Predicting and Bypassing End-to-End Service Degradation

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CSE-498

Bremler-Barr, Cohen, Kaplan, and Mansour. “Predicting and Bypassing End-to-End Internet Service Degredations.” , ACM SIGCOMM Internet Measurement Workshop, 2002.

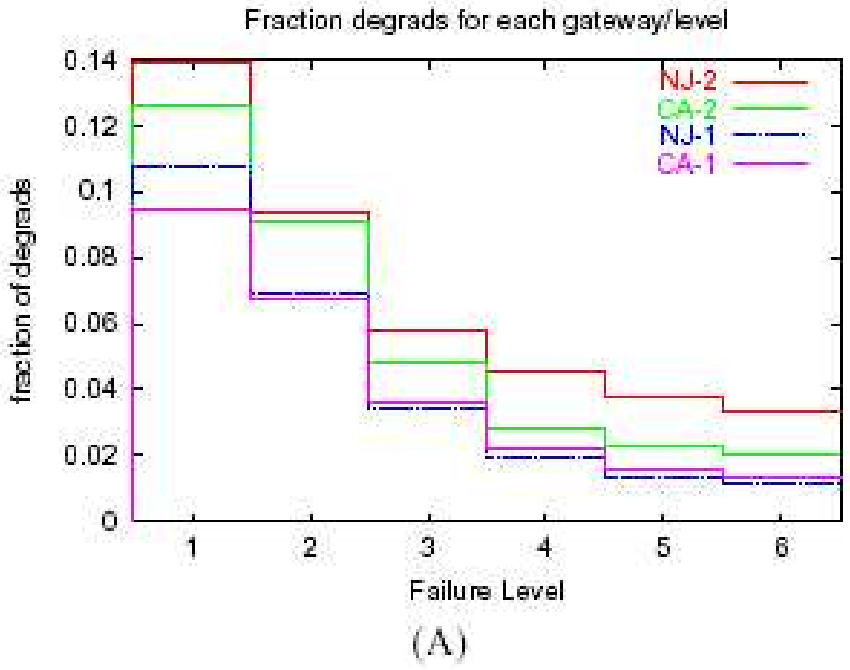
Problem

- Predict end-to-end service degradation in routers.
- Congestion, server loads, connectivity loss.
- Dynamic path (not mirror) selection between ASes and between ISPs/LANs.

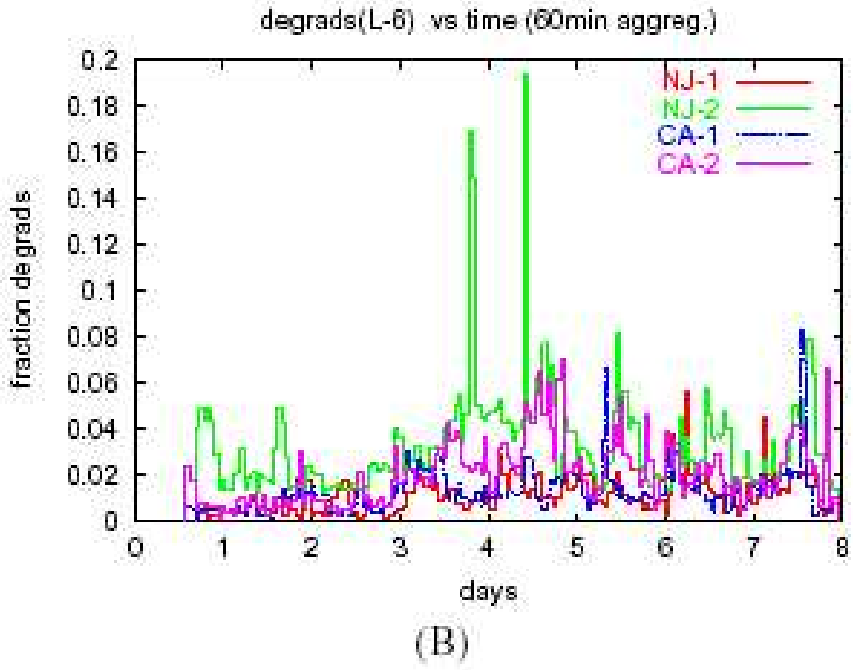
Measurements

- Four ASes (2 NJ, 2 CA)—hourly and once-a-minute
- RTT
- Degradation Levels: $50*20^{L-1}$ ms. L=1..6.

Degradation

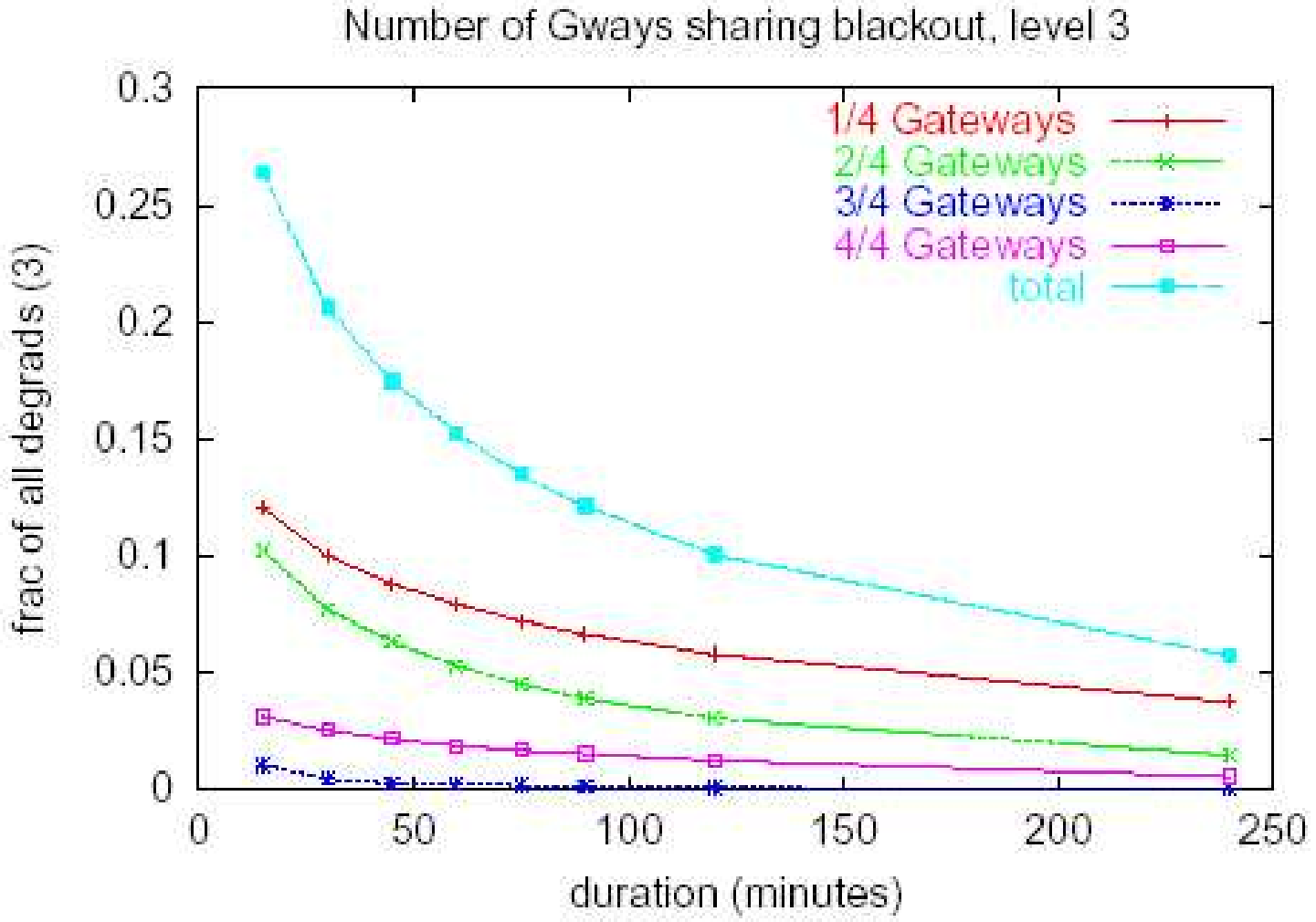


(A)



(B)

Degrads by # of Gateways

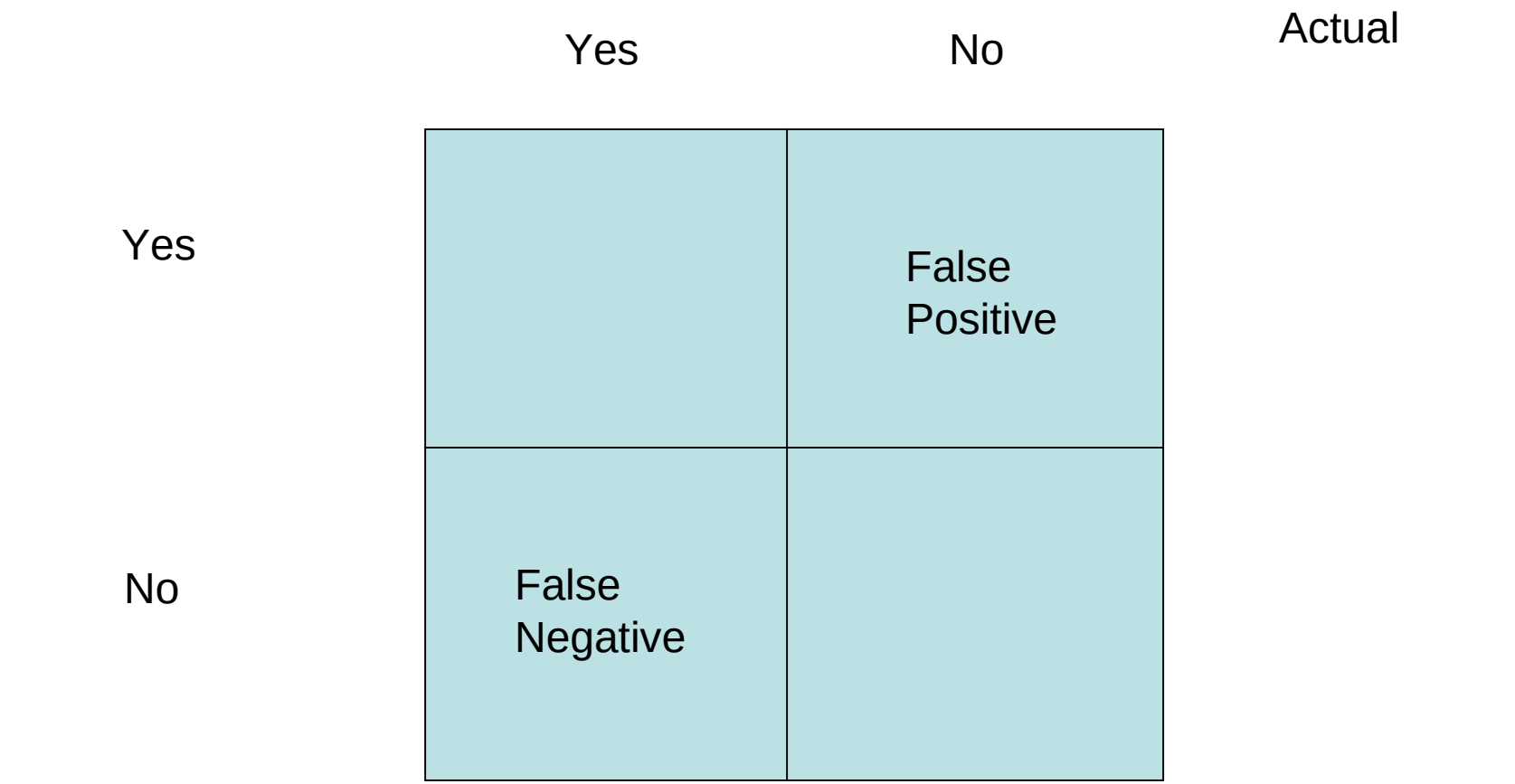


Predictors

- Given l,
- F_t in {0, 1}
- $h(H_t,t)$

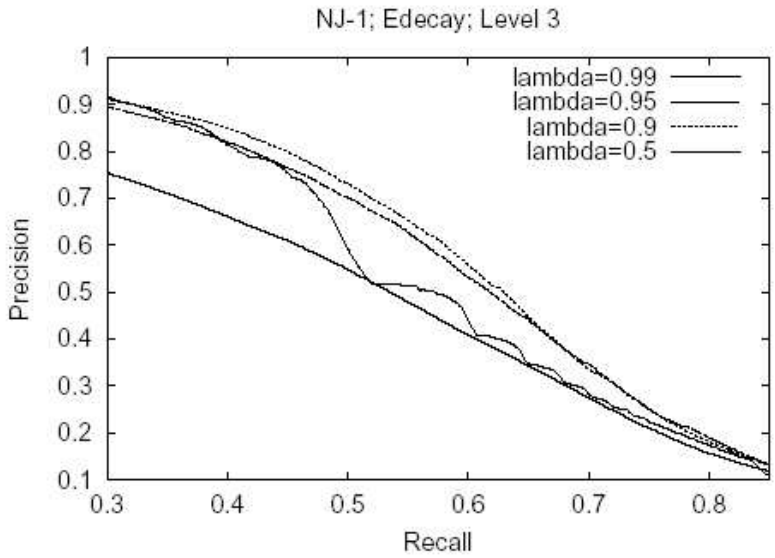
- Markov
- Recency and quantity principles
- EXPDECAY, POLYDECAY, VW-COVER, HMM

Optimization

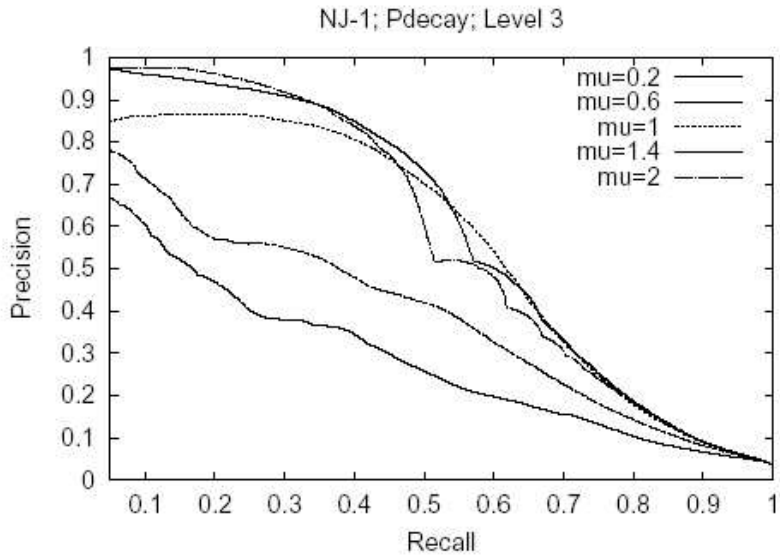


→ Precision vs. recall

Evaluation



EXPDECAY



POLYDECAY

Fig. 5. Recall-Precision curves for predicting level-3 degradations on NJ-1 gateway, using EXPDECAY and POLYDECAY.

Evaluation

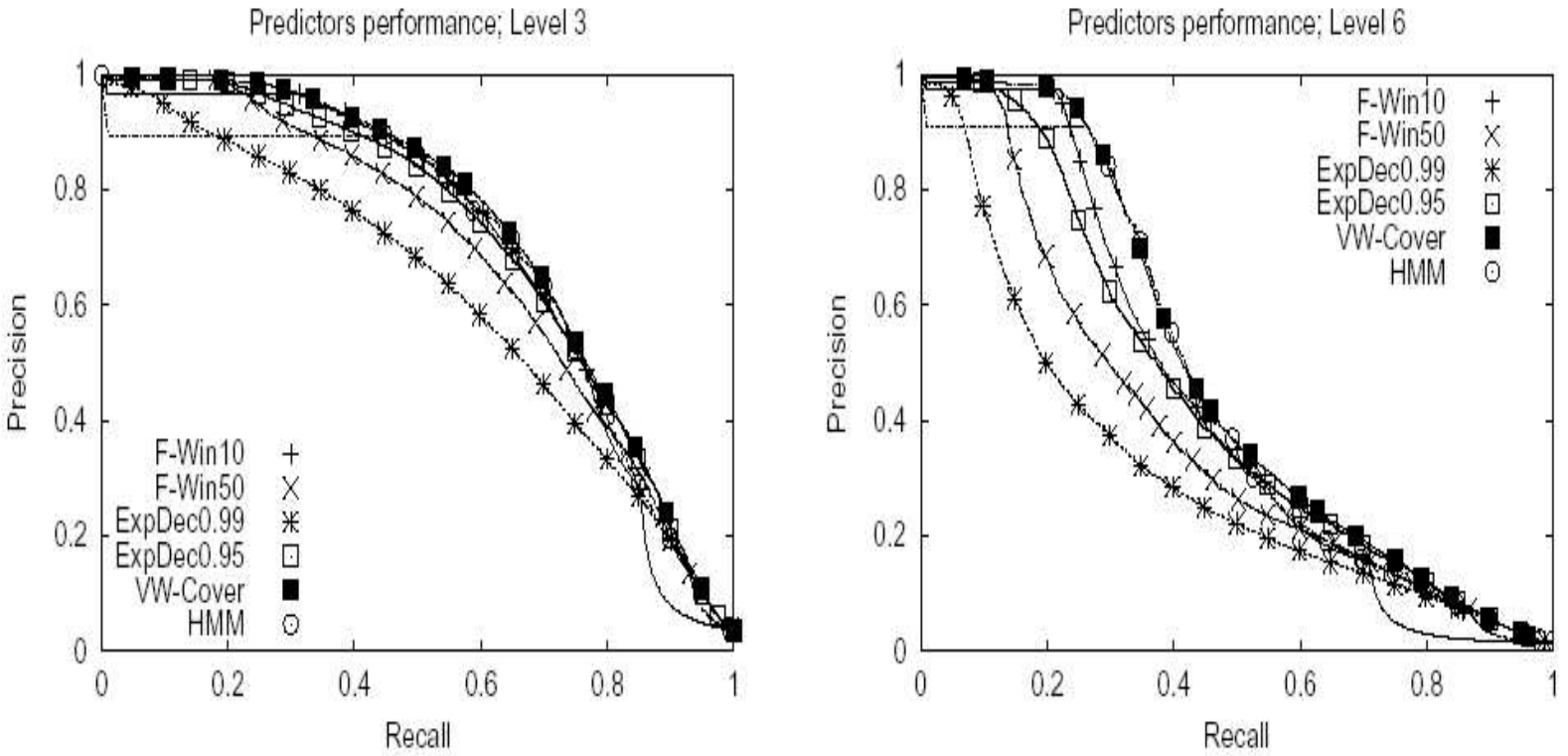


Fig. 6. Recall-Precision curves for predicting level-3 degradations (left) and level-6 degradations (right) using F-WINDOW$_{10}$, F-WINDOW$_{50}$, EXPDECAY$_{0.95}$, EXPDECAY$_{0.99}$, VW-COVER, and HMM (CA-1 gateway).