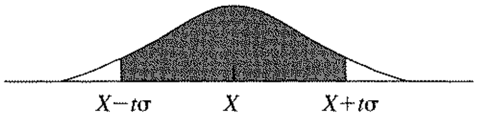
Link 06/05/2020

- Link alle due lezioni registrate:
  - https://drive.google.com/open?id=1FJYYv634ovNBrOabmrAZT7QWg-V8z3-S

Table A. The percentage probability, $Prob(\text{within } t\sigma) = \int_{X-t\sigma}^{X+t\sigma} G_{X,\sigma}(x)\,dx$, as a function of t.



t	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.00	0.80	1.60	2.39	3.19	3.99	4.78	5.58	6.38	7.17
0.1	7.97	8.76	9.55	10.34	11.13	11.92	12.71	13.50	14.28	15.07
0.2	15.85	16.63	17.41	18.19	18.97	19.74	20.51	21.28	22.05	22.82
0.3	23.58	24.34	25.10	25.86	26.61	27.37	28.12	28.86	29.61	30.35
0.4	31.08	31.82	32.55	33.28	34.01	34.73	35.45	36.16	36.88	37.59
0.5	38.29	38.99	39.69	40.39	41.08	41.77	42.45	43.13	43.81	44.48
0.6	45.15	45.81	46.47	47.13	47.78	48.43	49.07	49.71	50.35	50.98
0.7	51.61	52.23	52.85	53.46	54.07	54.67	55.27	55.87	56.46	57.05
0.8	57.63	58.21	58.78	59.35	59.91	60.47	61.02	61.57	62.11	62.65
0.9	63.19	63.72	64.24	64.76	65.28	65.79	66.29	66.80	67.29	67.78
1.0	68.27	68.75	69.23	69.70	70.17	70.63	71.09	71.54	71.99	72.43
1.1	72.87	73.30	73.73	74.15	74.57	74.99	75.40	75.80	76.20	76.60
1.2	76.99	77.37	77.75	78.13	78.50	78.87	79.23	79.59	79.95	80.29
1.3	80.64	80.98	81.32	81.65	81.98	82.30	82.62	82.93	83.24	83.55
1.4	83.85	84.15	84.44	84.73	85.01	85.29	85.57	85.84	86.11	86.38
1.5	86.64	86.90	87.15	87.40	87.64	87.89	88.12	88.36	88.59	88.82
1.6	89.04	89.26	89.48	89.69	89.90	90.11	90.31	90.51	90.70	90.90
1.7	91.09	91.27	91.46	91.64	91.81	91.99	92.16	92.33	92.49	92.65
1.8	92.81	92.97	93.12	93.28	93.42	93.57	93.71	93.85	93.99	94.12
1.9	94.26	94.39	94.51	94.64	94.76	94.88	95.00	95.12	95.23	95.34
2.0	95.45	95.56	95.66	95.76	95.86	95.96	96.06	96.15	96.25	96.34
2.1	96.43	96.51	96.60	96.68	96.76	96.84	96.92	97.00	97.07	97.15
2.2	97.22	97.29	97.36	97.43	97.49	97.56	97.62	97.68	97.74	97.80
2.3	97.86	97.91	97.97	98.02	98.07	98.12	98.17	98.22	98.27	98.32
2.4	98.36	98.40	98.45	98.49	98.53	98.57	98.61	98.65	98.69	98.72

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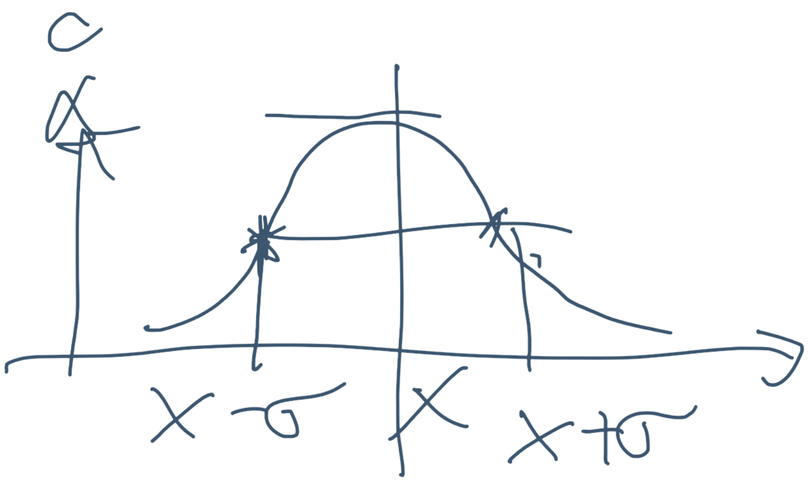
(1

$$f_{X,\sigma}(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-X)^2}{2\sigma^2}}$$

$$\bar{x} \equiv X$$

$$\sigma_x^2 = \sigma^2$$

$$\int_a^b f_{X,\sigma}(x)\,dx$$



$$\int_{X-\sigma}^{X+\sigma} f_{X,\sigma}(x)\,dx$$

$$\frac{1}{\sigma\sqrt{2\pi}}\int_{X-\sigma}^{X+\sigma} e^{-\frac{(x-X)^2}{2\sigma^2}}dx = \frac{1}{\sigma\sqrt{2\pi}}\int_{-\sigma}^{\sigma} e^{-\frac{y^2}{2\sigma^2}}dy =$$

$$y = x - X$$

$$y_1 = \cancel{X} - \sigma - \cancel{X} = -\sigma$$

$$y_2 = \cancel{X} + \sigma - \cancel{X} = \sigma$$

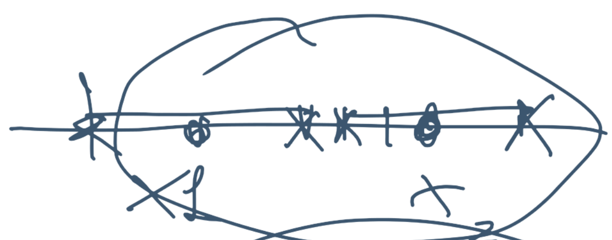
$$= \frac{1}{\cancel{\sigma}\sqrt{2\pi}}\int_{-1}^{1} e^{-\frac{z^2}{2}}\cancel{\sigma}\,dz = 0.68$$

$\sim 70\%$

$$z = \frac{y}{\sigma}$$

$$z_1 = \frac{y_1}{\sigma} = \frac{-\sigma}{\sigma} = -1$$

$$z_2 = \frac{y_2}{\sigma} = \frac{+\sigma}{\sigma} = +1$$



$\bar{x} \pm \sigma$

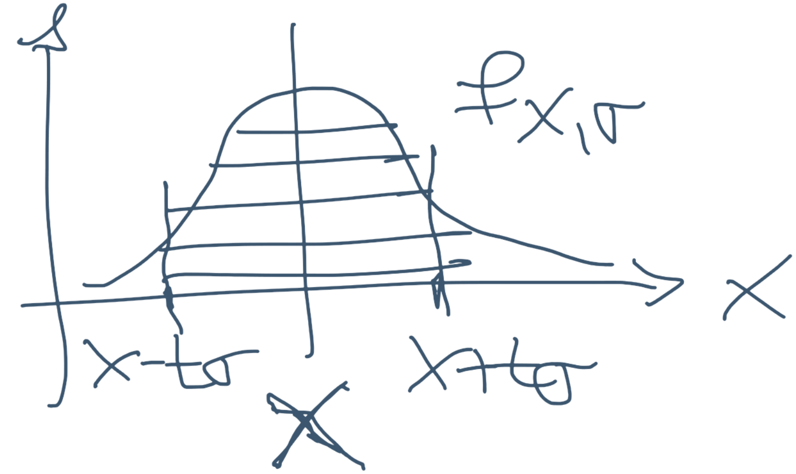
1.2 ± 0.3

$1.6 \sim 1 - 70\% \sim 30\%$

1.9 $\boxed{2\sigma}$

$$\frac{1}{\sigma\sqrt{2\pi}}\int_{X-t\sigma}^{X+t\sigma} e^{-\frac{(x-X)^2}{2\sigma^2}}dx \rightsquigarrow \frac{1}{\sqrt{2\pi}}\int_{-t}^{t} e^{-z^2/2}dz$$

$$\frac{1}{\sqrt{2\pi}\,\sigma}\, e^{-\frac{(x-X)^2}{2\sigma^2}} = f_{X,\sigma}(x)$$



PROBABILITÀ

$$\int_a^b f_{X,\sigma}(x)\,dx$$

$$a = X - t\sigma$$
$$b = X + t\sigma$$

$y = x - X$

$z = \frac{y}{\sigma}$

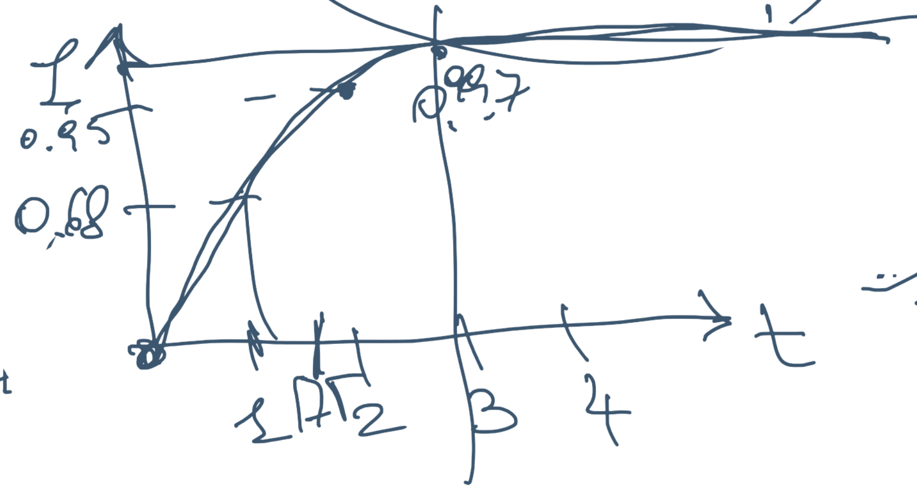
$f_{0,1}(z)$

$\int_{-1}^{1}$ 68%

$\int_{-2}^{2}$ 95.4%

$\int_{-3}^{3}$ 99.7

$\int_{-4}^{4}$ 99.99



$$\frac{1}{\sqrt{2\pi}}\int_{-t}^{t} e^{-z^2/2}\,dz$$

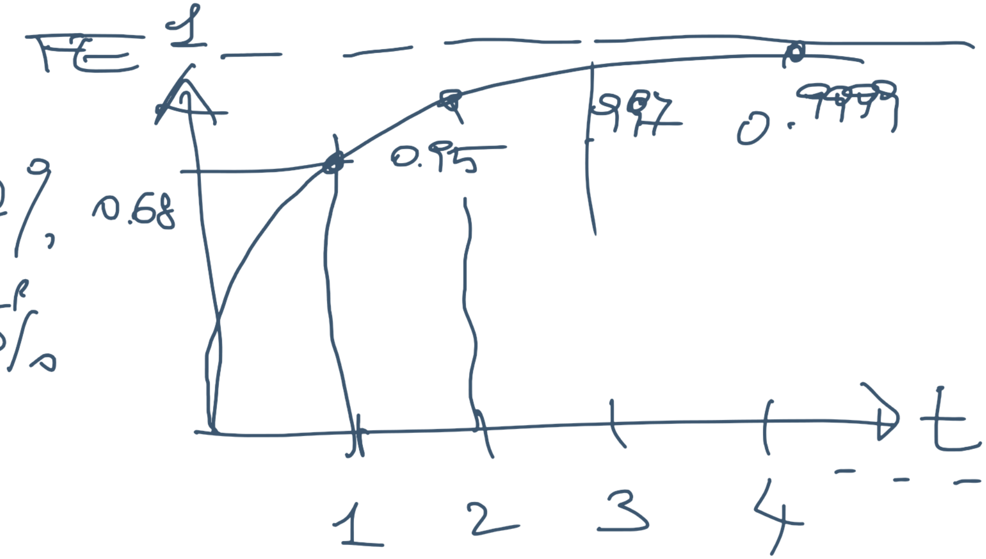
FUNZIONE DI ERRORE

$t=1$ 0.68 68%

$t=2$ 0.954 95%

$t=3$ 0.997

$t=4$ 0.9999

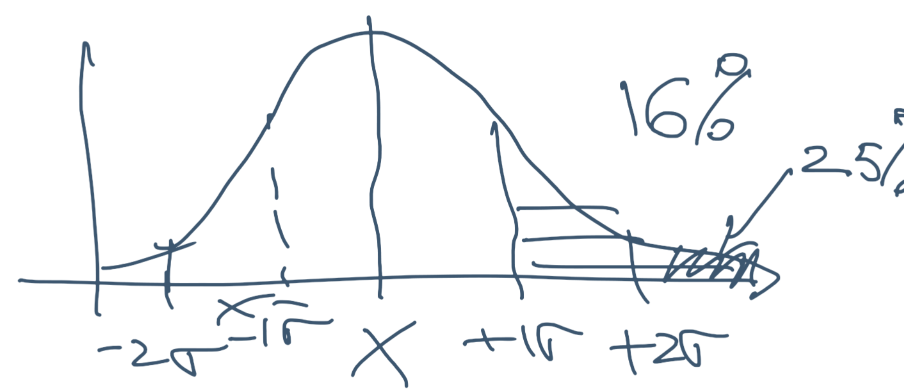


$X = 1.2 \pm 0.3$ s

1.9 < 5%

1.3 OK

1.6 30%



$x_1, \ldots, x_N$ $\quad X \quad f_{x,\sigma} = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-X)^2}{2\sigma^2}}$

$P(x_1) \sim P(x_1 \div x_1 + dx_1)$

$\sim \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x_1-X)^2}{2\sigma^2}} dx_1 \propto e^{-\frac{(x_1-X)^2}{2\sigma^2}}$

$P(x_2) \sim e^{-\frac{(x_2-X)^2}{2\sigma^2}} \quad \frac{1}{\sigma}$

$\vdots$

$P(x_N) \sim e^{-\frac{(x_N-X)^2}{2\sigma^2}} \quad \frac{1}{\sigma}$

$P(x_1, \ldots, x_N) = P(x_1) \cdot P(x_2) \cdots P(x_N)$

$\frac{1}{6} \cdot \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36 \cdot 6}$

$\frac{e^{-\frac{(x_1-X)^2}{2\sigma^2}}}{\sigma} \cdot \frac{e^{-\frac{(x_2-X)^2}{2\sigma^2}}}{\sigma} \cdots \frac{e^{-\frac{(x_N-X)^2}{2\sigma^2}}}{\sigma} = e^{-\frac{\sum_{i=1,N}(x_i-X)^2}{2\sigma^2}} \cdot \frac{1}{\sigma^N}$

$$P(x_1, \dots x_N) \propto \frac{1}{\sigma^N} e^{-\frac{\sum (x_i - x)^2}{2\sigma^2}}$$

(x, σ)

MASSIMA VEROSIMIGLIANZA

$\boxed{\text{MAXIMUM LIKELIHOOD}}$

$(x_1, x_2, \dots, x_N)$

$\boxed{f_{x,\sigma}(x)}$

$$P(x_1, \dots x_N) = P(x_1) P(x_2) \dots P(x_N)$$

$$\sim \frac{1}{\sigma_N} e^{-\frac{\sum (x_i - x)^2}{2\sigma^2}}$$

$x \; \sigma$

(x, σ) 0.5 ± 0.2

$0.6 \pm 0.2 \leftarrow$

0.6 ± 0.3

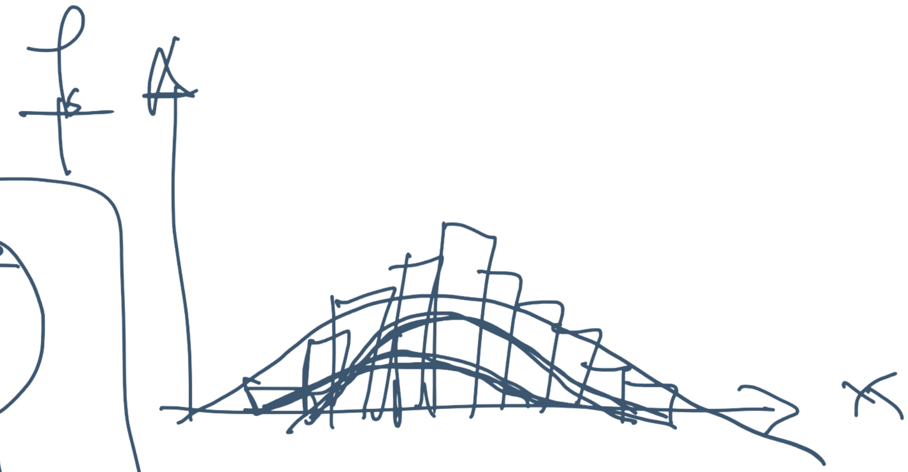
$P(x_1, x_2, \dots x_N) = 0.2$

$P(\quad) = 0.3$

$(\quad) = \boxed{0.4}$

(x, σ)

$$P(x_1 \ldots x_N) \propto \frac{1}{\sigma^N} e^{-\frac{\sum (x_i - x)^2}{2\sigma^2}}$$



$\cancel{x}$

σ

$$\frac{\partial \left(\sum (x_i - x)^2 \right)}{\partial x} = 0$$

$$\sum 2 (x_i - x)(-1) = 0$$

$$\cancel{2} \sum (x_i - x) = 0$$

$$\sum x_i - \sum x = 0$$

$$\sum x_i - N x = 0 \qquad x = \frac{\sum_i x_i}{N} = \text{MEDIA}$$

$$\sigma^2 = \frac{1}{N}\sum_i (x_i - X)^2$$

ok ma ideale

$$= \cancel{\frac{1}{N}\sum_i (x_i - \bar{x})^2}$$

$$\frac{1}{N-1}\sum_i (x_i - \bar{x})^2$$

$$\boxed{\sigma^2 = \frac{1}{N-1}\sum_i (x_i - \bar{x})^2}$$

$$\bar{x} = \frac{\sum_i x_i}{N}$$

$$X$$

$\leftarrow$ corretta e pratica

$f_{X,\sigma}$