

## Hayato Saigo (Nagahama I-Bio) Why the arcsine law?

### Abstract

here is a probability distribution called the Arcsine law. This probability distribution appears in unexpected occasions, and in various fields of mathematics. Perhaps one of the most famous appearances is that Paul Lévy discovered in connection with some interesting properties such as "percentage of time staying on the positive side" for the Brownian movement. Later on, the appearance of the Arcsine law in this sense also proved by "combinatorial" way. In quantum probability theory (also called non-commutativity probability theory or algebraic probability theory), the Arcsine law plays universal roles as the central limit distribution with respect to "monotone independence" or as the "classical limit" of "quantum-classical correspondence". Furthermore, it appears as a limit distribution of (continuous time) quantum walk on  $\mathbb{Z}$ , and it can also be caught as "graph zeta" on  $\mathbb{Z}$ . And when you look closely, even in number theory you can see it! Here is the question: Why the Arcsine law? Unfortunately the speaker cannot give brief the answer at this time, however, will outline the characterization of the Arcsine law from the viewpoint of quantum probability theory and the strategy for the investigation on the fundamental question.