Name: Yuta Koike

Research field: Probability Theory / Mathematical Statistics

Key words: Asymptotic statistics, Limit theorem, Stochastic calculus, High-frequency data, Financial econometrics, High-dimensional data

Current research: My current main research areas are (1) high-frequency financial econometrics, (2) statistical inference for stochastic processes, and (3) limit theorems for high-dimensional data. Recently, I have been working especially on subject (3). These three research topics are not independent from each other, but are deeply related to each other. In particular, my applied interest is in (1), and mathematical problems I study in (2) and (3) are mostly originated in (1). For this reason, derived from (1), I may be interested in mathematical problems outside the areas of (2) and (3) in the future. In fact, although subject (2) was originally my main research area, the need to solve a certain problem that emerged in subject (1) led me to work on subject (3). Recently, I have also been working on the problem of applying machine learning methods to statistical inference for stochastic processes.

Notice for students: Mathematically, it is desirable that you have learned measure theory and basics of probability theory (such as conditional expectations and martingales). Some knowledge of functional analysis and stochastic calculus (such as semimartingale theory and Malliavin calculus) will also be useful.

My research area is statistics and thus closely related to actual problems; you will need to apply theories you develop to real data and interpret their consequences. Then, you will need some knowledge of the areas from which the data are taken, so it is important that you are interested in areas other than mathematics as well; it is better if you already have some knowledge of such an area. My current research area is related to finance, but statistics is used in many areas other than finance, so I recommend you to be interested in various areas which are not necessarily limited to mathematics and finance.

Also, since it is usually difficult to ensure the mathematical validity of a statistical method in an exact manner for a complex model, one commonly consider a virtual situation where the sample size of data tends to infinity and establish a relevant limit theorem to validate the method. Formally, such an argument does not ensure the validity of the method for a fixed sample size, so one needs to assess finite sample performance of the method by numerical experiments. For this purpose one needs to implement the statistical method as a computer program, so it is convenient for you to have knowledge of programming.