Formelsammlung

Statistik relativer Häufigkeiten

Standardabweichung:

$$SD \;=\; \sqrt{\frac{p(1-p)}{n}}$$

Konfidenzintervall:

$$\hat{p} - c\,SD \;\leq\; p \;\leq\; \hat{p} + c\,SD$$

Prüfung von $p = p_0$:

$$T \;=\; \frac{\hat{p} - p_0}{SD}$$

Stochastische Modelle

Binomialverteilung:

$$P(h_n(A) = k) \;=\; \binom{n}{k} p^k \,(1-p)^{n-k}$$

Hypergeometrische Verteilung:

$$P(h_n(A) = k) \;=\; \frac{\binom{M}{k}\binom{N-M}{n-k}}{\binom{N}{n}}$$

Lage und Streuung

Mittelwert:

$$\bar{x} \;=\; \frac{1}{n}\sum_{i=1}^{n} x_i \;=\; \frac{1}{n}\sum_{i=1}^{m} a_i h_i \;=\; \sum_{i=1}^{m} a_i f_i$$

Varianz:

$$s_x^2 \;=\; \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2 \;=\; \frac{1}{n}\sum_{i=1}^{n} x_i^2 - \bar{x}^2 \;=\; \sum_{i=1}^{m} f_i (a_i - \bar{x})^2$$

Statistik eines Mittelwerts

Stichprobenvarianz:

$$s^2_{n-1} \;=\; s^2_{x,n-1} \;=\; \frac{n}{n-1} s^2_x \;=\; \frac{1}{n-1}\sum_{i=1}^{n}(x_i-\bar{x})^2$$

Standardabweichung:

$$SD \;=\; \frac{\sigma}{\sqrt{n}} \;\approx\; \widehat{SD} \;=\; \frac{s_{n-1}}{\sqrt{n}}$$

Konfidenzintervall:

$$\bar{x} - c\,\widehat{SD} \;\le\; \mu \;\le\; \bar{x} + c\,\widehat{SD}$$

Prüfung von $\mu = \mu_0$:

$$T \;=\; \frac{\bar{x}-\mu_0}{\widehat{SD}}$$

ANOVA-Tabelle:

	SS	df	MSS
$*$	SS^*	1	MSS^*
R	SS_R	$n-1$	MSS_R
	SS_T	n	

$$SS^* \;=\; n(\bar{x}-\mu_0)^2, \qquad SS_R \;=\; n s^2_x$$

Empirische Korrelation

Korrelationskoeffizient:

$$r \;=\; r_{xy} \;=\; \frac{1}{n}\sum_{i=1}^{n} z_{x_i} z_{y_i} \;=\; \frac{s_{xy}}{s_x s_y}$$

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

Lineare Regression

Empirische Regressionsgerade:

$$y = \hat{a} + \hat{b}x$$

$$\hat{b} = r\frac{s_y}{s_x}, \qquad \hat{a} = \bar{y} - \hat{b}\bar{x}$$

ANOVA-Tabelle:

	SS	df	MSS
$*$	SS^*	1	MSS^*
R	SS_R	$n-2$	MSS_R
	SS_T	$n-1$	

$$SS^* = nr^2 s_y^2, \qquad SS_T = ns_y^2$$

Vergleich von zwei Mittelwerten

Standardabweichung:

$$SD = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Prüfung von $\mu_1 = \mu_2$:

$$T = \frac{\bar{x} - \bar{y}}{\widehat{SD}}$$

$$\widehat{SD} = \sqrt{\frac{s_{x,n-1}^2}{n_1} + \frac{s_{y,n-1}^2}{n_2}}$$

ANOVA-Tabelle:

	SS	df	MSS
ZW	SS_{ZW}	1	MSS_{ZW}
IN	SS_{IN}	n_1+n_2-2	MSS_{IN}
	SS_T	n_1+n_2-1	

$$SS_{ZW} = \frac{n_1 n_2}{n_1+n_2}(\bar{x}-\bar{y})^2, \qquad SS_{IN} = n_1 s_x^2 + n_2 s_y^2$$

Bedingte Wahrscheinlichkeiten

Bedingte Wahrscheinlichkeit:

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

„Inverse" Wahrscheinlichkeit:

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

„Totale" Wahrscheinlichkeit:

$$P(A) = P(A|B_1)P(B_1) + P(A|B_2)P(B_2) + \cdots + P(A|B_m)P(B_m)$$

Formel von BAYES:

$$P(B_i|A) = \frac{P(A|B_i)P(B_i)}{P(A|B_1)P(B_1) + \cdots + P(A|B_m)P(B_m)}$$

Kontingenztafeln

Empirische Vierfelderkorrelation:

$$\hat{\rho} = r = \frac{f(A \cap B) - f(A)f(B)}{\sqrt{f(A)f(A')f(B)f(B')}}$$

Prüfung auf stochastische Unabhängigkeit:

$$T = \sqrt{n}r$$

Testgröße für das Symmetrieproblem:

$$\frac{f(A|C) - 0.5}{\sqrt{\frac{0.5 \cdot 0.5}{h(C)}}}$$

$$C \;=\; (A \cap B') \cup (A' \cap B)$$

	0	0.02	0.04	0.06	0.08
0	0.50000	0.50798	0.51595	0.52392	0.53188
0.1	0.53983	0.54776	0.55567	0.56356	0.57142
0.2	0.57926	0.58706	0.59483	0.60257	0.61026
0.3	0.61791	0.62552	0.63307	0.64058	0.64803
0.4	0.65542	0.66276	0.67003	0.67724	0.68439
0.5	0.69146	0.69847	0.70540	0.71226	0.71904
0.6	0.72575	0.73237	0.73891	0.74537	0.75175
0.7	0.75804	0.76424	0.77035	0.77637	0.78230
0.8	0.78814	0.79389	0.79955	0.80511	0.81057
0.9	0.81594	0.82121	0.82639	0.83147	0.83646
1	0.84134	0.84614	0.85083	0.85543	0.85993
1.1	0.86433	0.86864	0.87286	0.87698	0.88100
1.2	0.88493	0.88877	0.89251	0.89617	0.89973
1.3	0.90320	0.90658	0.90988	0.91308	0.91621
1.4	0.91924	0.92220	0.92507	0.92785	0.93056
1.5	0.93319	0.93574	0.93822	0.94062	0.94295
1.6	0.94520	0.94738	0.94950	0.95154	0.95352
1.7	0.95543	0.95728	0.95907	0.96080	0.96246
1.8	0.96407	0.96562	0.96712	0.96856	0.96995
1.9	0.97128	0.97257	0.97381	0.97500	0.97615
2	0.97725	0.97831	0.97932	0.98030	0.98124
2.1	0.98214	0.98300	0.98382	0.98461	0.98537
2.2	0.98610	0.98679	0.98745	0.98809	0.98870
2.3	0.98928	0.98983	0.99036	0.99086	0.99134
2.4	0.99180	0.99224	0.99266	0.99305	0.99343
2.5	0.99379	0.99413	0.99446	0.99477	0.99506
2.6	0.99534	0.99560	0.99585	0.99609	0.99632
2.7	0.99653	0.99674	0.99693	0.99711	0.99728
2.8	0.99744	0.99760	0.99774	0.99788	0.99801
2.9	0.99813	0.99825	0.99836	0.99846	0.99856
3	0.99865	0.99874	0.99882	0.99889	0.99896
3.1	0.99903	0.99910	0.99916	0.99921	0.99926
3.2	0.99931	0.99936	0.99940	0.99944	0.99948
3.3	0.99952	0.99955	0.99958	0.99961	0.99964
3.4	0.99966	0.99969	0.99971	0.99973	0.99975
3.5	0.99977	0.99978	0.99980	0.99981	0.99983
3.6	0.99984	0.99985	0.99986	0.99987	0.99988
3.7	0.99989	0.99990	0.99991	0.99992	0.99992
3.8	0.99993	0.99993	0.99994	0.99994	0.99995
3.9	0.99995	0.99996	0.99996	0.99996	0.99997
4	0.99997	0.99997	0.99997	0.99998	0.99998

-0.08	-0.06	-0.04	-0.02	0	
0.00002	0.00002	0.00003	0.00003	0.00003	-4
0.00003	0.00004	0.00004	0.00004	0.00005	-3.9
0.00005	0.00006	0.00006	0.00007	0.00007	-3.8
0.00008	0.00008	0.00009	0.00010	0.00011	-3.7
0.00012	0.00013	0.00014	0.00015	0.00016	-3.6
0.00017	0.00019	0.00020	0.00022	0.00023	-3.5
0.00025	0.00027	0.00029	0.00031	0.00034	-3.4
0.00036	0.00039	0.00042	0.00045	0.00048	-3.3
0.00052	0.00056	0.00060	0.00064	0.00069	-3.2
0.00074	0.00079	0.00084	0.00090	0.00097	-3.1
0.00104	0.00111	0.00118	0.00126	0.00135	-3
0.00144	0.00154	0.00164	0.00175	0.00187	-2.9
0.00199	0.00212	0.00226	0.00240	0.00256	-2.8
0.00272	0.00289	0.00307	0.00326	0.00347	-2.7
0.00368	0.00391	0.00415	0.00440	0.00466	-2.6
0.00494	0.00523	0.00554	0.00587	0.00621	-2.5
0.00657	0.00695	0.00734	0.00776	0.00820	-2.4
0.00866	0.00914	0.00964	0.01017	0.01072	-2.3
0.01130	0.01191	0.01255	0.01321	0.01390	-2.2
0.01463	0.01539	0.01618	0.01700	0.01786	-2.1
0.01876	0.01970	0.02068	0.02169	0.02275	-2
0.02385	0.02500	0.02619	0.02743	0.02872	-1.9
0.03005	0.03144	0.03288	0.03438	0.03593	-1.8
0.03754	0.03920	0.04093	0.04272	0.04457	-1.7
0.04648	0.04846	0.05050	0.05262	0.05480	-1.6
0.05705	0.05938	0.06178	0.06426	0.06681	-1.5
0.06944	0.07215	0.07493	0.07780	0.08076	-1.4
0.08379	0.08692	0.09012	0.09342	0.09680	-1.3
0.10027	0.10383	0.10749	0.11123	0.11507	-1.2
0.11900	0.12302	0.12714	0.13136	0.13567	-1.1
0.14007	0.14457	0.14917	0.15386	0.15866	-1
0.16354	0.16853	0.17361	0.17879	0.18406	-0.9
0.18943	0.19489	0.20045	0.20611	0.21186	-0.8
0.21770	0.22363	0.22965	0.23576	0.24196	-0.7
0.24825	0.25463	0.26109	0.26763	0.27425	-0.6
0.28096	0.28774	0.29460	0.30153	0.30854	-0.5
0.31561	0.32276	0.32997	0.33724	0.34458	-0.4
0.35197	0.35942	0.36693	0.37448	0.38209	-0.3
0.38974	0.39743	0.40517	0.41294	0.42074	-0.2
0.42858	0.43644	0.44433	0.45224	0.46017	-0.1
0.46812	0.47608	0.48405	0.49202	0.50000	0