statistikk

$x_1, x_2, x_3, \ldots, x_n$ n målinger

Gjennomsnitt $\bar{x} = \frac{x_1 + + \cdots + x_n}{n} = \frac{\sum_{i=1}^{n} x_i}{n}$

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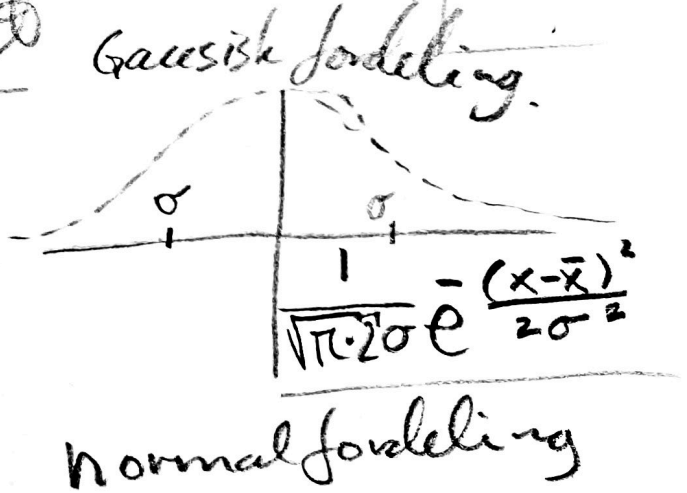
$\sigma^2 = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$ varians

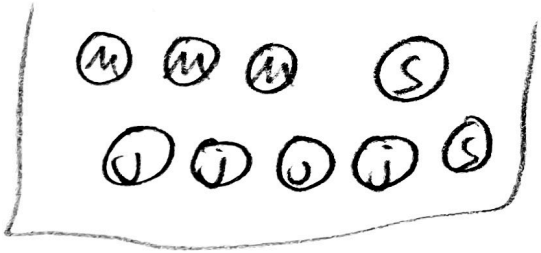
$\sigma = \sqrt{\sigma^2} = \sqrt{\text{varians}}$ standard avvikt.

sentral grenseteoremet



19.153

Matte : 3 pers
juss : 4 pers
språk : 2
} 9 personer



2 av de 9 personene møtes.

a) P begge studere matematikk ?

b) _____ samme fag ?

c) ulike fag ?

a) $\frac{3}{9} \cdot \frac{2}{8} = \frac{1}{3 \cdot 4} = \frac{1}{12} = P(MM)$

b) $P(SS) = \frac{2}{9} \cdot \frac{1}{8} = \frac{1}{9 \cdot 4} = \frac{1}{36}$

$P(JJ) = \frac{4}{9} \cdot \frac{3}{8} = \frac{1}{3} \cdot \frac{4}{8} = \frac{1}{6}$.

disjunkte hendelser

$P(\text{studerer det samme}) = P(MM) + P(JJ) + P(SS)$

$\frac{1}{12} + \frac{1}{36} + \frac{1}{6} = \frac{3+1+6}{36} = \frac{10}{36}$

$= \frac{5}{18}$

19.150

Hva er sannsynligheten for å trekke 2 friske egg.

B 1. egg som trekkes er friskt

A 2 egg ——————— .

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

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

"A og B"

$$P(B) = \frac{3}{4}$$

$$P(A|B) = \frac{2}{3}$$

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

"A eller B"

$$P(A \cap B) = \frac{2}{3} \cdot \frac{3}{4} = \frac{2}{4} = \frac{1}{2} = 50\%$$

↑ begge eggene er fine

c) $P(\text{skuddaver ulike jog}) = 1 - P(\underset{\text{jog}}{\text{samme}}) = 1 - \frac{5}{18}$

$= \frac{13}{18}$

Alternativt $P(JM) + P(JS) + P(MS) + P(MJ) + P(SJ) + P(SM)$

19.152 H kommeregner batteri varer mer enn 30 timer.

$P(H) = 0.75 = 75\%$

Trekker ut 5 av batteriene.

a) $P(\text{alle 5 varer mer enn 30 timer})$

$P(H_1)\underbrace{P(H_2|H_1)}_{P(H_2)} \cdot P(H_3)\ P(H_4) \cdot P(H_5) = \left(\frac{3}{4}\right)^5$

$= \frac{3^5}{4^5} = \frac{3 \cdot 81}{2^{10}}$

$= \frac{243}{1024} \sim 23{,}7\%$

19.141 $S = \{ \text{Lysparene} \}$

$H_{40} = \{ \text{40w lysparene} \}$ $H_{60} = \{ \text{60w parene} \}$

a) $H_{40} \cap H_{60} = \emptyset$ $H_{40} \cup H_{60} = S$

D defekte parer.

b) $P(D) = P(D \cap H_{40}) + P(D \cap H_{60}) = \frac{9}{42} = \frac{3}{14}$

$\frac{3}{42} + \frac{6}{42}$

c) $P(\bar{D} \mid H_{60}) = \frac{P(\bar{D} \cap H_{60})}{P(H_{60})} = \frac{16/42}{22/42}$

$= \frac{8}{11}$

d) $P(H_{40} \mid D) = \frac{P(H_{40} \cap D)}{P(D)} = \frac{3/42}{9/42} = \frac{1}{3}$.

19.215 Hendelsen A og B

$P(A) = 0.15$

$P(B|A) = 0.60$

$P(B|\bar{A}) = 0.1$

a) Er A, B disjunkte, uavhengige?

b) $P(\bar{A})$ $P(B)$ og $P(\bar{B})$

a) $P(B|A) = \frac{P(B \cap A)}{P(A)}$ $B \cap A \neq \emptyset$ siden $P(B|A) \neq 0$.

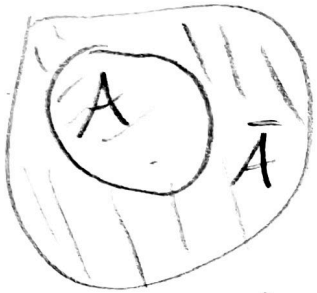
så ikke disjunkte

$P(B|A) \neq P(B|\bar{A})$ så ikke uavhengige.

b) $P(\bar{A}) = 1 - P(A) = 0.85$

$P(B) = P(A \cap B) + P(\bar{A} \cap B) = P(B|A) \cdot P(A) + P(B|\bar{A}) \cdot P(\bar{A})$

disjunkte med union lik B.



$A \cap \bar{A} = \emptyset$

$A \cup \bar{A} = S$

$P(A) + P(\bar{A}) = P(S) = 1$

$$P(B) = 0.60 \cdot 0.15 + 0.1 \cdot 0.85$$
$$= 0.09 + 0.085 = \underline{0.175}$$

$$P(\bar{B}) = 1 - P(B) = \underline{0.825}$$

c) 1) $P(A|B) =$

$$\frac{P(A \cap B)}{P(B)} = \frac{P(A \cap B)}{P(A)} \cdot \frac{P(A)}{P(B)}$$
$$= P(B|A) \cdot \frac{P(A)}{P(B)} \quad \text{(Bayes setning)}$$
$$= 0.60 \cdot \frac{0.15}{0.175} = 0.60 \quad \frac{30}{35} = 0.60 \cdot \frac{6}{7} \sim \underline{0.514}$$

2) $P(A \cap B) = P(B|A) \cdot P(A)$

$0.60 \cdot 0.15$

$= \underline{0.09}$

alternativt $\frac{P(A \cap B)}{P(B)} = \frac{0.09}{0.175} = \frac{90}{175} = \underline{\frac{18}{35}}$