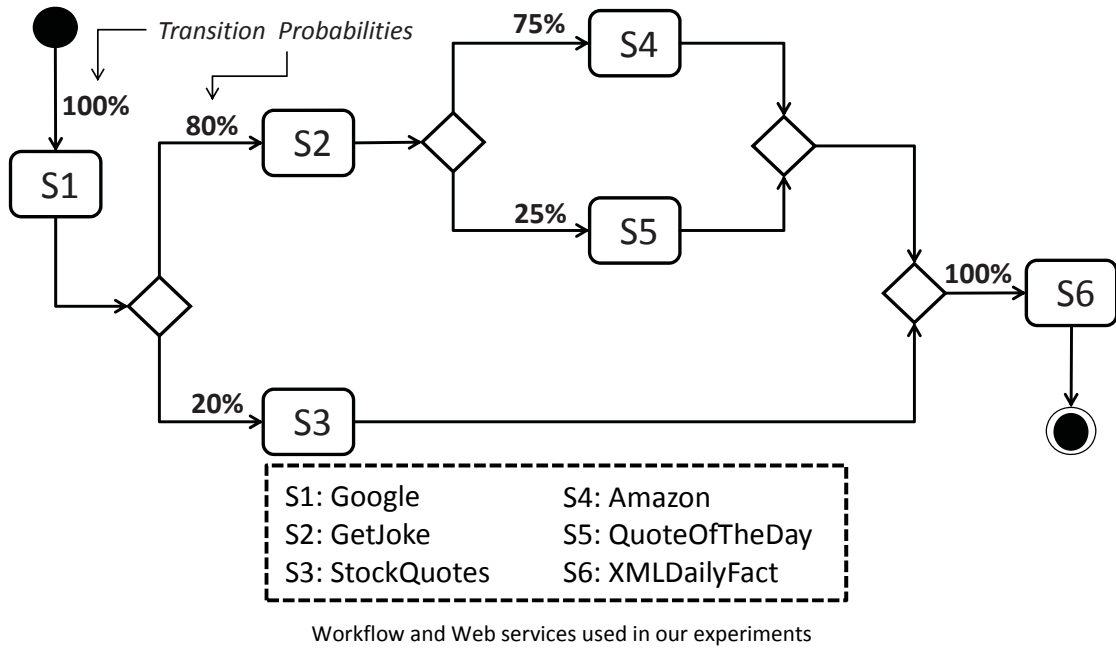


Experimental Setup and Results for “Accurate Proactive Adaptation of Service-oriented Systems”

This document includes additional information for the experimental setup and results.

1. Experimental Setup:

Our experiments are based on the following workflow:



We simulate the execution of this workflow with the third-party Web services provided by Cavallo et al¹. The workflow is given in a Markov-like representation, i.e., in addition to the service invocations and control constructs we have added transition probabilities. Those have been used such that we can get the wide range of usage rates by simulating 100, 200 and 400 executions of this workflow over the 2000 data points from the data set. Based on those transition probabilities, the simulation determines the actual execution path of the workflow. At each branch in the workflow, a random variable is used to choose one of the possible paths. As an example, the branch from Google to StockQuotes is chosen with a probability of 20%. Using 100 executions of the workflow we obtain the following usage rates: 0.01 for StockQuotes and QuoteOfTheDay, 0.03 for Amazon, 0.04 for GetJoke, and 0.05 for Google and XMLDailyFact. The remaining usage rates covered in our experiments are computed similarly using 200 and 400

¹ B. Cavallo, M. Di Penta, and G. Canfora, “An empirical comparison of methods to support qos-aware service selection,” in Proc. 2nd Int’l Workshop on Principles of Engineering Service-Oriented Systems (PESOS’10), 2010, pp. 64–70.

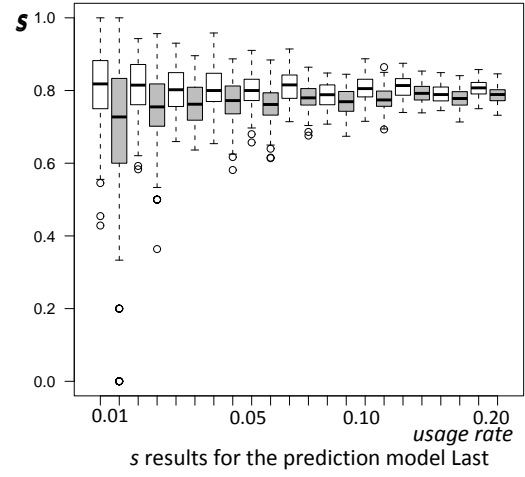
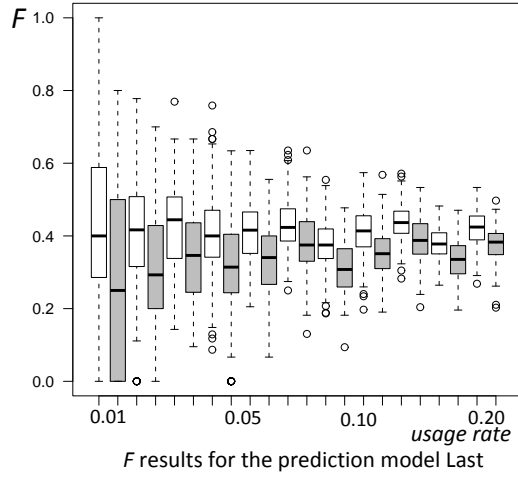
executions of the workflow. Altogether, we cover the following range of usage rates: 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.08, 0.10, 0.12, 0.16, and 0.20.

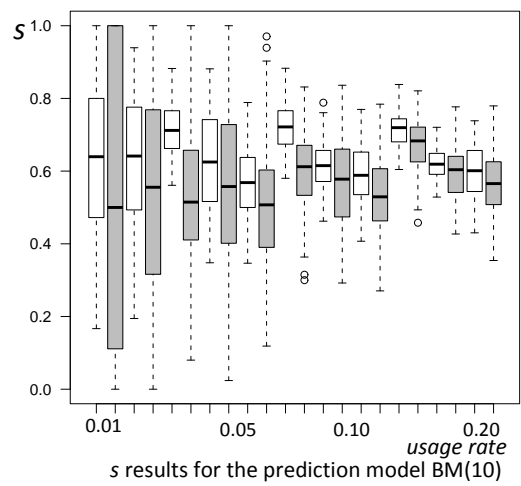
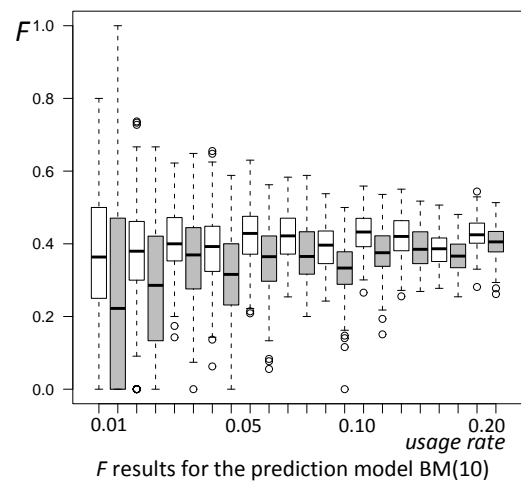
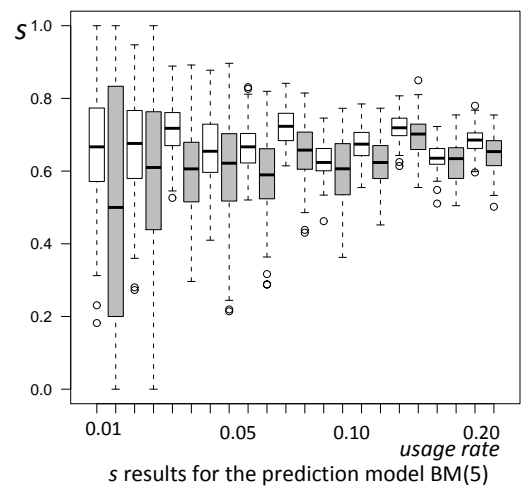
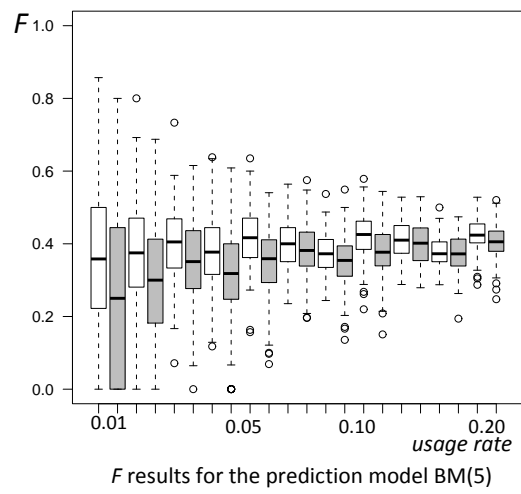
2. Execution and Results:

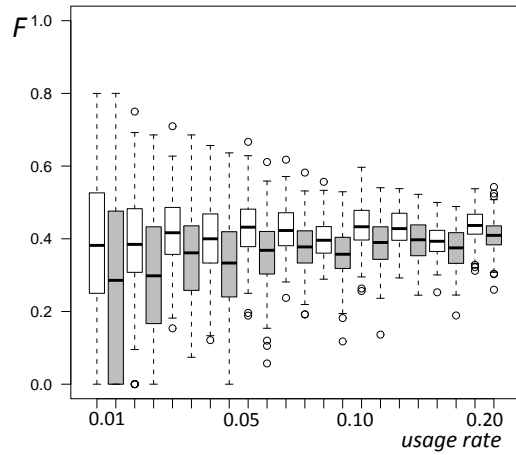
In this section we present the comprehensive experimental results we have computed to investigate the impact of different factors.

Influence of prediction models

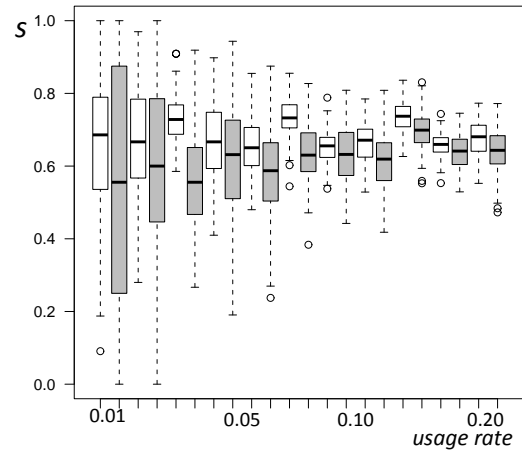
The below figures show the accuracy gains in terms of the F-measure (F) and specificity (s) for the different prediction models we have used in our experiments. The following figures show the box plots for both F and s results. White boxes represent results of predication using monitoring and online testing ($M\&OT$) and the grey boxes represent results of predication using monitoring only (M).







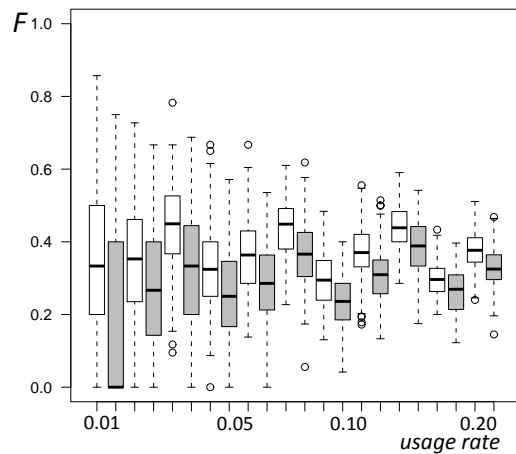
F results for the prediction model SEM



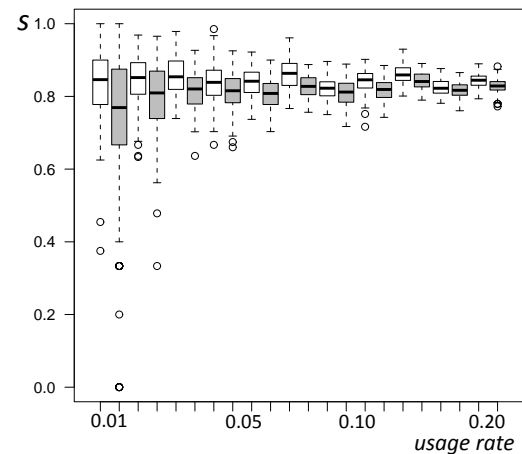
s results for the prediction model SEM

Influence of failure rate

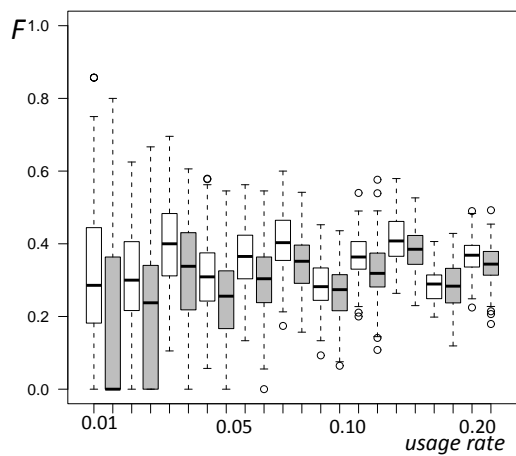
The below figures show the accuracy gains in terms of the F-measure (F) and specificity (s) for the different prediction models using different failure rates (25%, 20% and 15%) we have used in our experiments. The following figures show the box plots for both F and s results. White boxes represent results of predication using monitoring and online testing ($M\&OT$) and the grey boxes represent results of predication using monitoring only (M). Please note that we have already presented the boxplots for the results using 25% failure rate above.



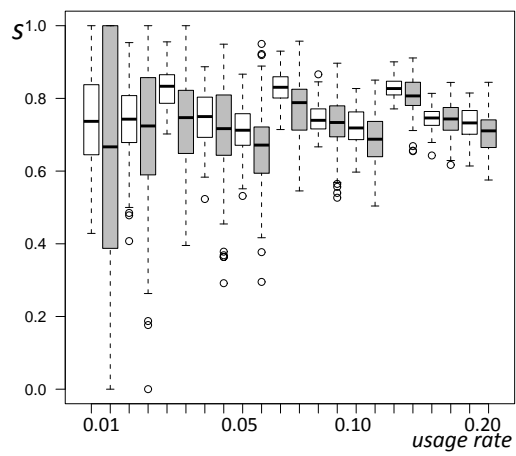
F results for the prediction model Last using 20% failure rate and 0.30 test rate



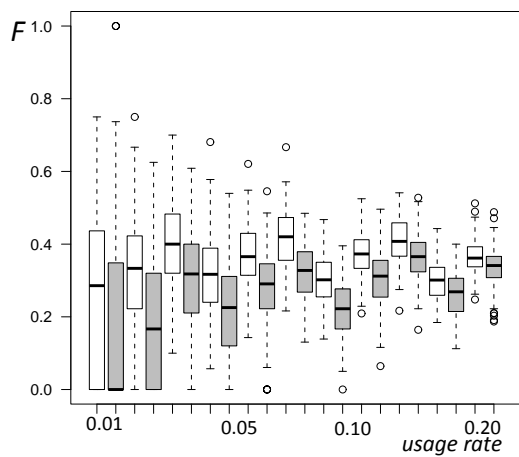
s results for the prediction model Last using 20% failure rate and 0.30 test rate



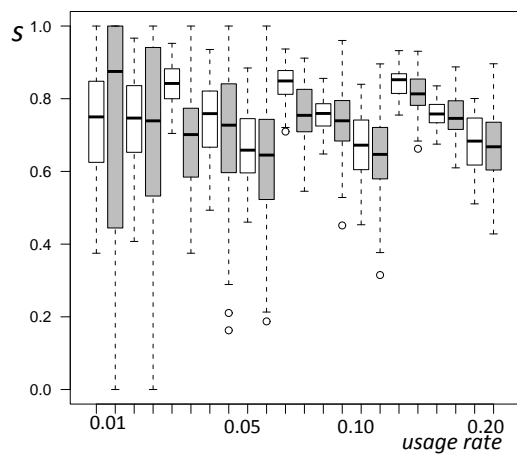
F results for the prediction model BM(5) using 20% failure rate and 0.30 test rate



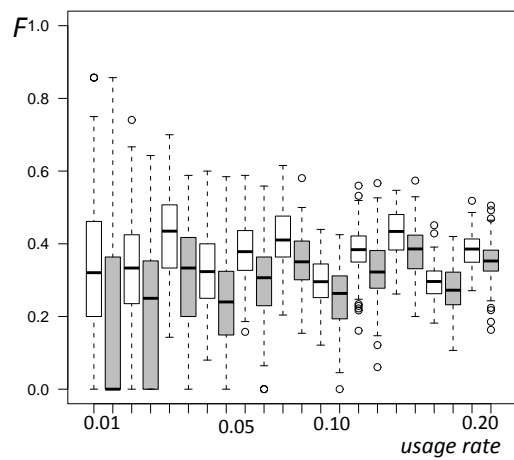
s results for the prediction model BM(5) using 20% failure rate and 0.30 test rate



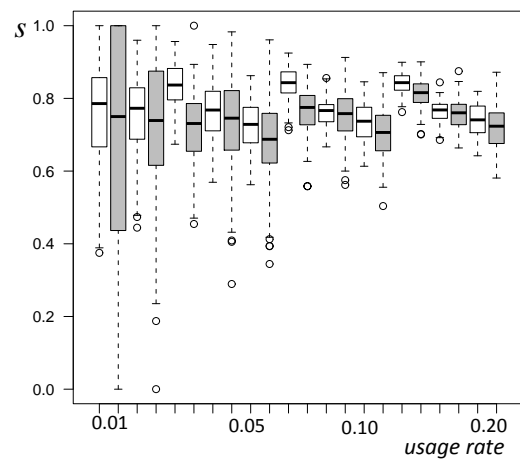
F results for the prediction model BM(10) using 20% failure rate and 0.30 test rate



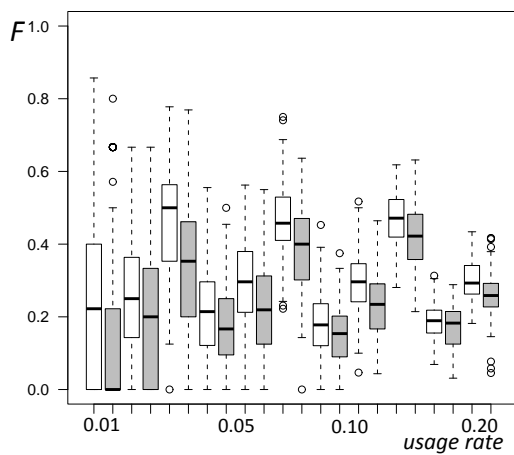
s results for the BM(10) prediction model using 20% failure rate and 0.30 test rate



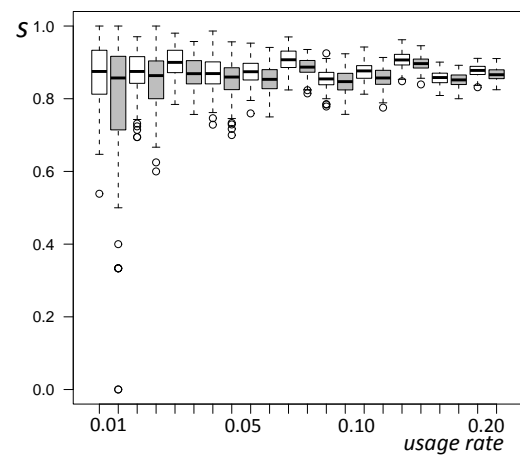
F results for the prediction model SEM using
20% failure rate and 0.30 test rate



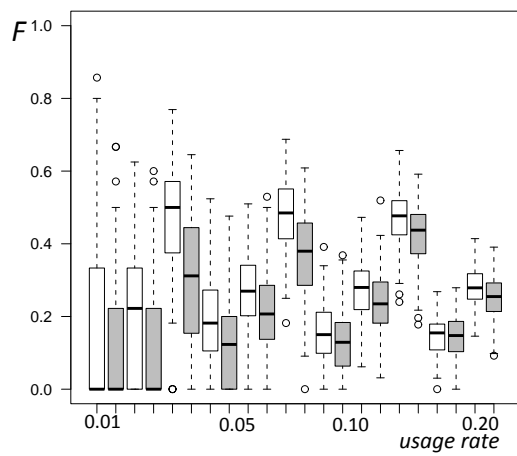
s results for the prediction model SEM using
20% failure rate and 0.30 test rate



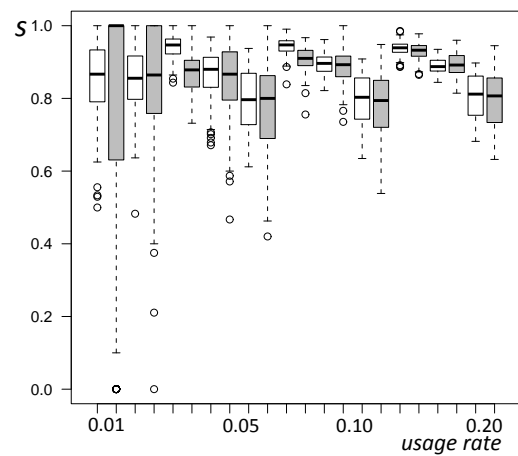
F results for the prediction model Last using
15% failure rate and 0.30 test rate



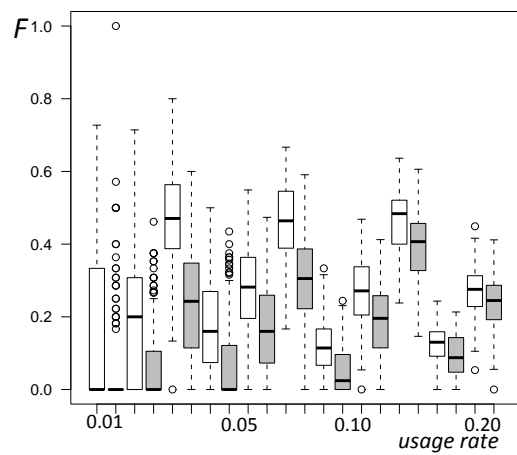
s results for the prediction model Last using
15% failure rate and 0.30 test rate



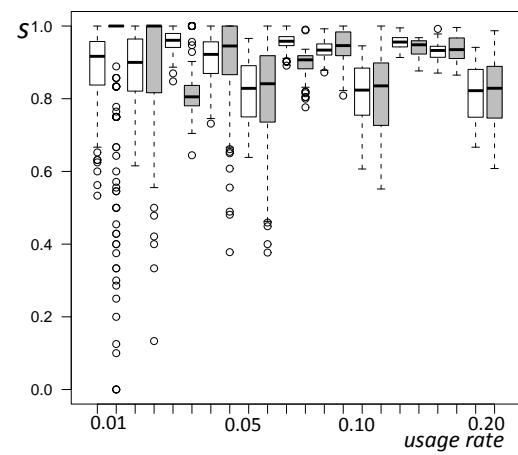
F results for the prediction model BM(5) using 15% failure rate and 0.30 test rate



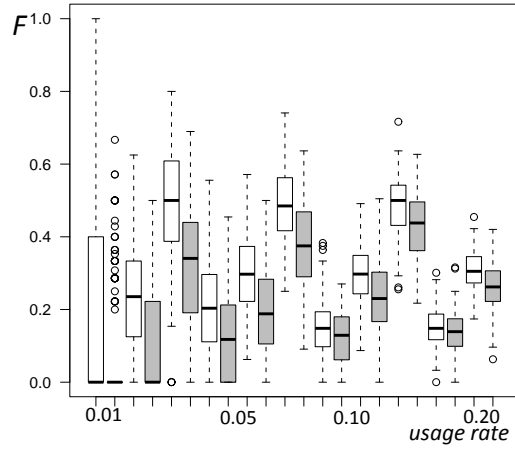
s results for the prediction model BM(5) using 15% failure rate and 0.30 test rate



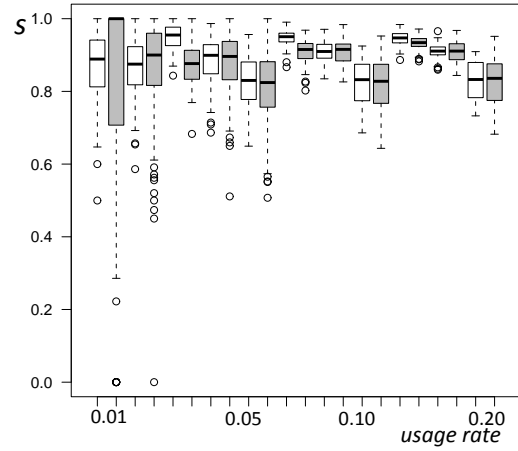
F results for the prediction model BM(10) using 15% failure rate and 0.30 test rate



s results for the prediction model BM(10) using 15% failure rate and 0.30 test rate



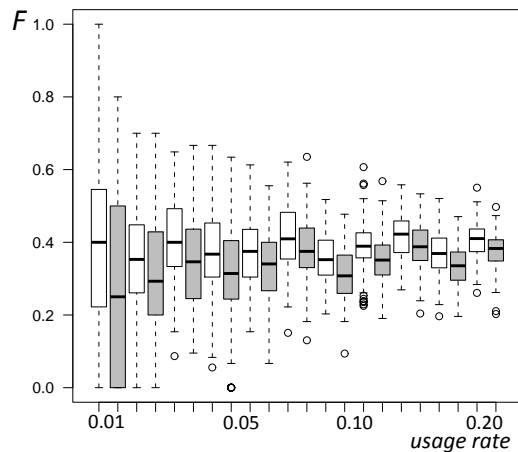
F results for the prediction model SEM using 15% failure rate and 0.30 test rate



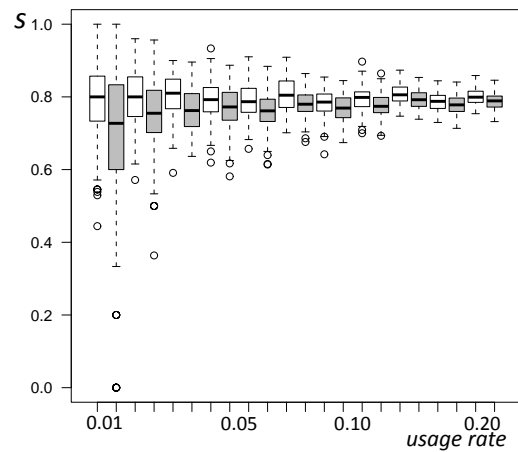
s results for the prediction model SEM using 15% failure rate and 0.30 test rate

Influence of test rate

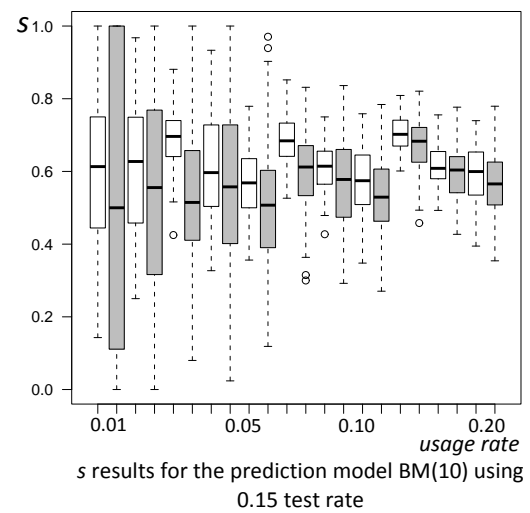
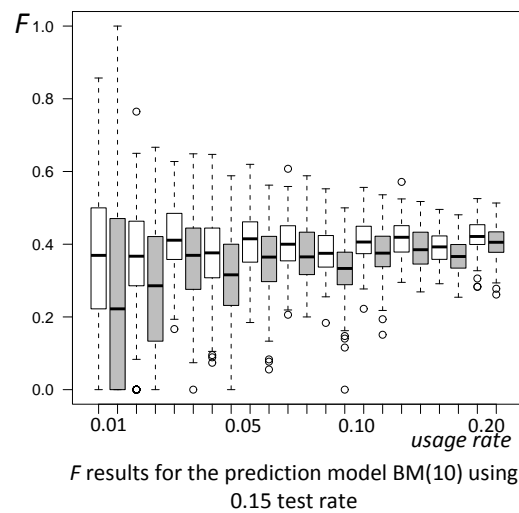
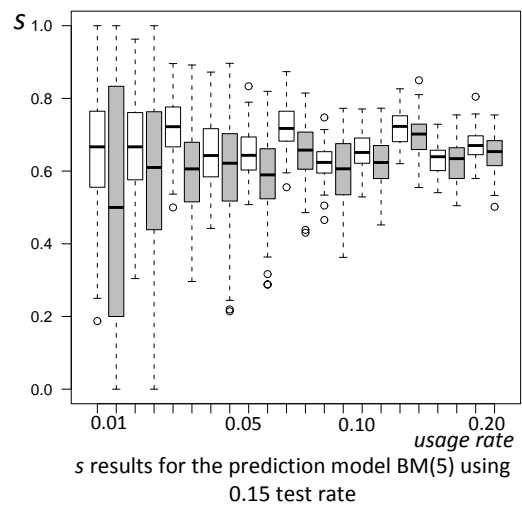
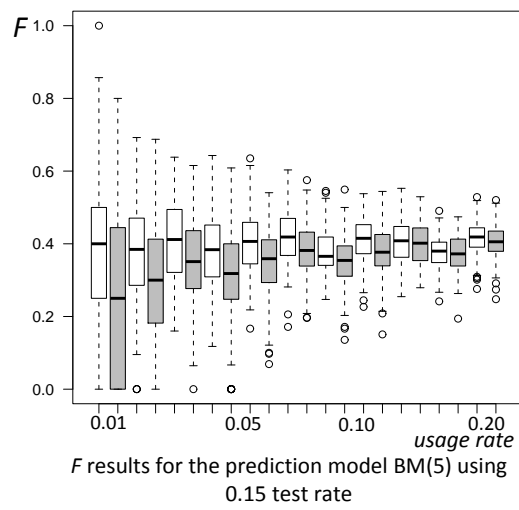
The below figures show the accuracy gains in terms of the F-measure (F) and specificity (s) for the different prediction models using different online test rates (0.15, 0.30 and 0.60) we have used in our experiments. The following figures show the box plots for both F and s . White boxes represent results of predication using monitoring and online testing ($M\&OT$) and the grey boxes represent results of predication using monitoring only (M). Please note that we have already presented the boxplots for the 0.30 test rate above.

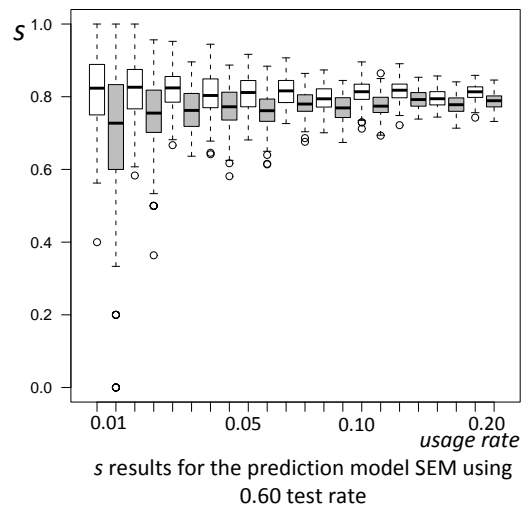
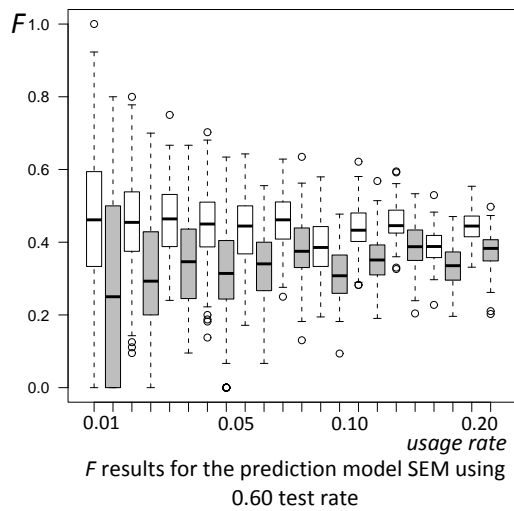
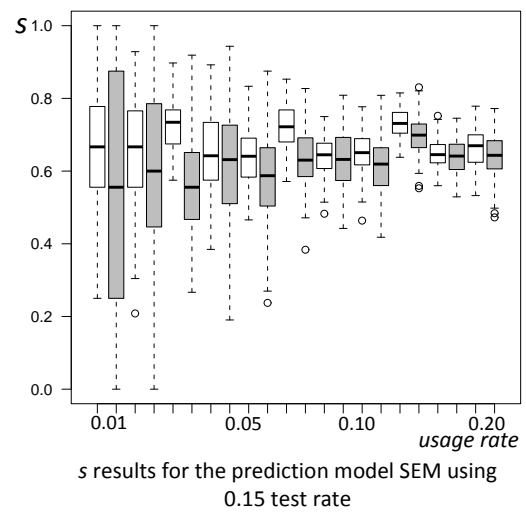
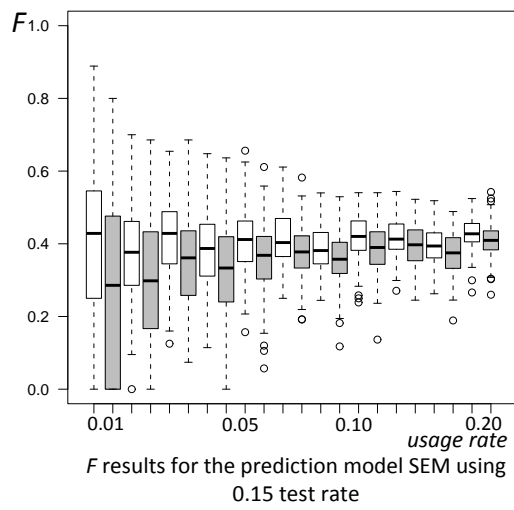


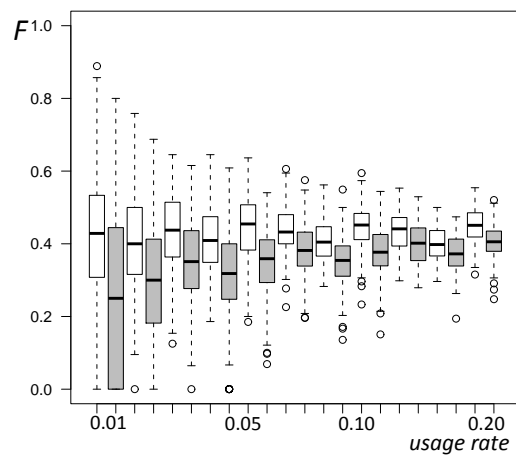
F results for the prediction model Last using 0.15 test rate



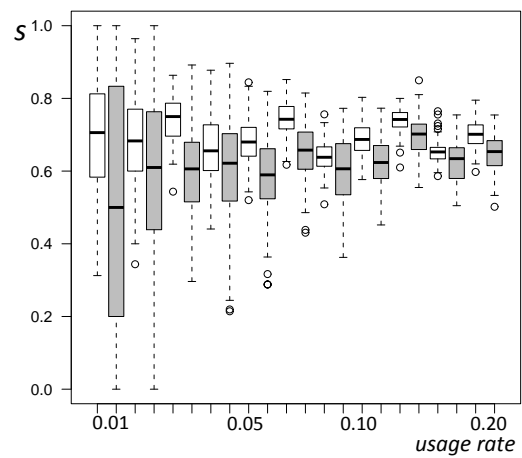
s results for the prediction model Last using 0.15 test rate



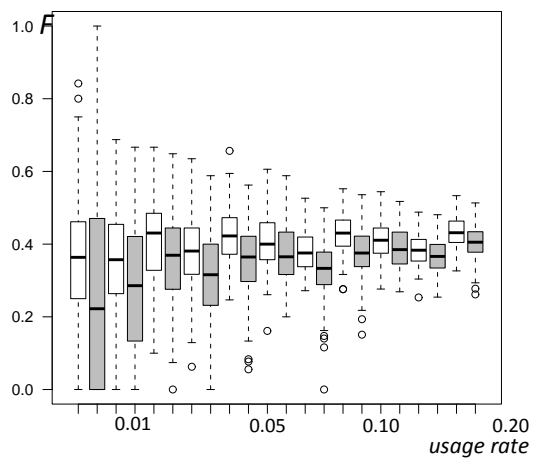




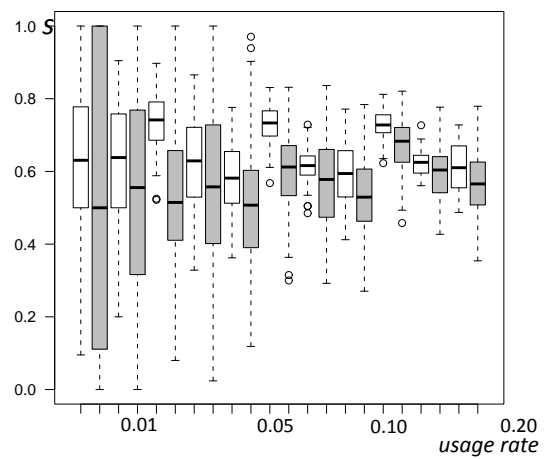
F results for prediction model BM(5) using 0.60 test rate



s results for prediction model BM(5) using 0.60 test rate



F results for the prediction model BM(10) using 0.60 test rate



s results for prediction model BM(10) using 0.60 test rate

