UNIVERSITY OF TORONTO | Statistical Sciences

Simultaneous nonparametric inference under complex temporal dynamics

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Outline

- Introduction
- Setting
- Main Theorems
- Applications to Testings
- Simulation Results
- Real Data Analysis

Introduction

Model

Varying Coefficient Model

$$y_i = \mathbf{x}_i^\top \boldsymbol{\beta}_i + e_i, \quad i = 1, 2, \cdots, n,$$

where $\{\mathbf{x}_i = (x_{i,1}, \cdots, x_{i,p})^\top\}$ is the p-dimensional covariate (or predictor) process, $\{e_i = (e_{i,1}, \cdots, e_{i,p})^\top\}$ is the p-dimensional error process.

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Setting

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Main Theorems

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Applications to Testings

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Simulation Results

Three types of tests are considered in the simulation experiment:

- Exact Function Test: $\mathbf{C}\boldsymbol{\beta}(t) = f(t), \quad t \in [0,1]$
- Lack-of-fit Test: $\Lambda_{\mathbf{C}}(t) = f(t, \{\Lambda(t_i)\}_{i \in \mathcal{J}}), \quad t \in [0,1]$
- Qualitative Test: $\Lambda_{\mathbf{C}}(t) \in \mathcal{N}_0$

Real Data Analysis

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Algorithm

Algorithm 1 Dynamic generative model

Initialize parameters θ, ϕ
repeat
  Get random minibatch datapoints $\mathbf{x}, \mathbf{u}$
  Get Monte Carlo samples $\mathbf{z}^*$ from distribution $q_\phi(\mathbf{z}|\mathbf{x}, \mathbf{u})$
  Evaluate $\mathbb{E}_{\mathbf{z}\sim q_\phi}[\log p_\theta(\mathbf{x}|\mathbf{z}, \mathbf{u})]$ using $\mathbf{z}^*$
  Update parameters using gradients $\nabla_{\theta,\phi}\mathcal{L}$ (e.g. SGD)
until convergence of parameters θ, ϕ
return θ, ϕ

Mathematical Environment Blocks

Definition

This is a definition.

Theorem

This is a theorem.

Lemma

This is a proof idea.