Odhad střední hodnoty při známém rozptylu σ^2

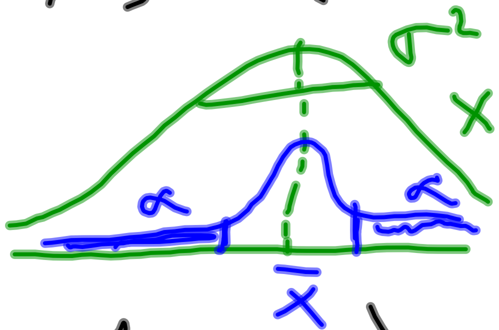
$$\bar X \sim N\left(\mu, \underbrace{\frac{\sigma^2}{n}}\right)$$

$$P\{\mu \in I\} \geq 1-\alpha$$

$$P\left[\frac{\sqrt{n}}{\sigma}(\bar X - \mu) \leq \Phi^{-1}(1-\alpha)\right] \quad q_x(1-\alpha)$$

$$\left\langle \bar X - \underbrace{\frac{\overbrace{\sigma}^{\sigma}}{\sqrt{n}}} \Phi^{-1}(1-\alpha), \infty \right)$$

$$\left(-\infty, \bar X + \frac{\sigma}{\sqrt{n}} \Phi^{-1}(1-\alpha)\right\rangle$$



$$\left\langle \bar X - \underbrace{\frac{\sigma}{\sqrt{n}}}_{\sigma = \sqrt{DX}} \Phi^{-1}(1-\alpha/2), \bar X + \frac{\sigma}{\sqrt{n}} \Phi^{-1}(1-\alpha/2) \right\rangle$$

EX

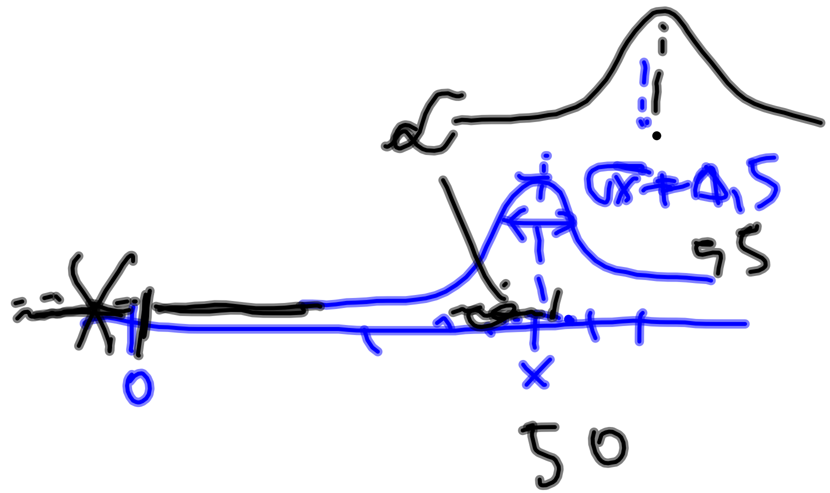
Cv. 10.2.1 - tachometr

$\sigma = 1{,}5\ km \cdot h^{-1}$

$\alpha = 0{,}001$

$\Phi^{-1}(0.999) = 3.09$

$\Delta = 1{,}5 \cdot 3{,}09 = 4{,}635$



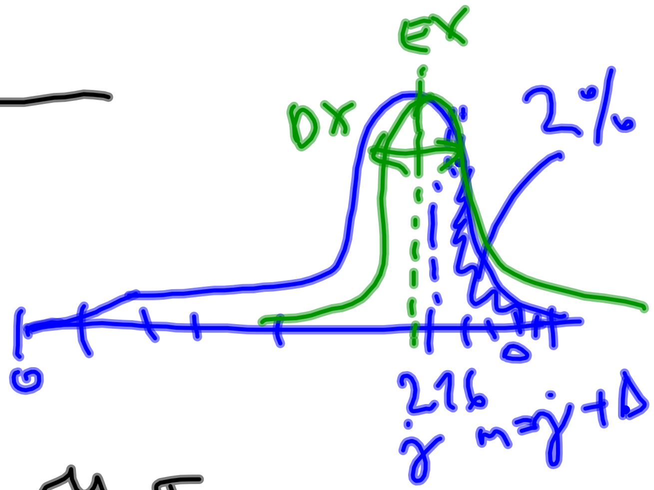
Cv. 10.2.3 - overbooking

$j = 216$ $\quad Bi(m, 1-q)$

$q = 5\%$ $\quad EX = m(1-q)$

$\alpha = 2\%$ $\quad \sigma_x^2 = DX = m\cdot(1-q)\cdot q$

$\Phi^{-1}(0.98) = 2.054$ $\quad q_X(1-\alpha) \leq j$



CLV

$$\frac{j-EX}{\sigma} \geq \Phi^{-1}(0.98) \qquad X \sim N(\mu, \sigma) \;\; N(0,1)$$

$$\frac{j - m\cdot(1-q)}{\sqrt{m(1-q)\cdot q}} \geq 2.054 \qquad \frac{216 - m\cdot 0{,}95}{\sqrt{m\cdot 0{,}95\cdot 0{,}05}} \geq 2{,}054$$

$$\frac{216 - m \cdot 0{,}95}{\sqrt{m \cdot 0{,}95 \cdot 0{,}05}} \geq 2{,}054$$

$$216 - m \cdot 0{,}95 \geq 2{,}054 \cdot \left(\sqrt{m \cdot 0{,}0475}\right)$$

$$216^2 - 2 \cdot 216 \cdot m \cdot 0{,}95 + (0{,}95 \cdot m)^2 \geq 2{,}054^2 \cdot m \cdot 0{,}0475$$

$$m \leq 220.374$$

$$m \leq 220$$

$$\sum_{k=217}^{m} \binom{m}{k} (1-q)^k q^{m-k} \approx 4.2 \cdot 10^{-3}$$

$m = 221 \Rightarrow 1.2\,\%$

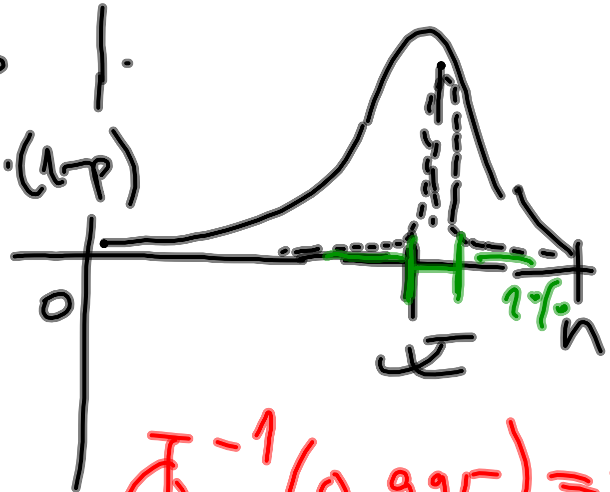
$m = 222 \Rightarrow 3.2\,\%$

Cv. 10.2.7 - rozpad atomu

$n = 10^6$ atomů $EX = n \cdot p$

99% odhad $DX = n \cdot p \cdot (1-p)$

$\alpha/2 = 0.995$ $Bi(n,p)$



$\Phi^{-1}(0.995) = 2.576$

$P = 1 - \left(\frac{1}{2}\right)^2 = 1 - \frac{1}{4} = \frac{3}{4}$

$\left\langle 10^6 \cdot \frac{3}{4} \pm \sqrt{10^6 \frac{3}{16}} \cdot 2{,}576 \right\rangle$

$75 \cdot 10^4 \pm 1115 \Rightarrow \langle 748885 ; 751115 \rangle$