



Kyoto International Seminar
“Recent Development for Statistical Science”

Date: October 26 - 28, 2017

Venue: Kyoto Terrace

Organizer: Masanobu Taniguchi

Supported by

- (1) Kiban (A-15H02061)
- (2) Tokutei-Kadai(B)

Kyoto (Fushimi-Uji) International Seminar

"Recent Developments for Statistical Science"

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(http://www.kyoto-terrsa.or.jp/floor_map/en.php)

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(Research Institute for Science & Engineering, Waseda University)

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M. Taniguchi, Research Institute for Science & Engineering, Waseda University

(2) Tokutei-Kadai (B)

M. Taniguchi, Research Institute for Science & Engineering, Waseda University

Program (* Speaker)

October 26

14:30 - 15:10: Toshihiro Abe (Nanzan Univ.)

[A mode and antimode preserving circular distribution and its properties](#)

15:10 - 15:50: Fumiya Akashi (Waseda Univ.)

[Robust confidence region for time series regression models under the presence of infinite variance and long-memory](#)

Coffee break

16:20 - 17:00: Junichi Hirukawa* (Niigata Univ.) and Shunsuke Sakai

[Rank tests for an ARMA model against other tv-ARMA models](#)

October 27

9:50 - 10:30: Yan Liu (Waseda Univ.)

[Robust parameter estimation for irregularly observed stationary process](#)

Coffee break

10:50 - 11:30: Ming-Yen Cheng (Hong Kong Baptist Univ.)

[A New Test for Functional One-Way ANOVA with Application to Ischemic Heart Screening](#)

Lunch

13:00 - 13:40: Estate Khmaladze (Victoria Univ. of Wellington)

[On infinite divisibility and the nature of Zipf's law](#)

13:40 - 15:20: Yury Kutoyants* (Univ. du Maine), Dachian, Kordzakhia, Novikov and Lin

[On cusp location estimation for some stochastic processes: a survey](#)

Coffee break

15:50 - 16:50: Chaired by Masanobu Taniguchi (Waseda Univ.)

Discussion on "New Direction in Data Science"

October 28

9:50 - 11:00: All participants:

"Possibility of future research collaboration"

Abstracts

October 26 (14:30-17:00)

Toshihiro Abe

Title: A mode and antimode preserving circular distribution and its properties

Abstract: In this talk, we consider unimodal skew-symmetric circular distributions generated by inverse monotone function. General results of the distributions are provided for the properties, and the inverse sine-skewed circular distributions are introduced as a flexible model of this type. We study their properties as well as those of two of their special cases. General results are also provided for maximum likelihood estimation of the parameters of the distributions. The methods of inference are applied in analyses of a circular data set.

Fumiya Akashi

Title: Robust confidence region for time series regression models under the presence of infinite variance and long-memory

Abstract: This talk considers robust inference for the coefficient of time series regression models with possibly heavy-tailed and/or long-range dependent covariate and error processes. In practical situation, it is often difficult to detect the thickness of the tail distribution or the intensity of the dependence of the model, and the rate of convergence of statistics contains unknown parameters of the model such as tail-index and Hurst-index. To overcome the difficulties, this talk applies self-normalized block sampling method. As a result, the proposed procedure does not require any prior estimation for nuisance parameters, and then the robust confidence region for the regression parameter is constructed. We also observe that the proposed method shows adequate finite sample performance with heavy-tailed long-memory processes.

Junichi Hirukawa

Title: Rank tests for an ARMA model against other tv-ARMA models

Abstract: In this talk, for a class of locally stationary process introduced by Dahlhaus, we apply the idea to the problem of testing ARMA model against other non-stationary ARMA model. When testing the problem, we use linear serial rank statistics and contiguity of LeCam's notion. And then, if null hypothesis is white noise, under null and alternative, the asymptotic normality of the proposed statistics is established by using the locally asymptotic normality (LAN). We incorporate the locally stationary phenomena in the testing problem.

October 27 (9:50-16:50)

Yan Liu

Title: Robust parameter estimation for irregularly observed stationary process

Abstract: We define a new class of disparities for robust parameter estimation of irregularly observed stationary process. The proposed disparities of spectral densities are derived from the point of view of prediction problem. The proposed disparities are not contained in the class of either location disparities or scale disparities. We investigate asymptotic properties of the minimum contrast estimators based on the new disparities for irregularly observed stationary processes with both finite and infinite variance innovations. The method provides a new way to estimate parameters robust against irregularly observed stationary process with infinite variance innovations. The relative efficiencies under regularly observed cases and the ratio of mean squared error under irregularly observed cases for comparison of different disparities are shown in our simulation studies.

Ming-Yen Cheng

Title: A New Test for Functional One-Way ANOVA with Application to Ischemic Heart Screening

Abstract: Motivated by an ischemic heart screening problem, we study a new global test for one-way ANOVA in functional data analysis. The test statistic is taken as the maximum of the pointwise F-test statistic over the interval the functional responses are observed. Nonparametric bootstrap, which is applicable in more general situations and easier to implement than parametric bootstrap, is employed to approximate the null distribution and

to obtain an approximate critical value. Under mild conditions, asymptotically our test has the correct level and is root- n consistent in detecting local alternatives. Simulation studies show that, in terms of both level accuracy and power, the proposed test outperforms several existing tests when the correlation between observations at any two different points is high or moderate, and it is comparable with the competitors otherwise. Application to an ischemic heart dataset suggests that resting electrocardiogram signals may contain enough information for ischemic heart screening at outpatient clinics, without the help of stress tests required by the current standard procedure.

Estate Khmaladze

Title: On infinite divisibility and the nature of Zipf's law

Abstract: In a very long row of frequencies of rare and very rare events - like rare words in long texts, different rare species in ecological surveys, amount of admixtures in naturally sampled substances, etc., one can observe the presence of the famous *Zipf's law*. The law says that if in a large sample of size n , $\mu_n(k)$ stands for a number of events, which one observed exactly k times, and μ_n stands for total number of different events that one has observed, then

$$\frac{\mu_n(k)}{\mu_n} \rightarrow \frac{1}{k(k+1)}, \quad n \rightarrow \infty.$$

While the behaviour of $\mu_n(k)$ -s are in everybody's view, the probabilities of the events we observe remain unknown. It is completely not true that this behaviour is the same as the fractions above. Therefore, observing something close to the Zipf's law, we still do not know what sort of regularity in probabilities drive our frequencies. In this talk we show that there is an infinitely divisible distribution F on positive half-line, with its Lévy measure M , such that it describes underlying probabilities and that

$$\frac{\mu_n(k)}{\mu_n} \rightarrow \int_0^\infty \frac{z^k}{k!} e^{-z} M(dz).$$

Thus one would say that Zipf's law is followed by increments of a Poisson process in random time, or subordinator - an increasing Lévy process, driven by M .

Yury Kutoyants

Title: On cusp location estimation for some stochastic processes: a survey

Abstract: We present a review of some recent results of change point location estimation for several models of observations. We consider cusp-type change points problems for the i.i.d. random variables, Poisson and diffusion processes. We present the motivation why cusp-type singularity corresponds better to the traditional (discontinuous) models and describe the properties of the maximum likelihood and Bayes estimators in different asymptotics. The question of the asymptotic efficiency is discussed as well and the results of some numerical simulations are given. We give heuristic proves of the convergence of log-likelihood ratios of different models to the fractional Brownian motion.