

Statistics-CS	Random Variables, PDF and CDF
Tutorial 2	

- Let X denote the number of boys in a randomly selected three-child family. Assuming that boys and girls are equally likely, construct the probability distribution of X .
- The probability distribution of the random variable X = number of changes in major is shown below:

X =# changes in major	0	1	2	3	4	5	6	7	8
Probability	0.135	0.271	0.271	0.180	0.090	0.036	0.012	0.003	0.002

- What is the probability that a college student will change majors at most once?
 - John's parents are concerned that he has decided to change his major for the second time and claims that it is not unusual. Find the probability that a randomly selected college student will change his major as often as or more often than John?
 - What is the probability that a student will change majors 5 or 6 times?
 - What is the probability that a student will change majors at least once?
- You apply for a job in a factory that claims that the average salary is above 3,500€. With a sad surprise you see that your first earning is 2,000€. Do you have a strong proof that the ad was a fake? Construct a probability distribution for a random variable that describes salary for a staff that consist of 100 workers with 2,000€, 10 managers that earn 10,000€ and two directors with 50,000€.
 - The amount of time, in minutes, that a person must wait for a bus is uniformly distributed between zero and 15 minutes, inclusive.
 - What is the probability that a person waits fewer than 12.5 minutes?
 - On the average, how long must a person wait? Find the mean, μ , and the standard deviation, σ .
 - Ninety percent of the time, the time a person must wait falls below what value?
 - Given the Random Variable X has density function:

$$f(x) = \begin{cases} 2x & 0 < x < a \\ 0 & \text{otherwise} \end{cases}$$

- Determine a
 - Find $P(\frac{1}{2} < X < \frac{3}{4})$ and $P(-\frac{1}{2} < X < \frac{1}{2})$.
- The length of time X , needed by students in a particular course to complete a 1 hour exam is a random variable with PDF given by

$$f(x) = \begin{cases} (k(x^2 + x)), & \text{if } 0 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

- Find the value of k that makes $f(x)$ a PDF?
- Find the CDF.
- Use CDF to find $P(X \leq 1)$ and $P(X \leq 2)$
- Find the probability that that a randomly selected student will finish the exam in less than half an hour.
- Find the mean time needed to complete a 1 hour exam and standard deviation of X .