

Abstract

The first chapter consists of an overview of the theory of empirical processes, covering an introduction to empirical processes in \mathbb{R} , uniform empirical processes and function parametric empirical processes in SECTION 1.1. SECTION 1.2 contains an overview of the theory related to the law of the iterated logarithm for Brownian motion and the modulus of continuity for Brownian motion. SECTION 1.3 contains the theory of the limiting processes for the empirical process, most importantly Brownian motion, Brownian bridge and the connections and relationships between them, with distributions of selected statistics of Brownian motion and Brownian bridge derived from reflection principles. SECTION 1.4 contains an overview of the theory required to prove central limit results for the empirical processes, covering the theory of the space C and Donsker's theorem.

The second chapter covers research topics, starting with Fourier analysis of mixture distributions and associated theory in SECTION 2.1. SECTION 2.2 covers findings in a research problem about non-linear autoregressive processes. SECTION 2.3 introduces a martingale approach to testing a regression model. SECTION 2.4 links the theory of ranks and sequential ranks to the theory of empirical processes.