

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.

The HIAS Brown Bag Seminar is a university-wide seminar series hosted by the Hitotsubashi Institute for Advanced Study (HIAS). It aims to promote interaction among HIAS researchers, faculty members, and students. With its ten research centers, HIAS will continue to serve as a hub for active research collaboration across the University.

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

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



 **HiAS CURES**

一橋大学社会科学高等研究院
都市空間・不動産解析研究センター
Center for Urban & Real Estate Studies

CONTACT

Hitotsubashi Institute for Advanced Study (HIAS)
Research Services Office
✉ hias-info@ad.hit-u.ac.jp