Tilastollisten päättelyn perusteet, MTTTP5, kaavakokoelma

1 EMPIIRISET JAKAUMAT

(1.1) $$\overline{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

(1.2) $$s_x^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \overline{x})^2 = \frac{1}{n-1}\Big(\sum_{i=1}^{n} x_i^2 - n\overline{x}^2\Big) = \frac{1}{n-1}\,SS_x$$

2 TODENNÄKÖISYYSLASKENTAA

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

(2.2) $$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$

3 TODENNÄKÖISYYSJAKAUMIA

Diskreetti satunnaismuuttuja X

(3.1) $$E(X) = \mu = \sum_{i=1}^{k} x_i P(X = x_i)$$

(3.2) $$\mathrm{Var}(X) = \sigma^2 = \sum_{i=1}^{k}(x_i - \mu)^2 P(X = x_i)$$

Jatkuva satunnaismuuttuja X

(3.3) $$E(X) = \mu = \int_{-\infty}^{\infty} x f(x)\,\mathrm{d}x$$

(3.4) $$\mathrm{Var}(X) = \sigma^2 = \int_{-\infty}^{\infty} (x-\mu)^2 f(x)\,\mathrm{d}x$$

(3.5) $$\mathrm{Cov}(X,Y) = E\big(X - E(X)\big)\big(Y - E(Y)\big)$$

(3.6) $X \sim \text{Ber}(p), \qquad P(X=1)=p, \qquad P(X=0)=1-p,$
$E(X)=p, \qquad \text{Var}(X)=p(1-p)$

(3.7) $X \sim \text{Bin}(n,p), \qquad P(X=k)=\binom{n}{k}p^k(1-p)^{n-k},$
$E(X)=np, \qquad \text{Var}(X)=np(1-p)$

(3.8) $X \sim \text{Tasd}(a,b),$
$P(X=a)=P(X=a+1)=\cdots=P(X=b)=\dfrac{1}{n}, \quad \text{missä } b=a+(n-1),$
$E(X)=\dfrac{a+b}{2}, \qquad \text{Var}(X)=\dfrac{n^2-1}{12}$

(3.9) $X \sim \text{Tas}(a,b), \qquad f(x)=\dfrac{1}{b-a}, \quad a \le x \le b,$
$E(X)=\dfrac{a+b}{2}, \qquad \text{Var}(X)=\dfrac{(b-a)^2}{12}$

(3.10) $X \sim N(\mu,\sigma^2), \qquad f(x)=\dfrac{1}{\sigma\sqrt{2\pi}}\,\mathrm{e}^{-\frac{1}{2}(x-\mu)^2/\sigma^2},$
$E(X)=\mu, \qquad \text{Var}(X)=\sigma^2$

4 LUOTTAMUSVÄLEJÄ

<u>μ:lle</u>

(4.1) $\overline{X} \pm z_{\alpha/2}\dfrac{\sigma}{\sqrt{n}}$

(4.2) $\overline{X} \pm t_{\alpha/2;n-1}\dfrac{s}{\sqrt{n}}$

<u>π:lle</u>

(4.3) $p \pm z_{\alpha/2}\sqrt{\dfrac{p(100-p)}{n}}$

<u>$(\mu_1-\mu_2)$:lle</u>

(4.4) $\overline{X}-\overline{Y} \pm z_{\alpha/2}\sqrt{\dfrac{\sigma_1^2}{n}+\dfrac{\sigma_2^2}{m}}$

(4.5) $\overline{X}-\overline{Y} \pm t_{\alpha/2;n+m-2}\, s\sqrt{\dfrac{1}{n}+\dfrac{1}{m}}\,, \qquad \text{missä } s^2=\dfrac{(n-1)s_X^2+(m-1)s_Y^2}{n+m-2}$

5 TESTISUUREITA

$\underline{H_0 \colon \mu = \mu_0}$

$$Z = \frac{\overline{X} - \mu_0}{\sigma/\sqrt{n}} \sim N(0,1) \tag{5.1}$$

$$t = \frac{\overline{X} - \mu_0}{s/\sqrt{n}} \sim t(n-1) \tag{5.2}$$

$\underline{H_0 \colon \pi = \pi_0}$

$$Z = \frac{p - \pi_0}{\sqrt{\pi_0(100 - \pi_0)/n}} \overset{\text{likimain}}{\sim} N(0,1) \tag{5.3}$$

$\underline{H_0 \colon \mu_1 = \mu_2}$

$$Z = \frac{\overline{X} - \overline{Y}}{\sqrt{\sigma_1^2/n + \sigma_2^2/m}} \sim N(0,1) \tag{5.4}$$

$$t = \frac{\overline{X} - \overline{Y}}{s\sqrt{1/n + 1/m}} \sim t(n+m-2), \qquad \text{missä } s^2 = \frac{(n-1)s_X^2 + (m-1)s_Y^2}{n+m-2} \tag{5.5}$$