EoS - E-tutorial 05 - WiSe 2022/2023

StatRef.F.1.1.00014 (60 Punkte)

Sie haben die folgende Antwort gegeben:

The random variables X_1, X_2, X_3, X_4 and X_5 are normally distributed. You find the parameters of the respective distributions stated in the table below. Furthermore, Z_i $(i = 1, \ldots, 10)$ are random variables following a standard normal distribution. All random variables listed are overall stochastically independent.

$$
\begin{aligned}
Y_1 &= \sum_{i=1}^{7} Z_i \\
Y_2 &= \left(\frac{X_3 - 10}{\sqrt{\frac{\sum_{i=1}^{25} Z_i^2}{7}}}\right)^2 + \left(\frac{X_5 - 5}{\frac{Y_2}{5}}\right)^2 + Z_6^2 + Z_7^2 + Z_{10}^2 \\
Y_3 &= \left(\frac{X_3 - 10}{\sqrt{\frac{\sum_{i=1}^{25} Z_i^2}{7}}}\right) \Big/ \left(\frac{\sqrt{25}}{Z_5}\right) \\
Y_4 &= \sqrt{4} \cdot \frac{}{\sqrt{Z_1^2 + Z_2^2 + Z_5^2 + Z_7^2}}
\end{aligned}
$$

Hint: Please round your results - if necessary and if not asked otherwise - to **four** decimal places.

RV	X_1	X_2	X_3	X_4	X_5
μ	5	17	10	19	5
σ^2	1	64	25	9	25

a) (15 Points) Please calculate the expected value of the random variable Y_3. 1.6667

b) (15 Points) Please calculate the variance of the random variable Y_1. 7

c) (5 Points) Please state the number of degrees of freedom of the random variable Y_2. 5

d) (10 Punkte) Please state the 95%-quantile of the random variable Y_4. 2.1318

e) (15 Punkte) Please state the 99%-quantile of the random variable Y_1. 6.1549

Die bestmögliche Lösung lautet:

The random variables X_1, X_2, X_3, X_4 and X_5 are normally distributed. You find the parameters of the respective distributions stated in the table below. Furthermore, Z_i $(i = 1, \ldots, 10)$ are random variables following a standard normal distribution. All random variables listed are overall stochastically independent.

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Y_4 &= \sqrt{4} \cdot \frac{}{\sqrt{Z_1^2 + Z_2^2 + Z_5^2 + Z_7^2}}
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$$

Hint: Please round your results - if necessary and if not asked otherwise - to **four** decimal places.

RV	X_1	X_2	X_3	X_4	X_5
μ	5	17	10	19	5

σ^2	1	64	25	9	25

a) (15 Points) Please calculate the expected value of the random variable Y_3.
1.66666666666667

b) (15 Points) Please calculate the variance of the random variable Y_1. 7

c) (5 Points) Please state the number of degrees of freedom of the random variable Y_2. 5

d) (10 Punkte) Please state the 95%-quantile of the random variable Y_4. 2.13184678632665

e) (15 Punkte) Please state the 99%-quantile of the random variable Y_1. 6.15493793773588

Sie haben 60 von 60 möglichen Punkten erreicht.