Faculty Of Computers and Artificial Intelligence

Cairo University

212202.FCI.AI496.Selected Topics in Artificial intelligence-2

Assignment (1)

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Submitted to

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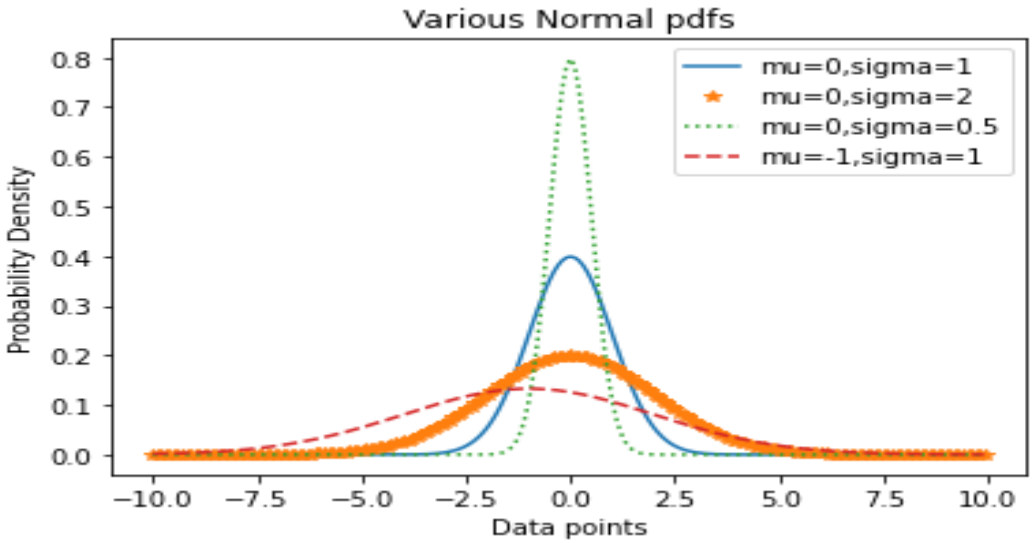
Probabibility Density Function

1-Normal distribution

$$f(x;\mu,\sigma) = \frac{1}{\sqrt{2\pi \cdot \sigma^2}} \cdot e^{-\frac{1}{2}\cdot\left(\frac{x-\mu}{\sigma}\right)^2}$$




```
output=normal_pdf(.5, mu=0.0, sigma=1.0)

output=0.3520653267642995
```

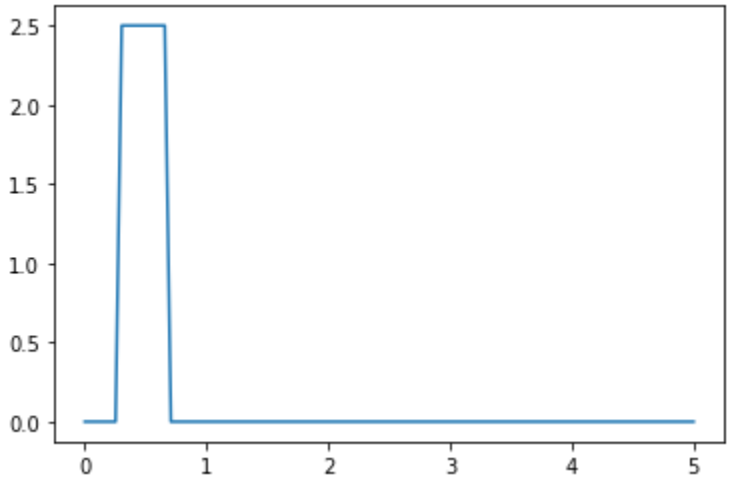
2-Uniform distribution

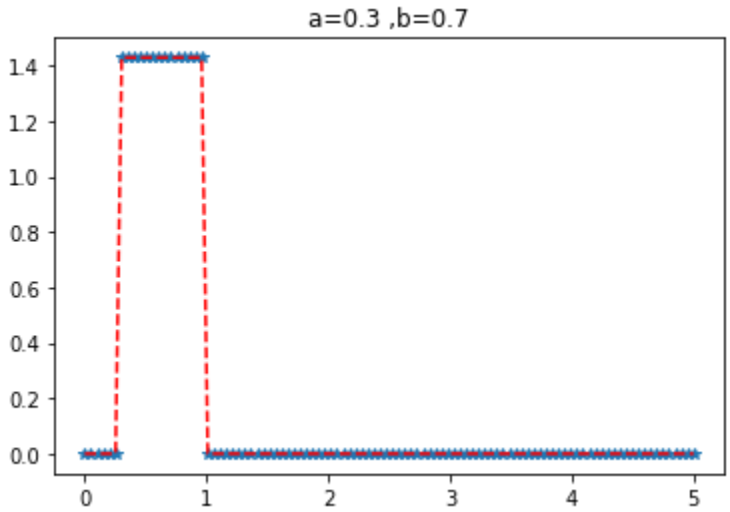
$$p(x) = \begin{cases} \frac{1}{b-a} & x \in [a,b], \\ 0 & x \notin [a,b]. \end{cases}$$

TASK

a=5.5 b=10

```
uniform_pdf(8,5.5,10)=0.2222222222222222
```



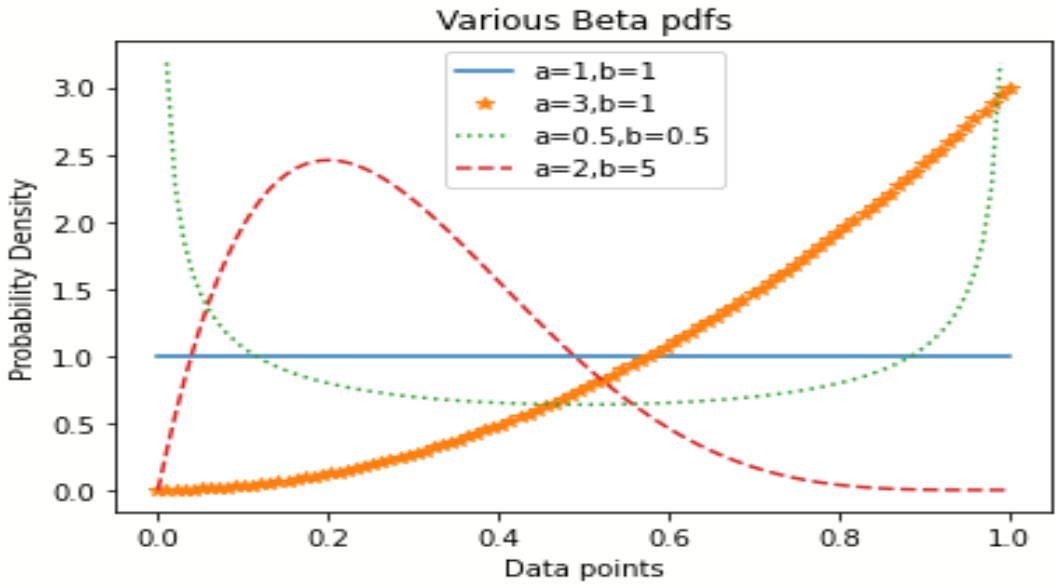


3-Beta distribution

$$P(x;\alpha,\beta) = (const) * x^{\alpha-1} * (1-x)^{\beta-1}$$
$$const = \Gamma(\alpha+\beta)/[\Gamma(\alpha) * \Gamma(\beta)]$$

```
output=beta_pdf(.2,2,5)
```

```
output=2.4576000000000007
```



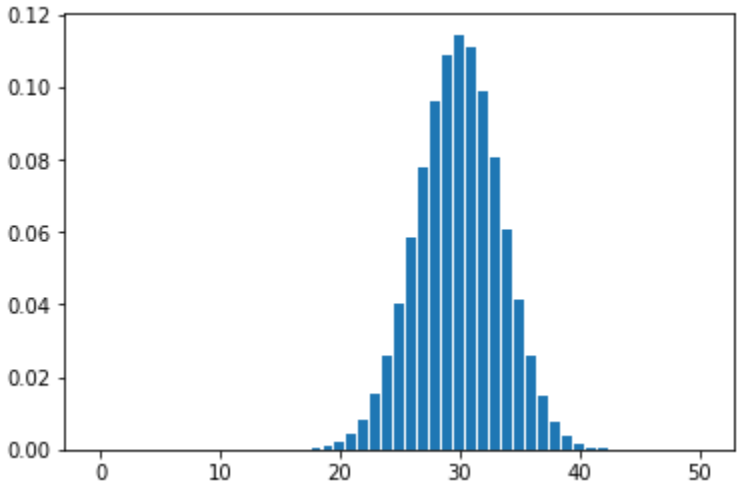
4-Binomial distribution

$$P(r;N,p)=\left(\frac{N!}{r!(N-r)!}\right)p^r(1-p)^{N-r}$$

mean=Np, variance=$Np(1-p)$

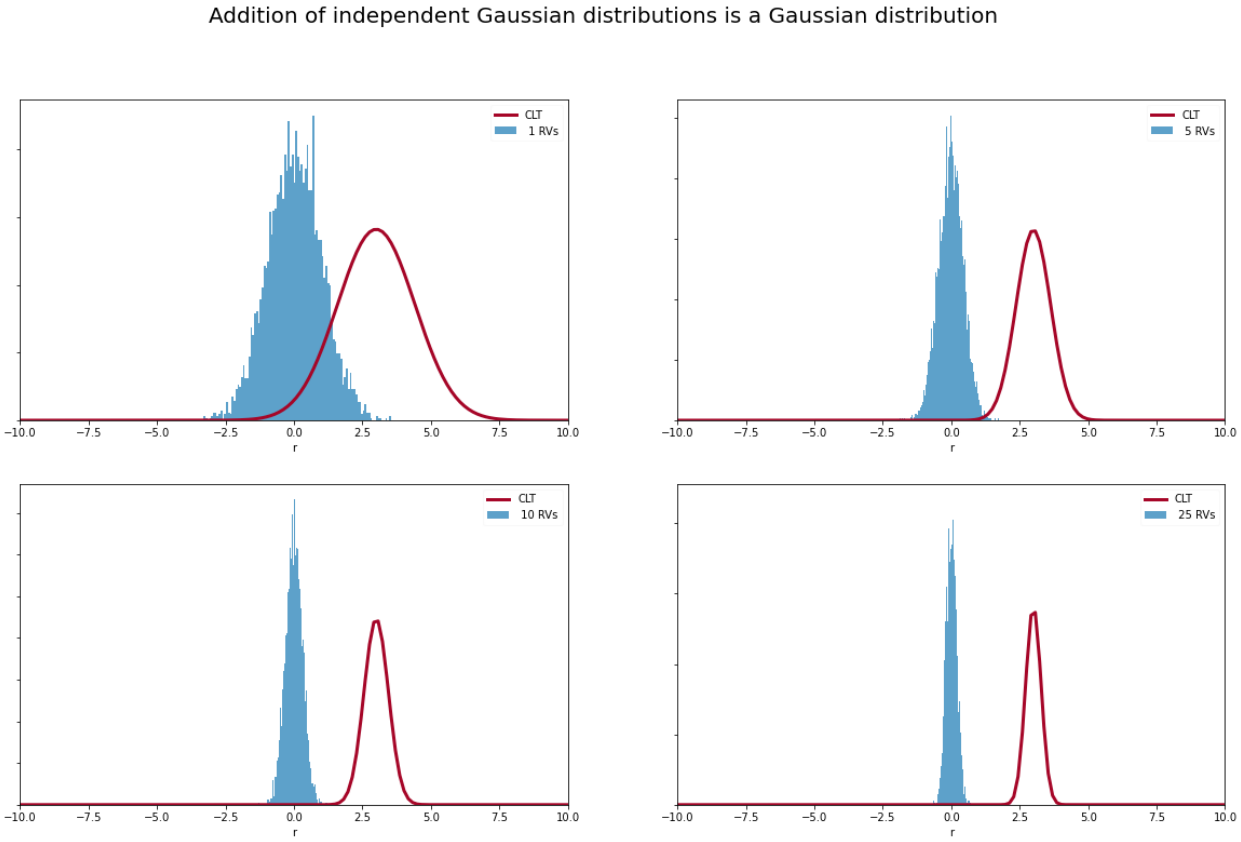
Binomial(r=15,n=30,p=0.6)

```
output =binomial(15,30,.6)
output =0.07831220968608016
```



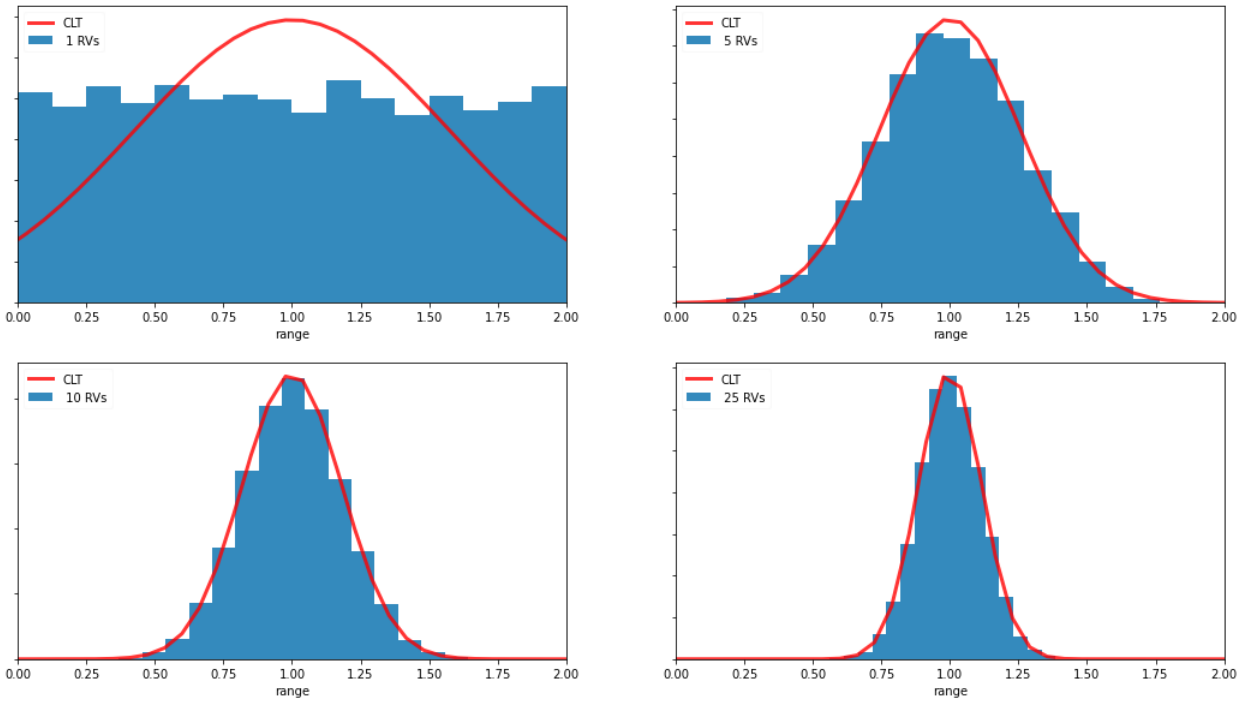
Central Limit Theorem

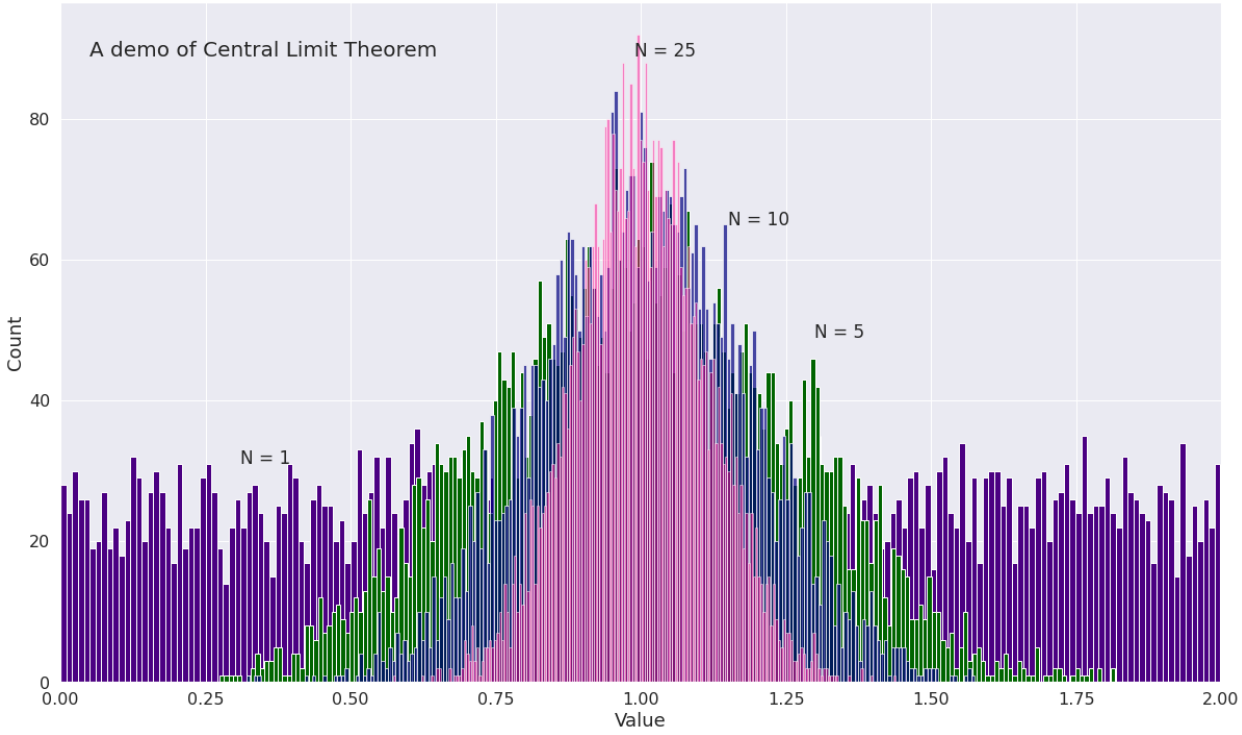
1- Normal (m = 3, var = 2)



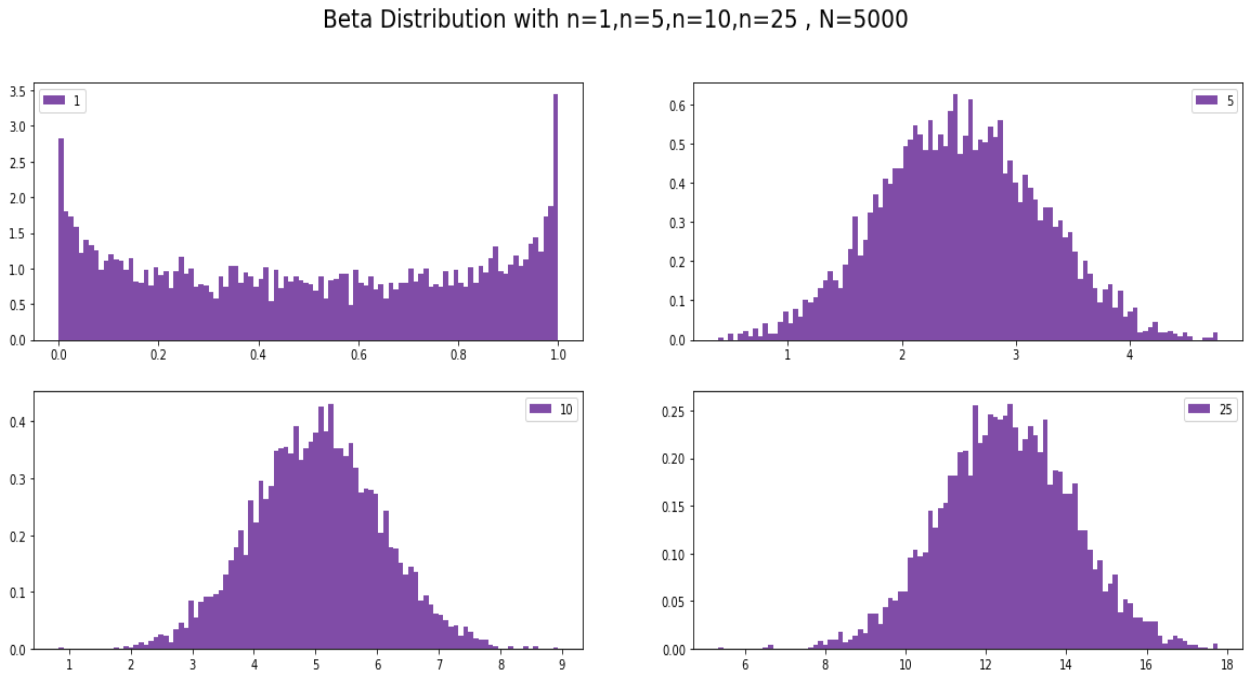
2- Uniform(0 to 2)

Addition of uniform random variables (RVs) converge to a Gaussian distribution (CLT)





3- Beta on a,b = (0.7,0.7)



4- Beta on a,b = (3,1)