

MSE-213

Probability and statistics for materials science

Lecture 3

Doping / Tests

If you follow Christian ethics (you try to avoid false punishment more than avoiding leaving someone unpunished, cf Matthew 13:29), is this test a good basis for decisions?



Yes

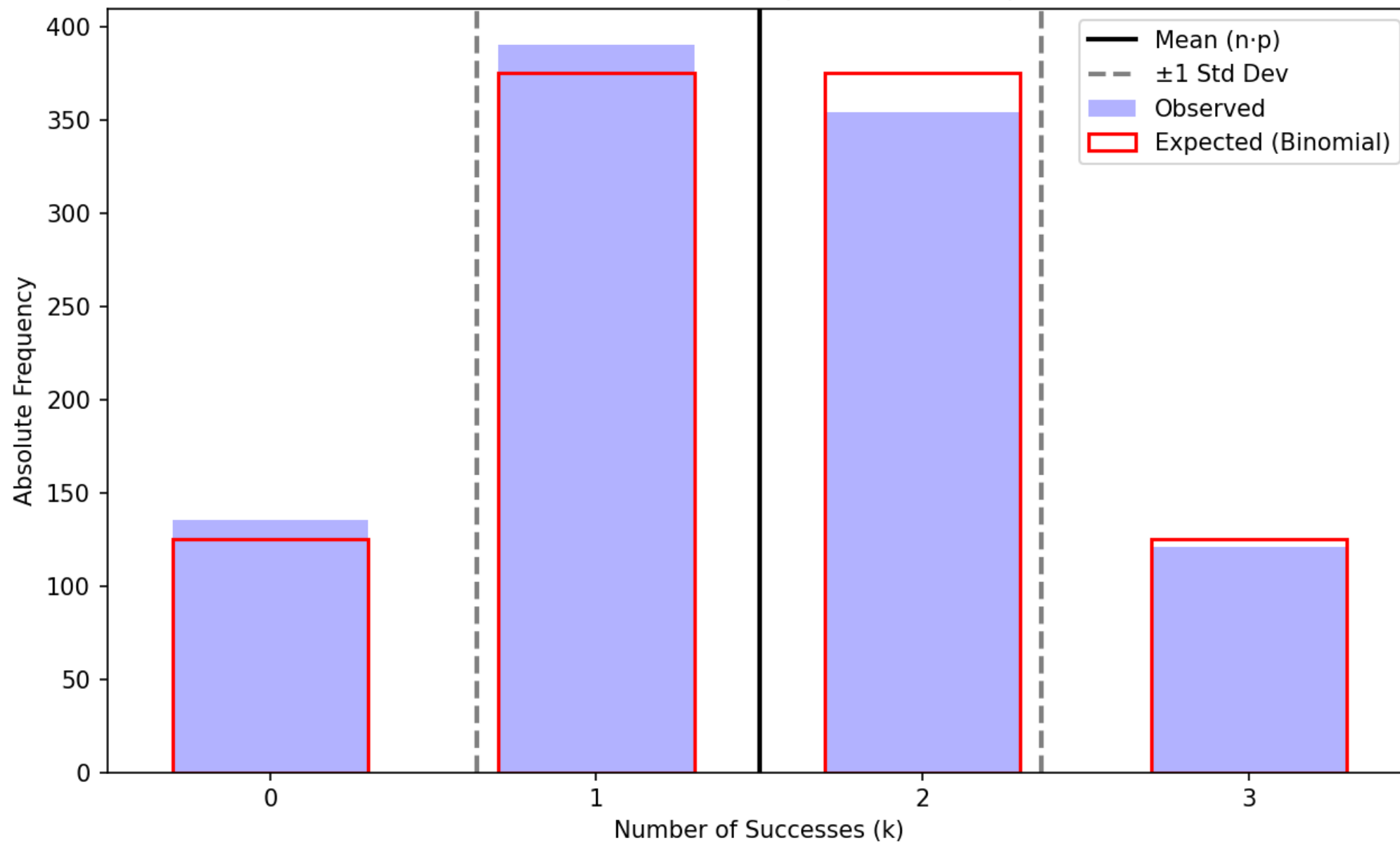


No

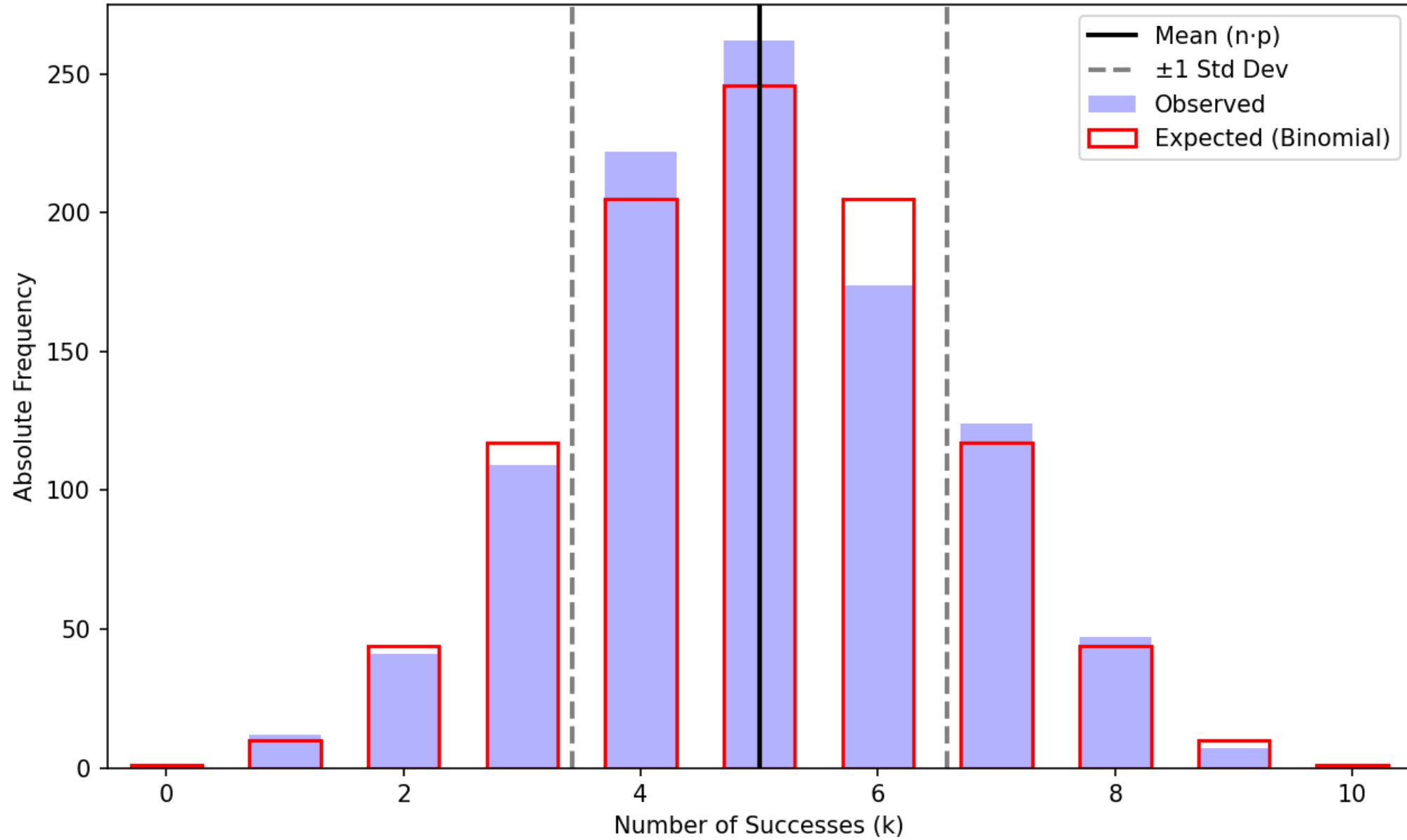


Depends on other parameters

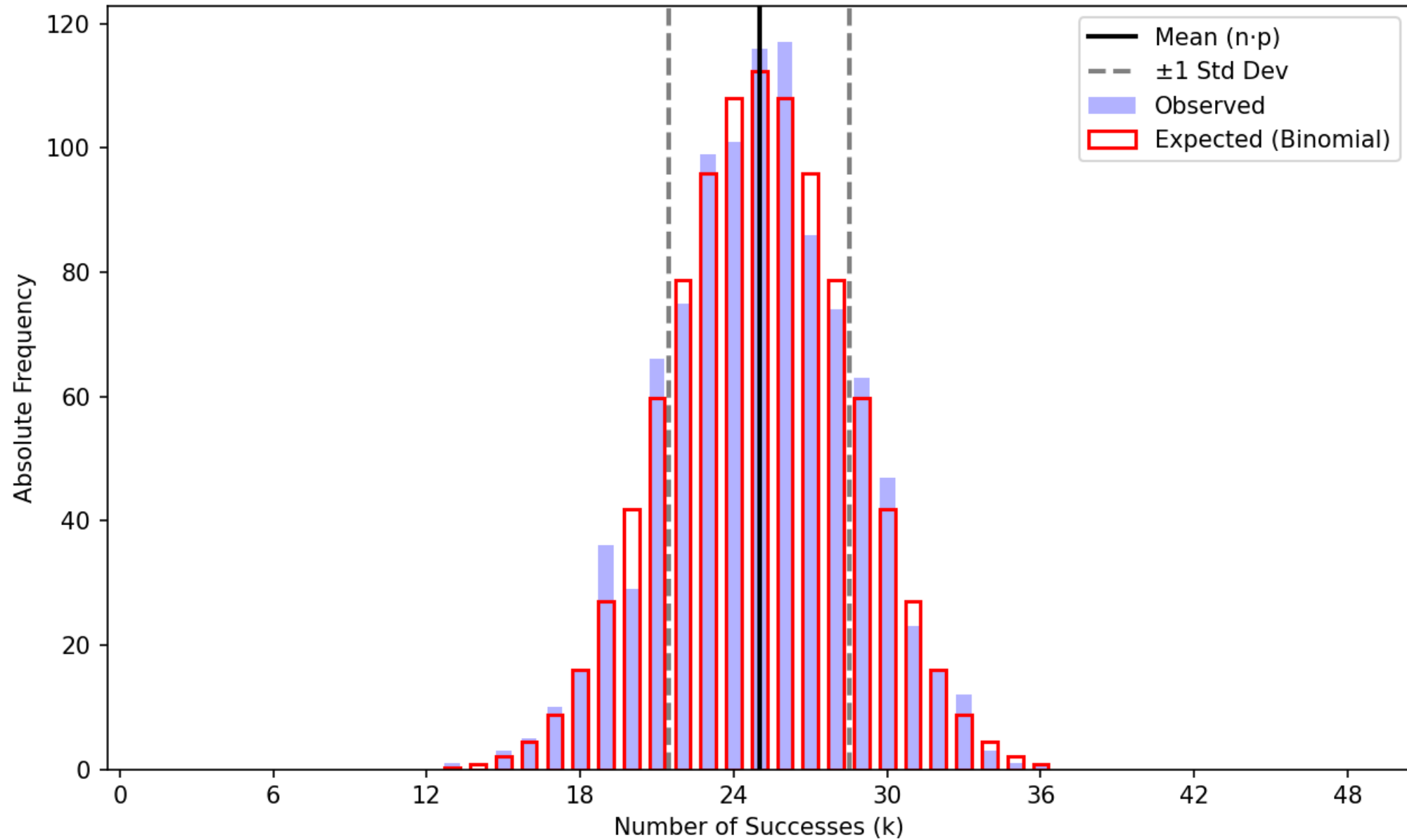
Bernoulli Distribution ($n=3, p=0.5$) 1000 Repetitions



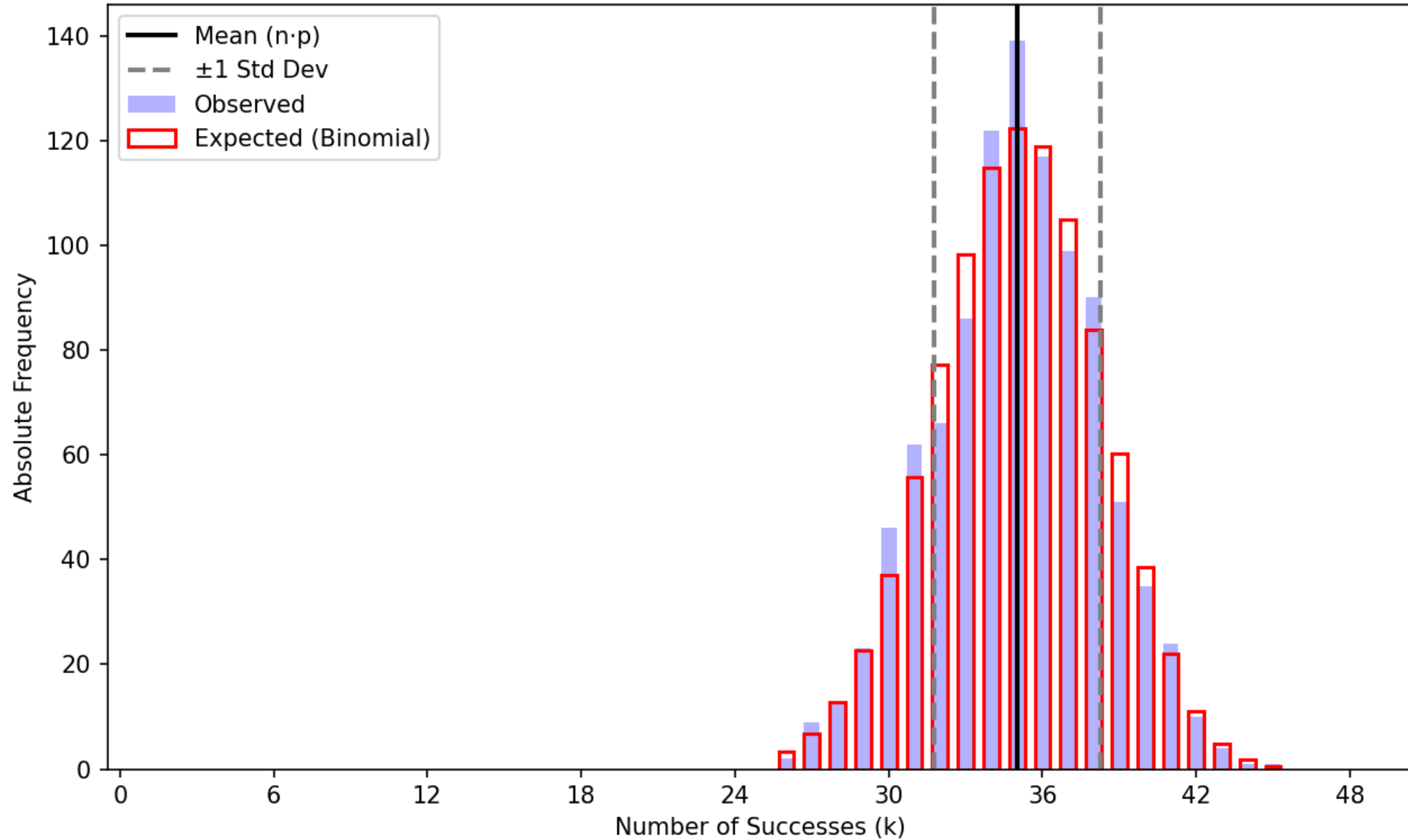
Bernoulli Distribution ($n=10, p=0.5$) 1000 Repetitions



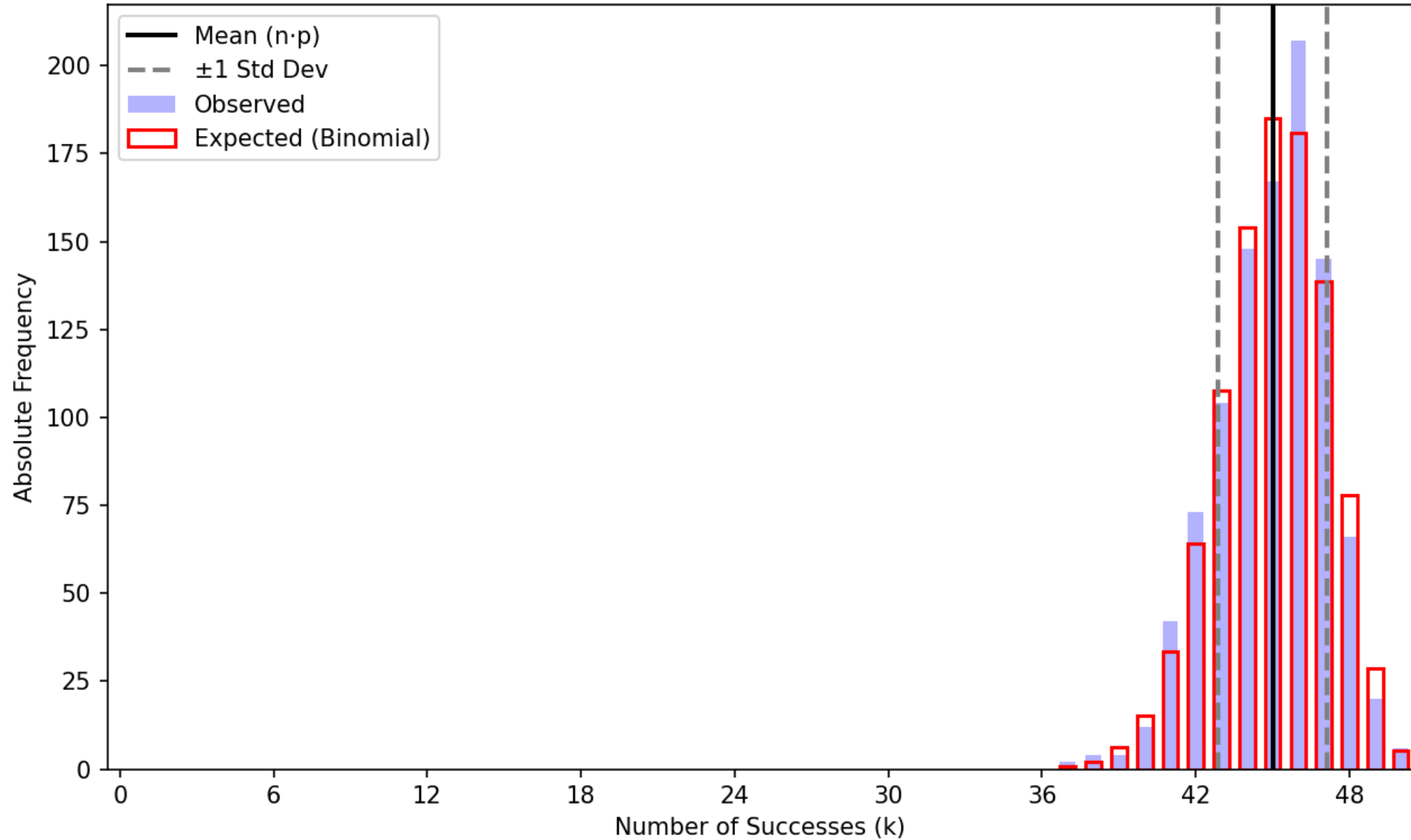
Bernoulli Distribution ($n=50, p=0.5$) 1000 Repetitions



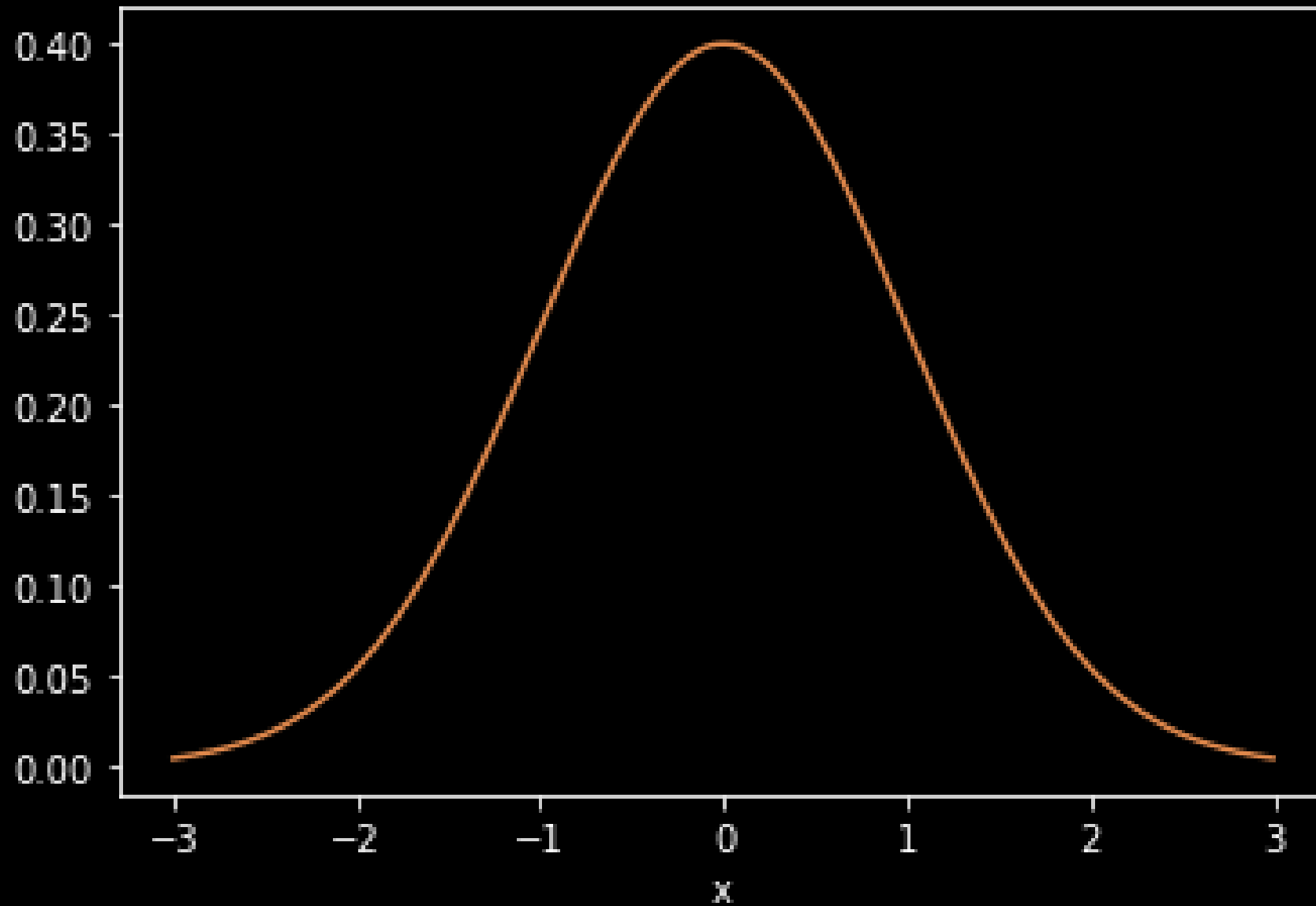
Bernoulli Distribution ($n=50, p=0.7$) 1000 Repetitions



Bernoulli Distribution ($n=50, p=0.9$) 1000 Repetitions

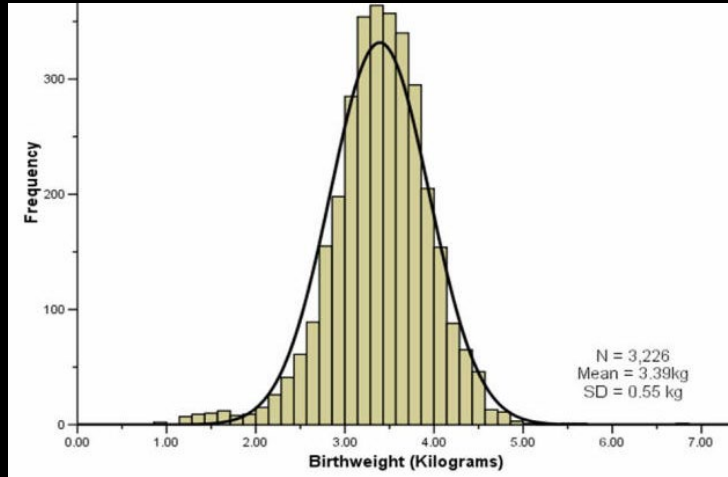


The Normal/Gaussian distribution



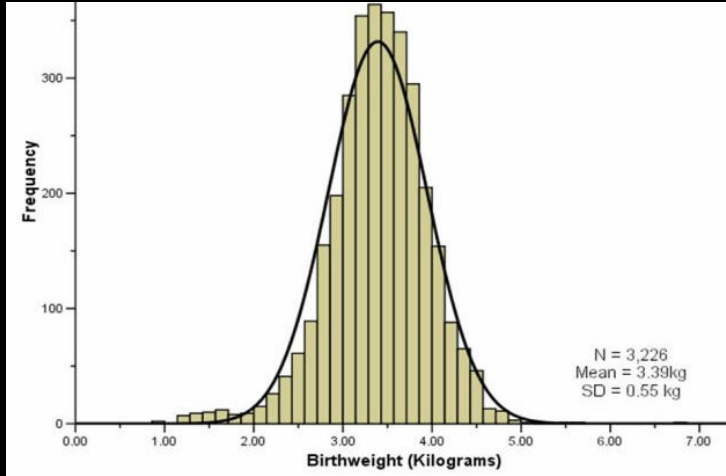
The Normal/Gaussian distribution

Birthweight

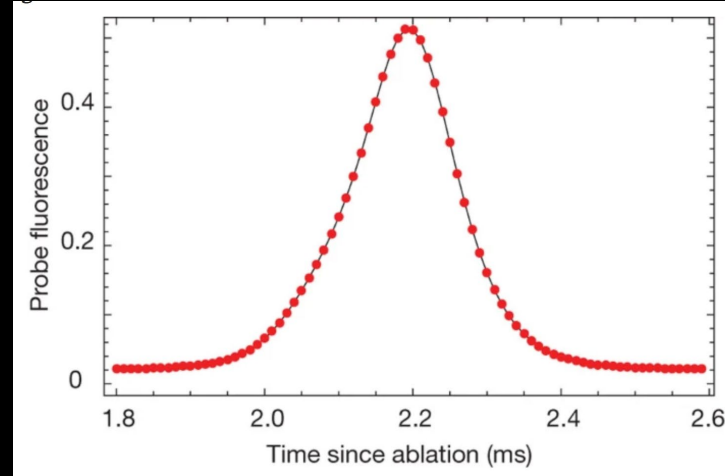


The Central Limit Theorem

Birthweight

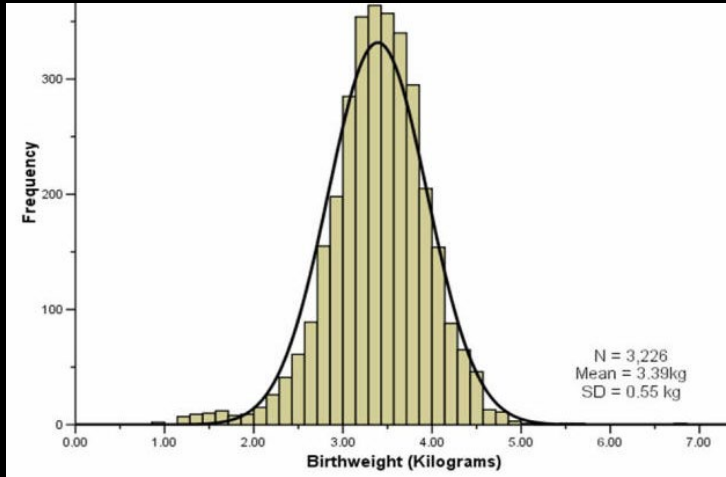


Fluorescence of atoms

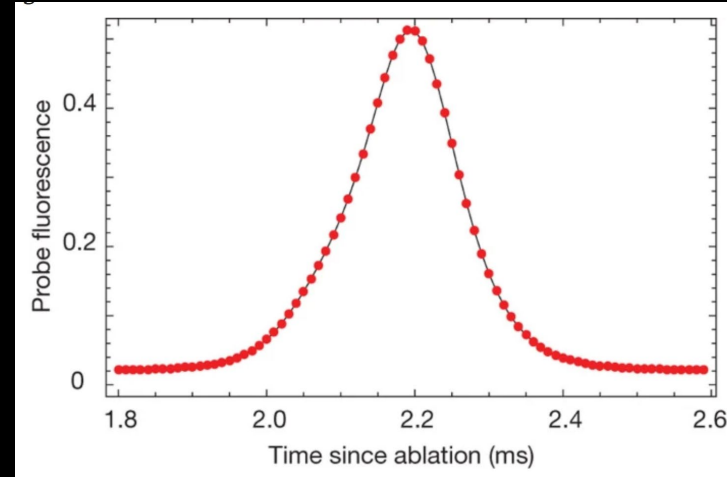


The Normal/Gaussian distribution

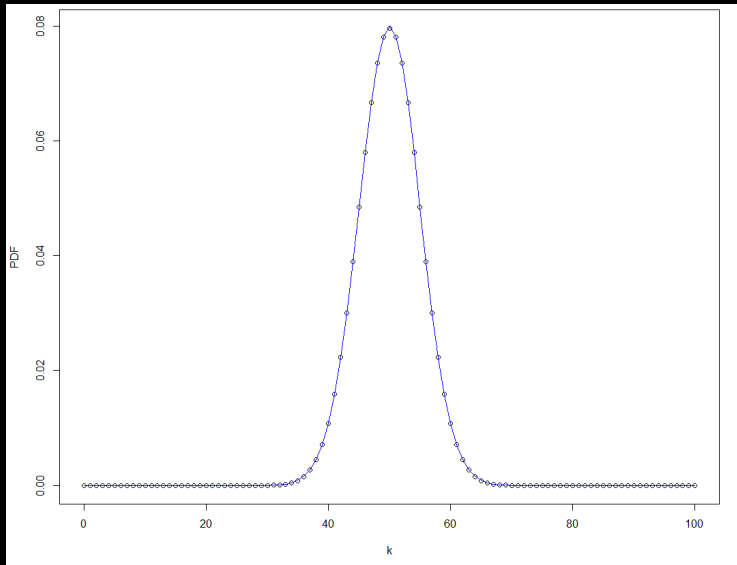
Birthweight



Fluorescence of atoms

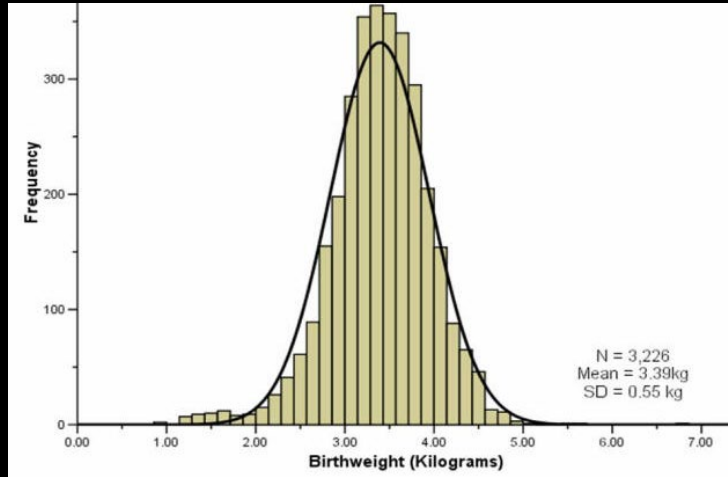


of heads in 50 coin tosses

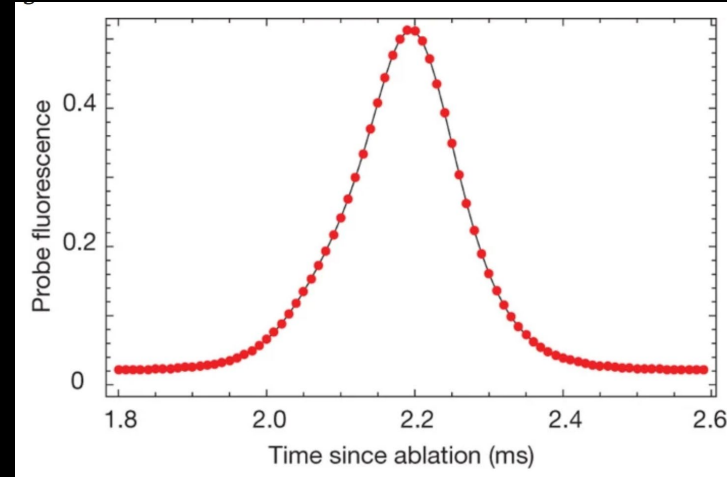


The Normal/Gaussian distribution

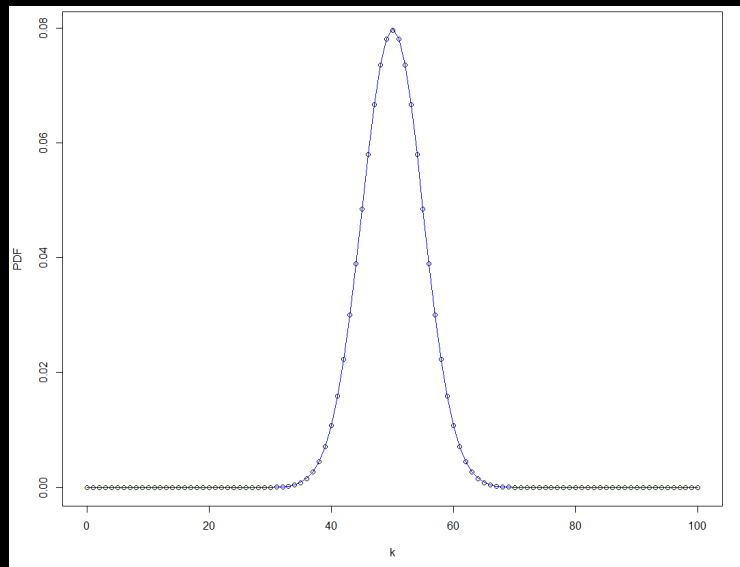
Birthweight



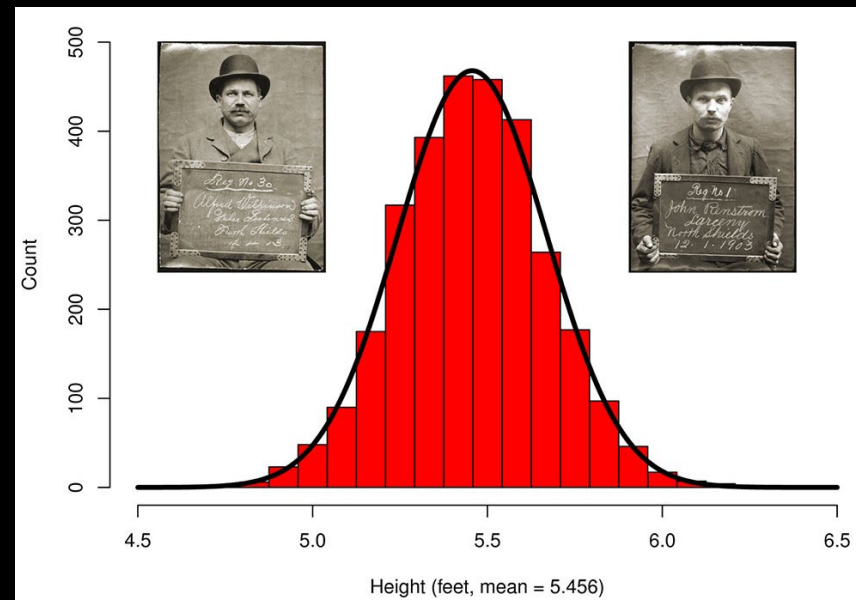
Fluorescence of atoms



of heads in 50 coin tosses



Height of 300 arrested people, ca 1900



Standard normal table / z table / z-score table

see for example ztable.io. On Moodle.

Cumulative distribution function (CDF) of the centered and reduced normal distribution (z-table) /
 Tableau de la fonction de répartition normale centrée et réduite.

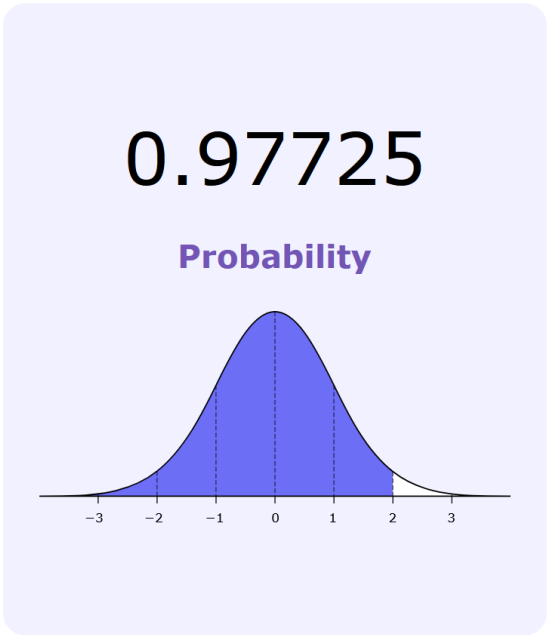
z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$	z	$\Phi(z)$
0,00	0,500	0,72	0,764	1,44	0,9251	2,16	0,9846	2,88	0,99801	3,80	0,9999277
0,02	0,508	0,74	0,770	1,46	0,9279	2,18	0,9854	2,90	0,99813	3,84	0,9999385
0,04	0,516	0,76	0,776	1,48	0,9306	2,20	0,9861	2,92	0,99825	3,88	0,9999478
0,06	0,524	0,78	0,782	1,50	0,9332	2,22	0,9868	2,94	0,99836	3,92	0,9999557
0,08	0,532	0,80	0,788	1,52	0,9357	2,24	0,9875	2,96	0,99846	3,96	0,9999625
0,10	0,540	0,82	0,794	1,54	0,9382	2,26	0,9881	2,98	0,99856	4,00	0,9999683
0,12	0,548	0,84	0,800	1,56	0,9406	2,28	0,9887	3,00	0,99865	4,04	0,9999733
0,14	0,556	0,86	0,805	1,58	0,9429	2,30	0,9893	3,02	0,99874	4,08	0,9999775
0,16	0,564	0,88	0,811	1,60	0,9452	2,32	0,9898	3,04	0,99882	4,12	0,9999811
0,18	0,571	0,90	0,816	1,62	0,9474	2,34	0,9904	3,06	0,99889	4,16	0,9999841
0,20	0,579	0,92	0,821	1,64	0,9495	2,36	0,9909	3,08	0,99996	4,20	0,9999867
0,22	0,587	0,94	0,826	1,66	0,9515	2,38	0,9913	3,10	0,99903	4,24	0,9999888
0,24	0,595	0,96	0,831	1,68	0,9535	2,40	0,9918	3,12	0,99910	4,28	0,9999907
0,26	0,603	0,98	0,836	1,70	0,9554	2,42	0,9922	3,14	0,99916	4,32	0,9999922
0,28	0,610	1,00	0,841	1,72	0,9573	2,44	0,9927	3,16	0,99921	4,36	0,9999935

Z-Score Table (Standard Normal Table)

Compute a P-value from a Z-score

ZScore (x)





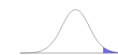
$P(Z < x)$

0.97725



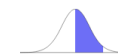
$P(Z > x)$

0.02275



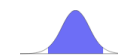
$P(0 < Z < x)$

0.47725



$P(-x < Z < x)$

0.95450



$P(Z < -x \text{ or } Z > x)$

0.04550

