During my doctoral research, I had used the software Mathematica by (Stephen) Wolfram. My visits to the Wolfram Mathworld webpage gradually became rare events. I visited it recently and landed at their pages of probability & statistics. And I couldn't help exclaim, 'how beautifully demonstrated!"

Maybe I was too distracted back then to have not noticed, or I was too much into differential equations PDEs 😉

✅ https://mathworld.wolfram.com/topics/ProbabilityandStatistics.html

➡️ The French Mathematician, A. de Moivre developed 'normal distribution' of a variate (with mean & variance) as an approximation to 'binomial distribution'.
https://mathworld.wolfram.com/BinomialDistribution.html

The normal distribution becomes a 'standard normal distribution' of a variate with zero mean & unity variance.
https://mathworld.wolfram.com/NormalDistribution.html

➡️ The ratio of two standard normal variates gets us a Cauchy variate.
https://mathworld.wolfram.com/CauchyDistribution.html

➡️ The square of a standard normal variate gets us a Chi-squared variate.
https://mathworld.wolfram.com/Chi-SquaredDistribution.html

➡️ The addition/sum of Chi-squared variates gets us a gamma variate (another Chi-squared variate) and the ratio of two independent gamma variates gets us a beta variate.

https://mathworld.wolfram.com/GammaDistribution.html

➡️ The beta distribution, for both shape parameters equal to unity that is, beta (1, 1) becomes a standard uniform distribution.
https://mathworld.wolfram.com/UniformDistribution.html

➡️ One can use Box-Muller transformation on two independent standard uniform variates to arrive at two standard normal variates.
https://mathworld.wolfram.com/Box-MullerTransformation.html

I dug up the web deeper and found this illustration of the relationships between distributions:

https://www.math.wm.edu/~leemis/chart/UDR/UDR.html