

HIAS Brown Bag Seminar #25

# GRAPH-LAPLACIAN MODELING OF SPATIO-TEMPORAL EFFECTS FOR HOUSE-PRICE ESTIMATION

Many variables involve the modeling of **spatial effects**, and their dynamics over time. This paper presents a **linear model** in which **spatio-temporal random effects** are modeled by **graph-Laplacians**. A graph-Laplacian flexibly encodes **adjacency in both space and time**, in our case not depending on unknown parameters.

The **graph-Laplacian** can be input for a prior in a **Bayesian** estimation setup, or used as a regularization term in a **Ridge** regression. A **spectral decomposition** of the graph-Laplacian significantly reduces **computation time** for estimation


As an application, we estimate **graph-Laplacian hedonic pricing** and **repeat-sales models** on sales prices of **Australian residential properties** in the period from **1990 to 2024**. Bayesian and Ridge regression estimation results are very similar, although the computation time for the Ridge regression is orders of magnitude faster, however at the expense of missing posterior density functions.


Our results highlight the advantages of graph-Laplacians for predicting **individual property prices** and for producing stable, granular **price indices**, also in thin markets.

24 February 2026

Tuesday 12:40 ▶ 13:40

Bring your own lunch. Coffee and snacks will be served.

 Room 205, Annex Building  
West Campus, Hitotsubashi University

 Please register via the URL or QR code.  
<https://forms.office.com/r/CmKMR7fhDP>  
[Deadline] 20 February, 3 p.m.



Presenter

Prof. Marc K. Francke

Specialy Appointed Professor  
Hitotsubashi Institute for Advanced Study  
Professor Real Estate Analytics  
The University of Amsterdam



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