

Decision Making in a Changing Environment

Alan Veliz-Cuba^{1*}, Zachary Kilpatrick², Krešimir Josić³

¹*Department of Mathematics, University of Dayton, Dayton, OH 45469*

²*Department of Applied Mathematics, University of Colorado Boulder, Boulder, CO 80309*

³*Department of Mathematics, University of Houston, Houston, TX 77004*

avelizcuba1@udayton.edu

Organisms and ecological groups accumulate evidence to make decisions. Classic experiments and theoretical studies have explored this process when the correct choice is fixed during each trial. However, we live in a constantly changing world. What effect does such impermanence have on classical results about decision making? To address this question we use sequential analysis to derive a tractable model of evidence accumulation when the correct option changes in time. Our analysis shows that ideal observers discount prior evidence at a rate determined by the volatility of the environment, and the dynamics of evidence accumulation is governed by the information gained over an average environmental epoch. Our work builds a bridge between statistical decision making in volatile environments and stochastic nonlinear dynamics.