In this lecture, we introduce the Poisson process, which is a continuous time analog of the Bernoulli process.

One way of thinking about it is as follows.

Time is continuous, but conceptually we divide it into a very large number of slots.

And during each slot, we have a tiny probability of an arrival.

This probability is proportional to the length of the slot.

Furthermore, we have an independence assumption for the different slots.

The Poisson process is a very elegant model of arrival processes in continuous time.

It models many real-world phenomena.

And it also has a very clean mathematical structure that allows us to calculate practically every quantity of interest.

Our development will parallel our analysis of the Bernoulli process.

For example, we will find the PMF of the number of arrivals during a time interval and the PDF of the time of the kth arrival.

We will discuss the memorylessness properties of the Poisson process.

Similar to the case of the Bernoulli process, this is just a consequence of the independence assumptions that we are making.

We will then exploit these independence properties to argue that the interarrival times are independent exponential random variables.

And we will conclude with a comprehensive example.