

Dados: $\{y_1, \dots, y_n\}$

Modelo: $y_t = \beta_0 + \beta_1 y_{t-1} + \epsilon_t$, $\epsilon_t \sim N(0, \sigma^2)$
 (AR(1))
 $y = \begin{pmatrix} y_1 \\ \vdots \\ y_n \end{pmatrix}$, $X = \begin{pmatrix} 1 & y_1 \\ \vdots & \vdots \\ 1 & y_{n-1} \end{pmatrix}$, $\beta = \begin{pmatrix} \beta_0 \\ \beta_1 \end{pmatrix}$

$y = X\beta + \epsilon$, $\epsilon \sim N(0, \sigma^2 I)$

Prior: $\beta \sim N(b_0, B_0)$, $\sigma^2 \sim IG(c_0, d_0)$
 b_0, B_0 e c_0, d_0 hiperparâmetros

\Rightarrow Condições completas são "Gibbs"
 $(\beta | y, \sigma^2) \sim N \left[(B_0^{-1} + X'X/\sigma^2)^{-1} (B_0^{-1} b_0 + X'y/\sigma^2), (B_0^{-1} + X'X/\sigma^2)^{-1} \right]$
 $(\sigma^2 | y, \beta) \sim IG \left(c_0 + \frac{n-p}{2}, d_0 + \frac{(y - X\beta)'(y - X\beta)}{2} \right)$

Prior Normal-Gamma para β_j

$\beta \sim NG(\lambda, \sigma^2)$ se

$p(\beta | \lambda, \sigma^2) = \frac{1}{\sqrt{\pi}^p \alpha^{\delta-1/2} \lambda^{\delta+1/2} \Gamma(\delta)} |\beta|^{-\delta-1/2} K_{\delta-1/2} \left(\frac{|\beta|}{\lambda} \right)$
 (aka Exponential Delta) $\Gamma(\delta)$ Função Beta modificada do tipo

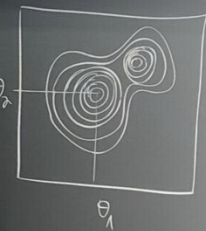
$\beta \sim NG(\lambda, 1) \equiv \text{Laplace}(\lambda)$

$E(\beta | \lambda) = 0$
 $V(\beta | \lambda) = 2\sigma^2 \lambda^2$

Hedibert Lopes
 Professor of
 Statistics and
 Econometrics

ALGORITMO METROPOLIS-HASTINGS

Quero amostrar de $p(\theta)$
 Só sei amostrar de $q(\theta | \theta^{(j-1)})$
 $\alpha = \min \left\{ 1, \frac{p(\theta^*)/q(\theta^* | \theta^{(j-1)})}{p(\theta^{(j-1)})/q(\theta^{(j-1)} | \theta^*)} \right\}$
 $\theta^{(j)} \sim q(\theta | \theta^{(j-1)}) \Rightarrow \theta^{(1)} = \theta^*$ com probabilidade α
 $y^{(j)} = \theta^{(j)}$ com probabilidade $1-\alpha$
 $\Rightarrow \theta^{(1)}, \dots, \theta^{(M)}$ $\sim p(\theta)$



$p(\theta) = 0.8 N \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \right) + 0.2 N \left(\begin{pmatrix} 1 \\ 1 \end{pmatrix}, \begin{pmatrix} 0.25 & 0 \\ 0 & 0.25 \end{pmatrix} \right)$

www.hedibert.org

32 years in higher education

2013 – 2024: Professor of Statistics and Econometrics at INSPER.

2021 - 2023: Head of Department of Statistics, Arizona State University.

2003 – 2013: Professor of Econometrics and Statistics, University of Chicago.

1996 - 2003: Assistant Professor of Statistics, Federal University of Rio de Janeiro.

1992- 1996: Lecturer of Statistics, Fluminense Federal University.

Head of the Data and Decision Sciences Unit at INSPER

Publication in top journals

85 scientific papers in internationally acclaimed journals

Journal of the American Statistical Association

Bayesian Analysis

Journal of Econometrics

American Economic Review

Statistical Science

Journal Computational and Graphical Statistics (Currently Associate Editor)

Statistics and Computing

Journal of Business and Economic Statistics

Econometric Review

Journal of Forecasting

International Journal of Forecasting

Journal of Time Series Analysis

20 articles with more than 100 citations

Books and monographs

Gamerman and Lopes (2006)

MCMC: Stochastic Simulation for Bayesian Inference (2nd edition)

3rd edition (Fall 2025) – Gamerman, Lopes and Bambirra

4685 citations

Parmigiani and Inoue (2009) *Decision Theory: Principles and Approaches*.

[Contributions by Hedibert F. Lopes](#)

Migon and Lopes (2002) *Análise Bayesiana de Decisões: Aspectos Práticos*. ABE

Lopes and Rocha-Lima (1995) *Cointegração: Enfoques Clássico e Bayesiano*. ABE

Fellowship

International Society of
Bayesian Analysis (ISBA)

First Brazilian Elected
Fellow (2022)

International Statistical
Institute (ISI)

Elected Fellow (2018)



Bolsistas CNPq INSPER

Nome	Área	Nível	Início	Término
Hedibert Freitas Lopes	Estatística	PQ-1C	01/03/21	31/07/25
Naercio Aquino Menezes Filho	Capital Humano	PQ-1C	01/03/23	31/07/27
Sergio Pinheiro Firpo	Capital Humano	PQ-1C	01/03/21	31/07/25
Rodrigo Reis Soares	Economia dos Recursos Humanos	PQ-1D	01/03/21	31/07/25
Adriana Bruscato Bortoluzzo	Administração Financeira	PQ-2	01/03/22	31/07/25
Cristine Campos de Xavier Pinto	Métodos e Modelos Matemáticos, Econométricos e Estatísticos	PQ-2	01/03/23	31/07/26
Danny Pimentel Claro	Mercadologia	PQ-2	01/03/24	31/07/27
Jose Heleno Faro	Economia Matemática	PQ-2	01/03/23	31/07/26
Pedro Garcia Duarte	História do Pensamento Econômico	PQ-2	01/03/23	31/07/26
Sandro Cabral	Administração Pública	PQ-2	01/03/22	31/07/25

Projetos FAPESP

Projeto Temático – FAPESP

Pesquisador principal

01/09/2023 a 31/08/2028

Séries Temporais, Ondas, Dados de Alta Dimensão e Aplicações

Programa Ciência para o Desenvolvimento - FAPESP

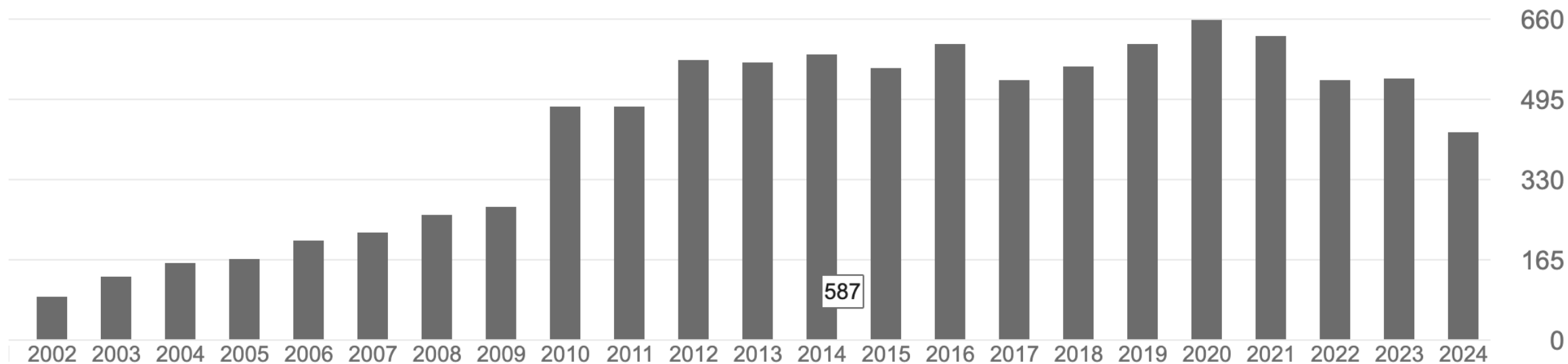
Pesquisador principal

01/06/2024 – Duração 48 meses

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Doutores em Estatística e Economia que orientei entre 2017 e 2024

1. Renata Tavanielli

D.Sc. in Statistics (Expected defense for 2025)

Thesis topic: Cholesky-based dynamic copula modeling

Institution: University of Sao Paulo

2. Rafael Campello de Alcantara

Post-doc at UT Austin

D.Sc. in Business Economics (Fev-2024)

Thesis topic: Cutoff-aware BART for estimating Heterogeneous Treatment Effects in Regression Discontinuity Designs

Institution: Insper

3. Igor Ferreira Batista Martins

Post-doc in Econometrics at Örebro, Sweden

D.Sc. in Business Economics (Feb-2024)

Thesis topic: Essays in Bayesian Financial Econometrics

Institution: Insper

4. Bruno do Prado Costa Levy

Itaú Asset Management

D.Sc. in Business Economics (2021)

Thesis topic: Dynamic ordering learning in multivariate forecasting

Institution: Insper

5. Henrique Bolfarine

Professor UT Austin

D.Sc. in Statistics (2021)

Thesis topic: Decoupling Shrinkage and Selection in Gaussian Linear Factor Analysis

Institution: University of Sao Paulo

6. Helton Graziadei

Assistant Professor at UEM

D.Sc. in Statistics (2020)

Thesis topic: Some Bayesian generalizations of the integer-valued autoregressive model

Institution: University of Sao Paulo

7. Paloma Waisman Uribe

Data Science Manager at Nubank

D.Sc. in Statistics (2017)

Thesis topic: Dynamic sparsity on time-varying Cholesky-based covariance matrices

Institution: University of Sao Paulo

bayesian
dynamic
model
factor
learning
analysis
models
stochastic
volatility
regression
semi-parametric
distributions
priors
shrinkage
linear
multivariate
gaussian
volatility
forecasting
time-varying
treatment
time
parsimonious
time-varying
efficient
structures
constrained
based
number
rdd
linear
heterogeneous
international
particle
factors
distributions
frequency
identification
bart
learning
inference
illusion
counts
pooled
identifying
series
integer-valued
mixed
effects
copula
identification
shrinkage

1. A Constrained **BART** Model for Identifying Heterogeneous Treatment Effects in RDD
2. When it counts: Econometric identification of the basic **factor model** based on GLT structures
3. Parsimonious Bayesian **factor analysis** when the number of factors is unknown
4. Dynamic mixed frequency **pooled copula** International Journal of Forecasting
5. Time series momentum predictability via dynamic binary classification
6. **Dynamic portfolio allocation** in high dimensions using sparse risk factors
7. Dynamic ordering learning in multivariate forecasting
8. **Dynamic sparsity** on dynamic regression models
9. Tree-Based Bayesian Treatment Effect Analysis
10. Decoupling shrinkage and selection in Gaussian linear **factor analysis**
11. **Deep Learning** Models For Inflation Forecasting
12. Parsimony inducing priors for **large scale state-space models**
13. Bayesian generalizations of the **integer-valued autoregressive** model
14. The illusion of the illusion of **sparsity**
15. How many hospitalizations has the **COVID-19** vaccination already prevented in Sao Paulo?
16. **Spatial Prediction** of Sea Level Trends
17. **Prior sensitivity analysis** in a semi-parametric integer-valued time series model
18. Scalable semi-parametric inference for the means of **heavy-tailed** distributions
19. Bayesian semi-parametric **Markov switching** stochastic volatility mode
20. Walk on the wild side: **Multiplicative sunspots** and temporarily unstable path
21. **Efficient sampling** for Gaussian linear regression with arbitrary priors
22. Particle learning for Bayesian **semi-parametric stochastic volatility** model
23. Dynamic models
24. **Bayesian hypothesis testing**: Redux
25. On the long run volatility of stocks: **time-varying predictive systems**
26. Bayesian factor model **shrinkage** for linear IV regression with many instruments
27. Sequential Bayesian learning for stochastic volatility with **variance-gamma jumps** in returns
28. Efficient Bayesian inference for **multivariate factor SV models**
29. Cholesky **realized stochastic volatility** model
30. Particle learning for **fat-tailed** distributions
31. **Time-varying extreme pattern** with dynamic models
32. **Bayesian instrumental variables**: likelihoods and priors
33. **Treatment effects**: a Bayesian perspective, Econometric Reviews
34. Modern Bayesian Factor Analysis

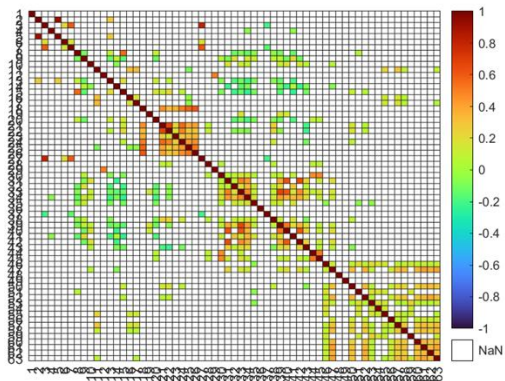


Figure 7: NYSE data; estimated marginal correlation matrix $E(\Omega^*|y)$, where $\Omega_{it}^* = \text{Corr}(\Lambda_{ifit}(y_t - \Lambda_{ifit}))$.

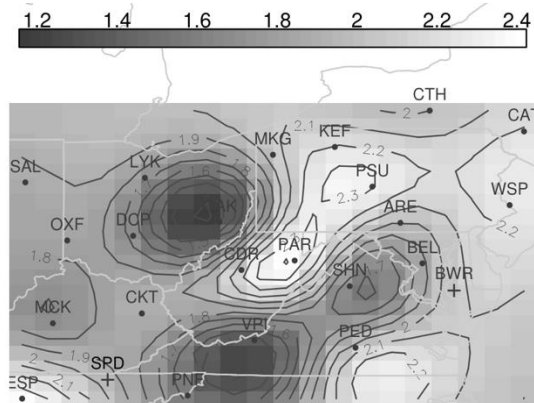
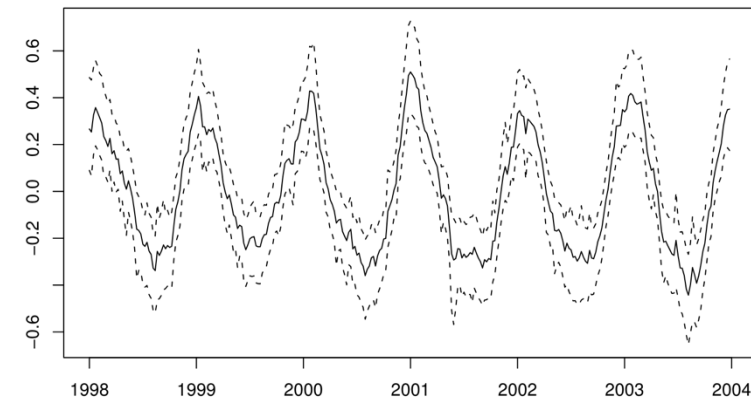
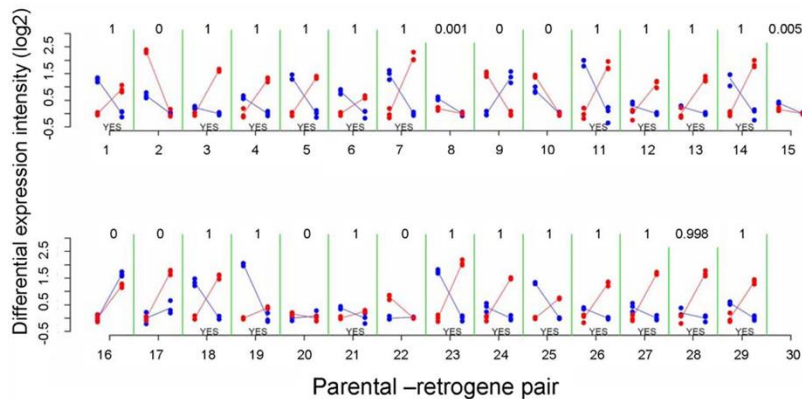
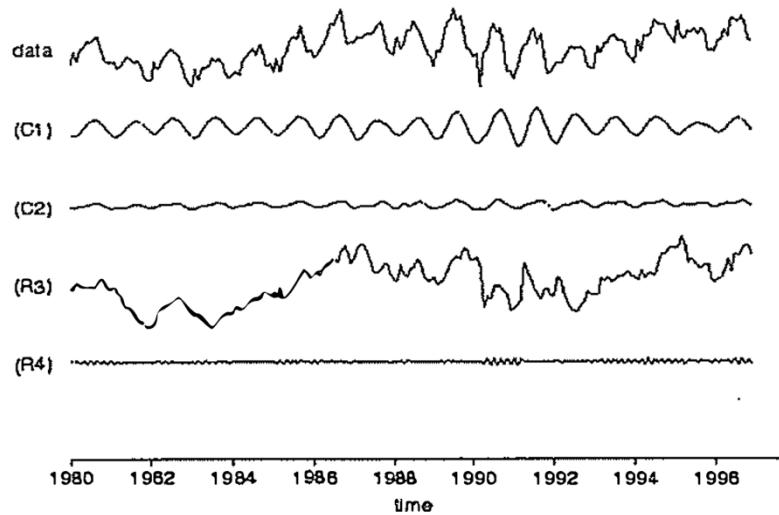


Figure 2: Google Flu Trends estimated ILI percentages (dashed line) and CDC ILI Surveillance percentages (solid line) for the United States, from June 2003 until September 2009. Separate plots correspond to separate influenza years, with each new influenza season starting in autumn, and ending in spring. Note that CDC did not use to produce ILI reports during summers before 2009, and thus no solid line appears during summer months prior to 2009.

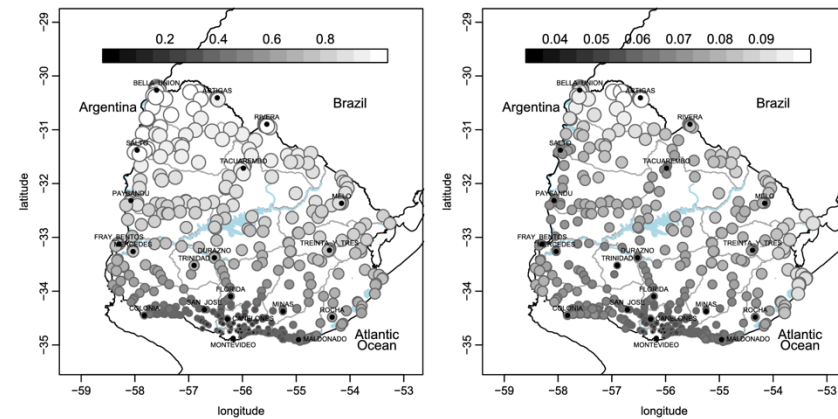
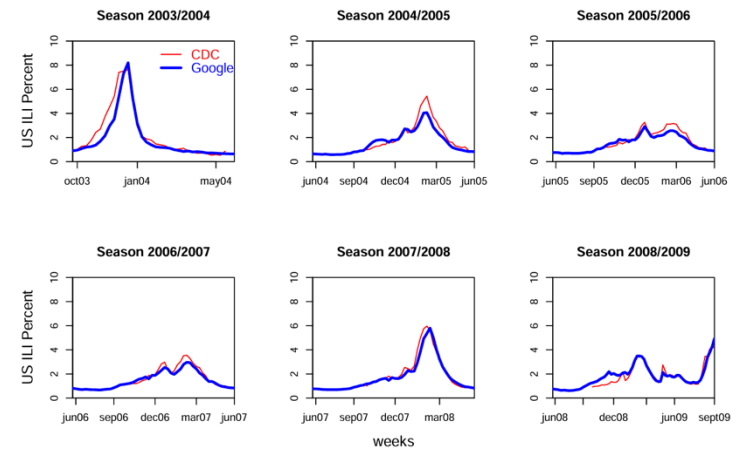


FIG. 2. Posterior mean of θ_i and standard deviations (second column) for observed and unobserved cities under the SHFM when $\phi = 5$.