

# Model checks in statistics: An innovation process approach

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*Abstract:* In this paper we study a class of Gaussian processes which typically appear as limits of marked empirical processes when composite models need to be checked. A transformation to their martingale part is derived which when applied to the empirical process gives rise to asymptotically distribution-free tests for composite models.

*Key words:* Model checks, innovation martingale, gaussian process.

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## 1 Introduction

In this paper we will develop a general methodology for nonparametrically testing the goodness-of-fit of a parametric or a semiparametric model. To begin with the simplest example, assume one observes independent identically distributed (i.i.d.) random variables  $X_1, \dots, X_n$  on the real line, from some unknown distribution function (d.f.)  $F$ . Furthermore, let  $\mathcal{F} = \{F_\theta : \theta \in \Theta\}$  be a given family of distribution functions parametrized by some vector  $\theta \in \Theta \subset \mathbb{R}^k$ . To keep the discussion as simple as possible, we will assume that no nuisance parameters are present so that  $F_\theta$  is uniquely determined by  $\theta$ . The problem of how to test for the hypothesis

$$H_0 : F \in \mathcal{F}$$

has attracted many researchers over the past decades. Most of the test statistics are certain functionals of the underlying empirical process. More