Korrelation (Pearson)

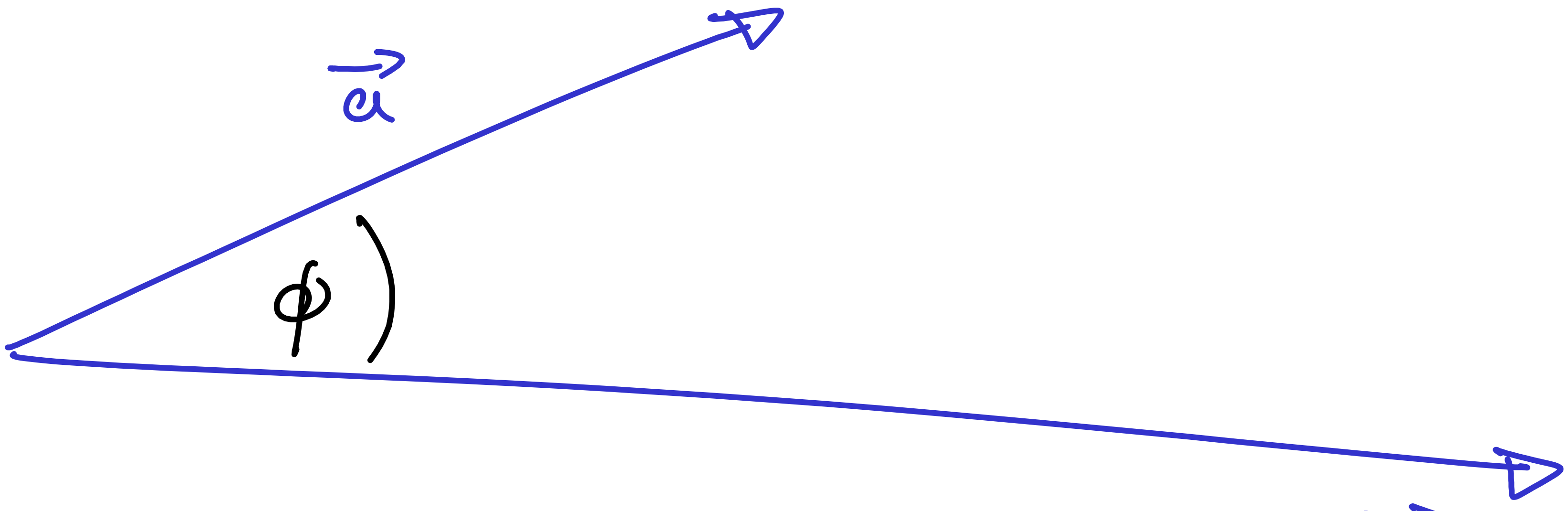
$$r_{xy} = \frac{s_{xy}}{s_x \cdot s_y}$$

$$s_{xy} = \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})$$

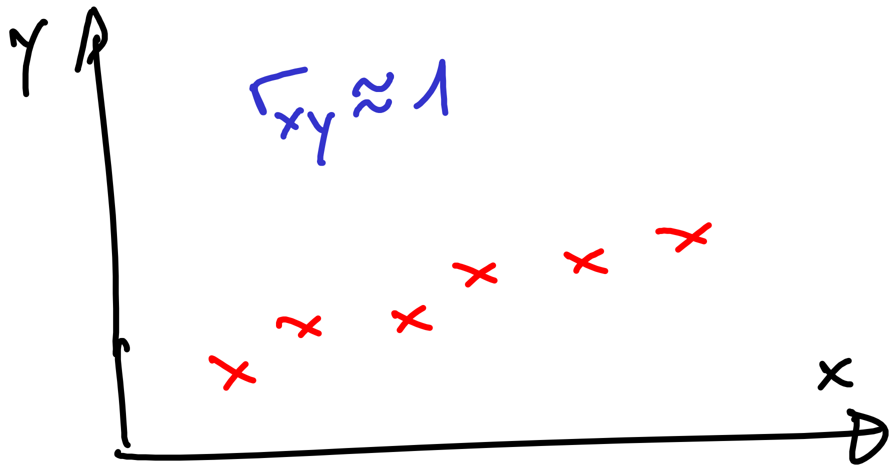
$$s_x = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (x_i - \bar{x})^2}$$

$$r_{xy} = \frac{\cancel{\frac{1}{n-1}} \sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\cancel{\frac{1}{n-1}} \sum_{j=1}^{n} (x_j - \bar{x})^2 \cdot \cancel{\frac{1}{n-1}} \sum_{k=1}^{n} (y_k - \bar{y})^2}}$$

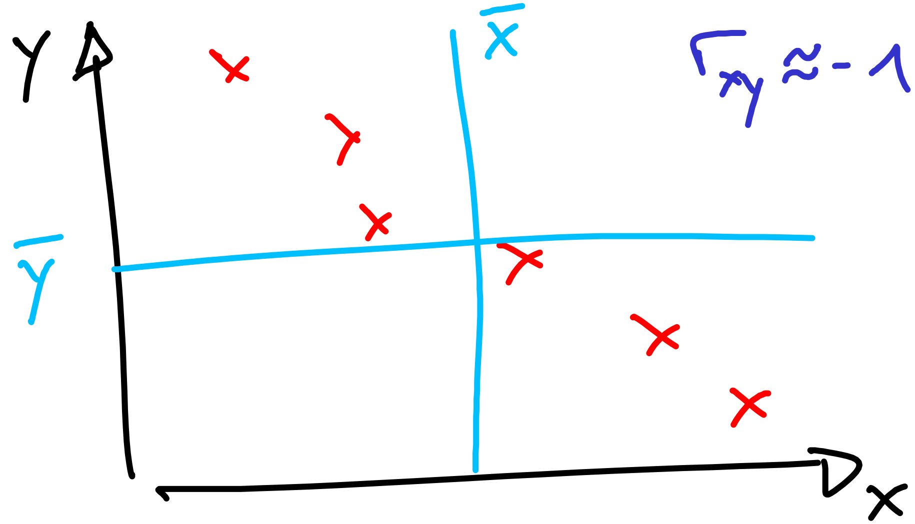
$$\vec{a} = \begin{pmatrix} x_1 - \bar{x} \\ x_2 - \bar{x} \\ \vdots \\ x_n - \bar{x} \end{pmatrix}, \quad \vec{b} = \begin{pmatrix} y_1 - \bar{y} \\ \vdots \\ y_n - \bar{y} \end{pmatrix}, \quad r_{xy} = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}|\,|\vec{b}|}$$



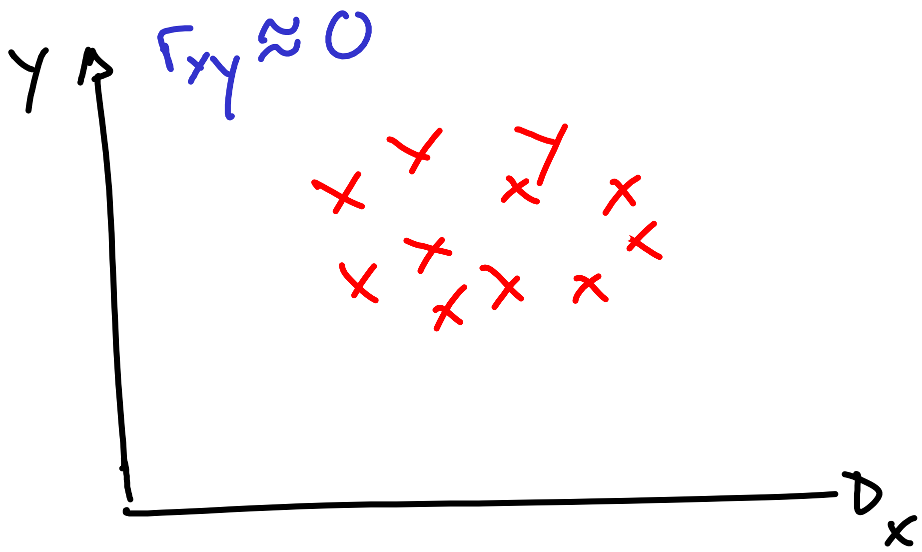
$$\vec{a} \cdot \vec{b} = |\vec{a}| \cdot |\vec{b}| \cdot \cos\phi$$



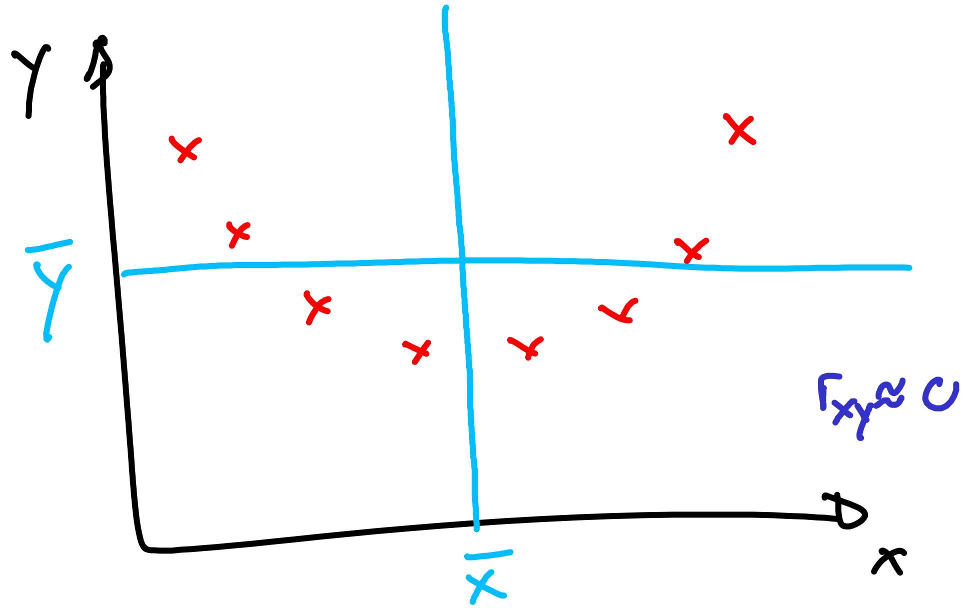
Y
X
$r_{xy} \approx 1$



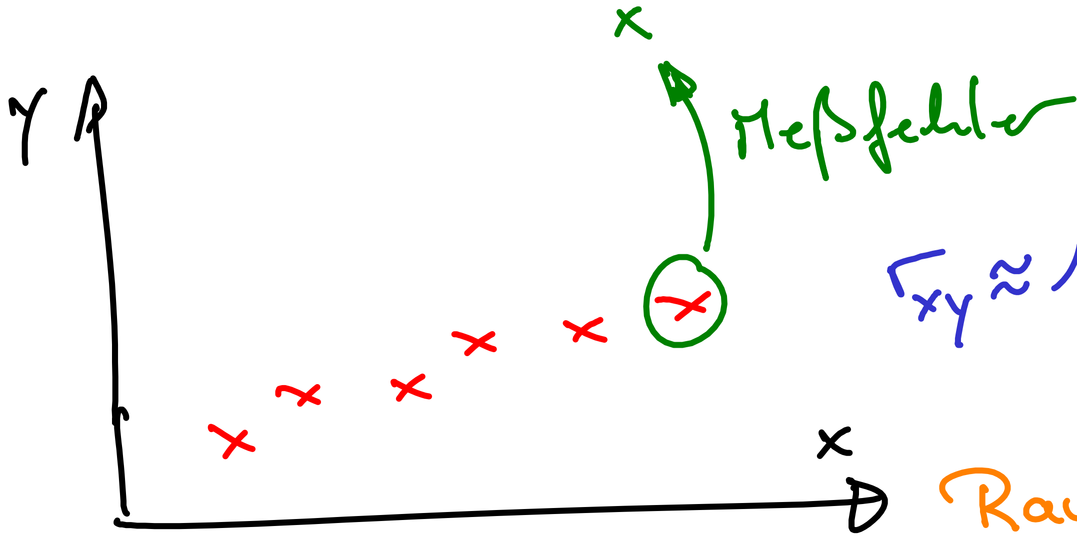
Y
X
$\bar{x}$
$\bar{y}$
$r_{xy} \approx -1$



Y
X
$r_{xy} \approx 0$



Y
X
$\bar{x}$
$\bar{y}$
$r_{xy} \approx 0$



$r_{xy} \approx 1 \xrightarrow[\text{Ausreißer}]{\text{Meßfehler}}$ Korrelation sicht

Rangkorrelation $r_{xy}^{(SP)}$ ändert sich nicht

$r_{xy} < 0$ und „deutlich" von Null verschieden

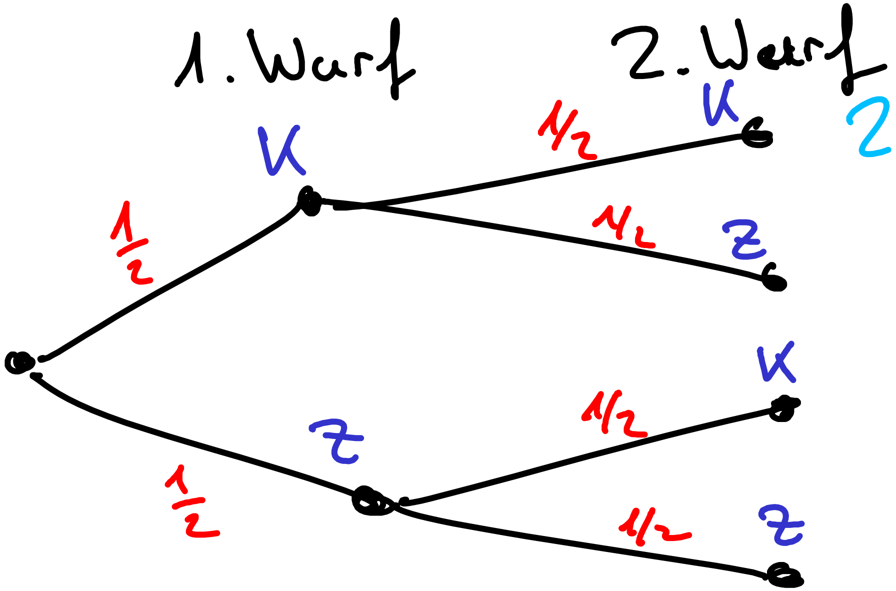
(aber da keine Korrelation)

ganz was anderes:

faire Münze

Wahrscheinlichkeit	$\frac{1}{2}$	$\frac{1}{2}$

2x werfen:



2x Kopf: $\frac{1}{4}$

$\frac{1}{4}$

$\frac{1}{4}$

$\frac{1}{4}$

ohne Beachtung der Reihenfolge

2 x K : $\frac{1}{4} = 25\%$

1xK, 1xZ (Reihenfolge egal) $\frac{1}{2} = 50\%$

2 x Z : $\frac{1}{4} = 25\%$

3x werfen: 3xK : $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \left(\frac{1}{2}\right)^3 = \frac{1}{8} = 12{,}5\%$

10x werfen: 9xK, 1Z

$$\left(\frac{1}{2}\right)^9 \cdot \frac{1}{2} \cdot 10 = \frac{10}{1024} \approx 1\%$$