# Path-ZVA simulation method for time-bounded rare events in a Semi-Markov chain

Daniël Reijsbergen[*†1], Pieter-Tjerk De Boer , and Werner Scheinhardt

[1]Singapore University of Technology and Design – Singapore

## Abstract

We present an importance-sampling simulation method for estimating the probability of a time-bounded rare event in a Semi-Markov chain. Our method is based on generalizing the Path-ZVA method developed earlier for Markov chains, which works by first finding which paths are asymptotically dominant, and then using them to approximate the theoretical zero-variance change of measure. Our method requires only mild assumptions about the tails of the chain's sojourn time distributions. We present an empirical study that shows that our method has desirable efficiency properties in this setting.

**Keywords:** reliability, semi Markov chains, importance sampling

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[*]Speaker
[†]Corresponding author: daniel_reijsbergen@sutd.edu.sg