

# Aggregate Learning for Mixed-Frequency Data

Takamichi Toda, Daisuke Moriwaki and Kazuhiro Ota

## Abstract

Large and acute economic shocks such as the 2007-2009 financial crisis and the current COVID-19 infections rapidly change the economic environment. In such a situation, the importance of real-time economic analysis using  $\{\text{it alternative data}\}$  is emerging. Alternative data such as search query and location data are closer to real-time and richer than official statistics that are typically released once a month in an aggregated form. We take advantage of spatio-temporal granularity of alternative data and propose a  $\{\text{Mixed-Frequency Aggregate Learning (MF-AGL)}\}$  model that predicts economic indicators for the smaller areas in real-time. We apply the model for the real-world problem; prediction of the number of job applicants which is closely related to the unemployment rates. We find that the proposed model predicts (i) the regional heterogeneity of the labor market condition and (ii) the rapidly changing economic status. The model can be applied to various tasks, especially economic analysis.