

MOOCs 2 (Massive Open Online Course 2) Report of 2018 by Professor Ryoichi Yamamoto (Self-paced)

Course Name: Stochastic Processes: Data Analysis and Computer Simulation

Course Start Date: Oct. 1, 2018 9:00 UTC

Course End Date: Aug. 1, 2019 23:30 UTC

Total Enrollment: 4006

Completed Enrollment: 62

Verified Enrollment: 92 (fee'd)

Verified Completed Enrollment: 52

Enrollment from 130 Countries/Regions in Total

---Top10 Countries---

USA	627
India	248
UK	160
Germany	141
France	108
Canada	106
Brazil	104
Mexico	97
China	87
Japan	82

Age Group

< 25 24.7 %

25-40 59.2 %

41 < 16.1 %

Syllabus

Week 1: Python programming for beginners

Using Python, iPython, and Jupyter notebook

Making graphs with matplotlib

The Euler method for numerical integration

Simulating a damped harmonic oscillator

Week 2: Distribution function and random number

Stochastic variable and distribution functions

Generating random numbers with Gaussian/binomial/Poisson distributions

The central limiting theorem

Random walk

Week 3: Brownian motion 1: basic theories

Basic knowledge of Stochastic process

Brownian motion and the Langevin equation

The linear response theory and the Green-Kubo formula

Week 4: Brownian motion 2: computer simulation

Random force in the Langevin equation

Simple Python code to simulate Brownian motion

Simulations with on-the-fly animation

Week 5: Brownian motion 3: data analyses

Distribution and time correlation

Mean square displacement and diffusion constant

Interacting Brownian particles

Week 6: Stochastic processes in the real world

Time variations and distributions of real world processes

A Stochastic Dealer Model I

A Stochastic Dealer Model II

A Stochastic Dealer Model III