

Summary Introduction Statistical Thermodynamics

Statistics

Class #1 22/09/20

Concepts

Random variable: Is a variable whose value depends of a aleatory event, (Eg. throw a dice or a coin.)

Exist two class of random variables **discrete** and **continuous** :

- **Discrete:** Are an array of finite values.
- **Continuous:** Are an array of infinite values.

Discrete variables

Throw a dice is an example of aleatory event, and the array of discrete values is $[1,2,3,4,5,6]$, if we want to know which are the probability to get the value 5 when throw the dice once, by our logic know that the probability is $\frac{1}{6}$, and this is true, but the reason behind of this is explain

So we can call S to the array of the discrete values (*communly called "sample space"*), and n the number of possibles values that S can be.

$$S = [s_i, s_{i+1}, s_{i+2} \dots s_n] \quad (1)$$

The same way we can define the array of probabilities for each values.

$$P = [p_i, p_{i+1}, p_{i+2} \dots p_n] \quad (2)$$

Example: for a coin $S = [sideA, sideB]$ by logic we know that the probability to get the *sideA* or *sideB* must be $\frac{1}{2}$ this is because have two available values for the coin, we normalization the probability to 1, like this:

$$\sum_{i=1}^n p_i = 1 \quad (3)$$

For a coin the probability must be 1 this is

$$p_{coin} = p_1 + p_2 = \frac{1}{2} + \frac{1}{2} = 1$$

This tell us and explaint why the probability for each event is $\frac{1}{2}$ and in the dice case is analogous.

$$p_{dice} = p_1 + p_2 + \dots + p_6 = \frac{1}{6} + \frac{1}{6} + \dots + \frac{1}{6} = 1$$

Permutations

This are the number of possibilities for a array of

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Topic X

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