

# Voter Model for General Election in Japan

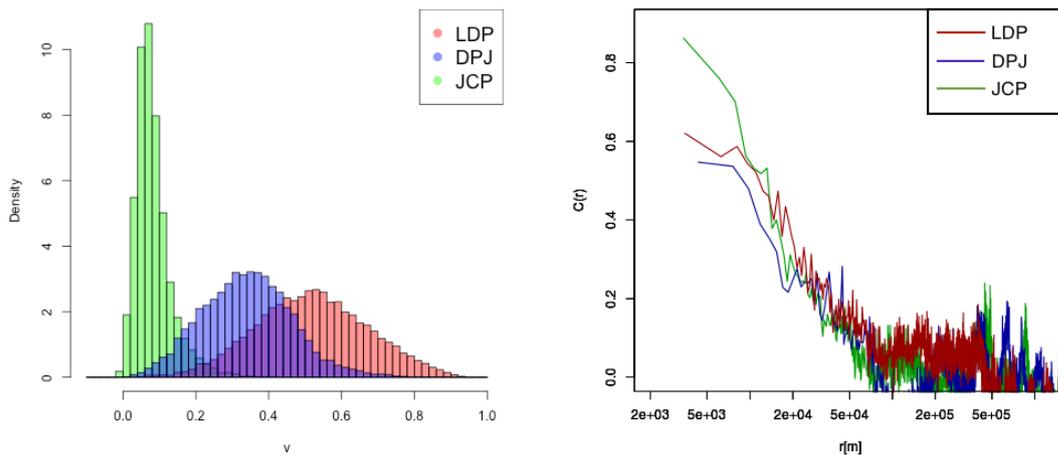
Fumiaki Sano\*, Masato Hisakado, and Shintaro Mori<sup>2</sup>

Department of Physics, Kitasato University, 1-15-1 Kitasato, Minami-ku, Kanagawa 252-0373 Japan

E-mail: \*ms16821@st.kitasato-u.ac.jp, <sup>2</sup>mori@sci.kitasato-u.ac.jp

**Keyword:** noisy voter model, mobility, socio-physics, opinion dynamics

We propose a noisy voter model with one-way mobility of agents, which incorporates the spatial and population diversity as input. The model tries to capture statistical features of Japanese General elections after the introduction of single-seat constituency system in 1996. It is a plurality election where only the most voted candidate gets a position. This work is a variant of the model proposed for U.S. presidential elections [1]. The crucial difference is the number of political parties participating in the elections. In Japan, Liberal Democratic Party (LDP), Democratic Party of Japan (DPJ) and Japanese Communist party (JCP) are the major political parties. In addition, there are many small and regional political parties as New Komeito, Japan Restoration Party, etc. To describe the voting process when  $q$  candidates compete against each other, we modify the previous model for  $q = 2$  candidates. In addition, we have the data only for the movement of people per year between different prefectures, our model incorporates one-way mobility of agents.



The data-analysis focuses on Japanese general elections from 1996(41st) to 2014(47th)[2]. We have studied the statistical properties of the vote shares  $v$  in the single-seat constituency system, where Japan is divided into about 300 regions and several candidates fight for a single seat. The left figure shows the distributions of  $v$  for LDP, DPJ and JCP. The average vote share over all election district changes from election to election, but the width remains approximately constant with standard deviations of  $\sigma_{LDP} \simeq 14.9\%$ ,  $\sigma_{DPJ} \simeq 12.3\%$ ,  $\sigma_{JCP} \simeq 4.76\%$  for each party, respectively. We also find that the spatial correlation of the vote shares decays logarithmically with the geographical distance[1].

## References

- [1] J. Fernández-Gracia, K. Suchecki, J. J. Ramasco, M. San Miguel and V. M. Eguíluz, "Is the Voter Model a Model for Voters?", Phys.Rev.Lett., vol.112,158701 (2014).
- [2] Y.Mori, "Japan General Election Data", Bokutakusha(2014).