# 東京大学 関本研究室 / Sekimoto Lab. IIS, the University of Tokyo. **Unveiling and Simulating the Activity Space-based Socioeconomic Segregation under Various Activity Contexts** in Tokyo Metropolitan Area

### Chenchen SUN, Yuya Shibuya, Yoshihide Sekimoto

0.182

Higher(>0.35

musement (n=610 / n'=5

Hospital (n=1356 / n'=1175

Hotel (n=518 / n'=486

Park (n=2570 / n'=2522

chool (n=1884 / n'=18

Welfare (n=1635 / n'=14)

Specialized Commercial (n=2090 / n'=203

ower((<0.27)

nment Administration (n=1384 / n'=117

— Weekday – – Weekend & Holid

## Introduction

Global cities (Sassen, 1991) experience serious social polarization. In these dual cities, economically and socially disadvantaged groups face serious geographical isolation problems due to high housing price, uneven job distribution, etc. Income segregation in Tokyo metropolitan area(typical global city in Asian), become increasingly pronounced these years, particularly within Tokyo's 23 special wards.



## Methodology

We firstly adopt place-based income segregation index to calculate the segregation level in grid units in different types of activity spaces (including residence, workplace, and nonroutine activity space). Then combined with the results from linear regression results, we build a ML model to predict the future place-based nonroutine activity segregation level in three possible case from 2025 to 2045.

# Result

Segregation Varies in Different Activity Spaces



Fig. 1. Average household annual income in Tokyo 23 Wards. Data source:国勢調查2020



Fig. 2. Workflow of comparing and simulating segregation level.

• Segregation Simulation in Different Policy Scenarios Through the optimized ML-based NRAS model considering influence of built-up environment, residents, 0.182 composition and control location visitors' jobs, 0.147 variables (sMape<30%), we predicted the NRAS in 0.160 typical three cases shown below.



0.2 0.8 0.0 Segregation (place-based

Figure 3 Distribution curves and Statistics of income segregation indicators in different activity spaces. (Data source : Person Trip Survey data 2018)

Residential segregation is 9.1% higher than Workplace segregation and Nonroutine activity segregation (activities excluding residence and workplace) is 9.3% higher than Routine activity segregation level.



Figure 4 Correlation and Probability Density Distribution with Mean Values of 13 Types of Place-based Nonroutine Activity Space Segregation Index on Weekday and Weekend & Holiday. (Data source : Agoop cellphone positioning data 2022)

Higher segregation level(>0.35) in Culture, Sport, Welfare

Figure 5 Simulation model for estimating place-based NRAS index Taking Case A as an example, opposite spatial changing tendency can be found. Segregation of most study area will decrease in Clustering scenario A3 compared with normal scenario A2. But an isolated island with super-







#### Sekimoto Lab. @ IIS Human Centered Urban Informatics, the University of Tokyo