TKMY3 Tilastollisen päättelyn perusteet

Kaavakokoelma

Todennäköisyyslaskentaa

(1) $n! = n \cdot (n-1) \cdot (n-2) \cdots 1$

(2) $\binom{n}{k} = \frac{n!}{k!(n-k)!}$

(3) $\frac{n!}{(n-k)!} = n \cdot (n-1) \cdots (n-k+1)$

(4) $P(\emptyset) = 0$

(5) $P(A^*) = 1 - P(A)$

(6) $P(A \cup B) = P(A) + P(B)$

(7) $P(\bigcup_{i=1}^{n} A_i) = \sum_{i=1}^{n} P(A_i)$

(8) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

(9) $P(A \cap B) = P(A) \cdot P(B)$

(10) $P(\bigcap_{i=1}^{n} A_i) = \prod_{i=1}^{n} P(A_i)$

(11) $P(A \cap B) = P(A) \cdot P(B \mid A)$

Diskreetit satunnaismuuttujat

(12) $F(x) = p(X \le x) = \sum_{x_i \le x} p_i$

(13) $EX = \sum P(x) \cdot x$

(14) $D^2X = \sum P(x) \cdot (x - EX)^2$

(15) $P(X = k) = \binom{n}{k} \cdot p^k \cdot (1-p)^{n-k}, k = 0, \ldots, n$

(16) $EX = np$

(17) $D^2X = n \cdot p \cdot (1-p)$

(18) $P(X = k) = \frac{\binom{K}{k}\binom{N-K}{n-k}}{\binom{N}{n}}, k = 0, \ldots, n$

(19) $EX = \frac{n \cdot K}{N}$

(20) $D^2X = \frac{n \cdot K}{N}\left(1 - \frac{K}{N}\right)\frac{N-n}{N-1}$

(21) $P(X = k) = \frac{\lambda^k e^{-\lambda}}{k!}, k = 0, 1, \ldots$

(22) $EX = \lambda$

(23) $D^2X = \lambda$

Jatkuvat satunnaismuuttujat

(24) $Z = \frac{X - \mu}{\sigma}$

(25) $\Phi(-z) = 1 - \Phi(z)$

(26) $F_p^{(v_1, v_2)} = \frac{1}{F_{1-p}^{(v_2, v_1)}}$

$z_p = -z_{1-p}$

$t_p = -t_{1-p}$

Luottamusvälejä

μ:lle

(27) $$V_{100(1-\alpha)} = [\bar{x} - t_{\alpha/2}^{(n-1)} \frac{s}{\sqrt{n}}, \bar{x} + t_{\alpha/2}^{(n-1)} \frac{s}{\sqrt{n}}]$$

(28) $$V_{100(1-\alpha)} = [\bar{x} - z_{\alpha/2} \frac{s}{\sqrt{n}}, \bar{x} + z_{\alpha/2} \frac{s}{\sqrt{n}}]$$

μ₁-μ₂:lle

σ_1 ja σ_2 tuntemattomia, yhtä suuria

(29) $$V_{100(1-\alpha)} = [\bar{X}_1 - \bar{X}_2 - t_{\alpha/2}^{(n_1+n_2-2)} s\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}, \bar{X}_1 - \bar{X}_2 + t_{\alpha/2}^{(n_1+n_2-2)} s\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}]$$

(30) $$V_{100(1-\alpha)} = [\bar{X}_1 - \bar{X}_2 - z_{\alpha/2} s\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}, \bar{X}_1 - \bar{X}_2 + z_{\alpha/2} s\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}]$$

(31) $$s = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1+n_2-2}}$$

σ_1 ja σ_2 tuntemattomia, eri suuria

(32) $$V_{100(1-\alpha)} = [\bar{X}_1 - \bar{X}_2 - t_{\alpha/2}^{(v)}\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}, \bar{X}_1 - \bar{X}_2 + t_{\alpha/2}^{(v)}\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}]$$

(33) $$\frac{1}{v} = \frac{c^2}{n_1-1} + \frac{(1-c)^2}{n_2-1}$$

(34) $$c = \frac{\frac{s_1^2}{n_1}}{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}$$

(35) $$V_{100(1-\alpha)} = [\bar{X}_1 - \bar{X}_2 - z_{\alpha/2}\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}, \bar{X}_1 - \bar{X}_2 + z_{\alpha/2}\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}]$$

μ_D:lle

(36) $$V_{100(1-\alpha)} = [\bar{D} - t_{\alpha/2}^{(n-1)} \frac{s_D}{\sqrt{n}}, \bar{D} + t_{\alpha/2}^{(n-1)} \frac{s_D}{\sqrt{n}}]$$

(37) $$V_{100(1-\alpha)} = [\bar{D} - z_{\alpha/2} \frac{s_D}{\sqrt{n}}, \bar{D} + z_{\alpha/2} \frac{s_D}{\sqrt{n}}]$$

π:lle

(38) $$V_{100(1-\alpha)} = \left[p - z_{\alpha/2}\sqrt{\frac{p(1-p)}{n}}, p + z_{\alpha/2}\sqrt{\frac{p(1-p)}{n}} \right]$$

π_1- π_2:lle

(39) $$V_{100(1-\alpha)} = \left[p_1 - p_2 \pm z_{\alpha/2}\sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}} \right]$$

π_D:lle

(40) $$V_{100(1-\alpha)} = \left[(b-c)\big/n \pm z_{\alpha/2}\sqrt{\frac{(b+c) - (b-c)^2\big/n}{n(n-1)}} \right]$$

Tilastollisia testejä

μ:lle

(41) $$t_{hav} = \frac{\bar{x} - \mu_0}{s\big/\sqrt{n}} \sim t^{(n\text{-}1)}$$

(42) $$z_{hav} = \frac{\bar{x} - \mu_0}{s\big/\sqrt{n}} \sim N(0{,}1)$$

μ_1-μ_2:lle

σ_1 ja σ_2 tuntemattomia, yhtä suuria

(43) $$t_{hav} = \frac{\bar{X}_1 - \bar{X}_2}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \sim t^{(n_1+n_2-2)}$$

(44) $$z_{hav} = \frac{\bar{X}_1 - \bar{X}_2}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \sim N(0{,}1)$$

(45) $$s = \sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1 + n_2 - 2}}$$

σ_1 ja σ_2 tuntemattomia, eri suuria

(46) $$t_{hav=} \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \sim t^{(v)}$$

(47) $$z_{hav=} \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \sim N(0{,}1)$$

(48) $$\frac{1}{v} = \frac{c^2}{n_1 - 1} + \frac{(1-c)^2}{n_2 - 1}$$

(49) $$c = \frac{\frac{s_1^2}{n_1}}{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

μ_D:lle

(50) $$t_{hav} = \frac{\overline{D}}{\frac{s_D}{\sqrt{n}}} \sim \mathrm{t}^{(\mathrm{n-1})}$$

(51) $$z_{hav} = \frac{\overline{D}}{\frac{s_D}{\sqrt{n}}} \sim \mathrm{N}(0,1)$$

(52) $$\overline{D} = \frac{1}{n}\sum_{i=1}^{n} D_i$$

(53) $$s_D = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(D_i - \overline{D})^2}$$

$\sigma^2{}_1/\sigma^2{}_2$:lle

(54) $$F_{\mathrm{hav}} = \frac{\mathrm{s}_1^2}{\mathrm{s}_2^2} \sim F^{(n_1-1,n_2-1)}$$

ρ:lle

(55) $$t_{hav} = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \sim \mathrm{t}^{(\mathrm{n-2})}$$

β_i:lle

(56) $$t_{hav} = \frac{b_1 - \beta_0}{s_{b_i}} \sim \mathrm{t}^{(\mathrm{n-k-1})}$$

Epäparametrisiä testejä

π:lle

(57) $$z_{hav} = \frac{p - \pi_0}{\sqrt{\frac{\pi_0(1-\pi_0)}{n}}} \sim \mathrm{N}(0,1)$$

π_1- π_2:lle

(58) $$z_{hav} = \frac{p_1 - p_2}{\sqrt{p(1-p)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \sim \mathrm{N}(0,1)$$

(59) $$p = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$$

π_D:lle

(60) $$z_{hav} = \frac{(b-c)/n}{\sqrt{\frac{(b+c) - (b-c)^2/n}{n(n-1)}}} \sim \mathrm{N}(0,1)$$

χ^2-yhteensopivuustesti

(61) $$\chi^2_{hav} = \sum_{i=1}^{k} \frac{(f_i - e_i)^2}{e_i} \sim \chi^2_{(k-1)}$$

χ^2-riippumattomuustesti

(62) $$\chi^2_{hav} = \sum_{i=1}^{r} \sum_{j=1}^{s} \frac{(f_{ij} - e_{ij})^2}{e_{ij}} \sim \chi^2_{((r-1)(s-1))}$$

(63) $$e_{ij} = \frac{f_{i.} f_{.j}}{n}$$