$\mathbb{DISCLAMER}$, this stuff should be taken as a quick indication, if you think something's wrong, go look in the course. Also, if you spot any mistakes please tell me

misc

- smol means $n < 30$, big means $n \geq 30$;
- $(S^*)^2 = \dfrac{n}{n-1}S^2 = \dfrac{1}{n-1}\sum_{i=1}^{n}(X_i - \bar{X})^2$;
- $S^* = \sqrt{(S^*)^2}, S = \sqrt{S^2}$, duh;
- $D^2(X) = \mathbb{E}(X^2) - (\mathbb{E}(X))^2$;
- Maximum likelihood estimator = (Metoda) verosimilității maxime
- the χ^2-test is gud for testing the expected frequency vs the frequency you got (like on a coin/ on dice);
- $cov(X, Y) = \mathbb{E}\left((X - \bar{X})(Y - \bar{Y})\right) = \mathbb{E}(XY) - \mathbb{E}(X)\mathbb{E}(Y)$;
- when testing try to reject the null hypotesis (ie. chose he other thing as the null hypotesis: if ya want to check if $r > 0.8$ make $(H_0) : r = 0.8$ and $(H_1) : r > 0.8$)

(also look at `https://en.wikipedia.org/wiki/Exclusion_of_the_null_hypothesis`);

- P-value:
  - $P_v \leq \alpha \implies (H_0)$ fals,
  - $P_v ==$ "Probabilitatea de a obtine un rezultat cel putin la fel de extrem ca cel observat,
  - $P_v = \mathbb{P}(T \geq t|H)$ for a one-sided (right tail) test,
  - $P_v = \mathbb{P}(T \leq t|H)$ for a one-sided (left tail) test,
  - $P_v = 2\min\{\mathbb{P}(T \leq t|H), \mathbb{P}(T \geq t|H)\}$ for a two-sided test
  - more stuff at C6/pg 3;

Confidence intervals - tl;dr

for the average

type	where to find	X type	n size	σ known	the interval
bilateral	C5 - pg 2	$\mathcal{N}(\mu,\sigma^2)$	whatever	yes	$\mu \in \left(\bar{X} - \frac{\sigma}{\sqrt{n}} z_{1-\alpha/2}, \bar{X} + \frac{\sigma}{\sqrt{n}} z_{1-\alpha/2}\right)$
bilateral	C5 - pg 3	whatever	big	yes	$\mu \in \left(\bar{X} - \frac{\sigma}{\sqrt{n}} z_{1-\alpha/2}, \bar{X} + \frac{\sigma}{\sqrt{n}} z_{1-\alpha/2}\right)$
no sup	C5 - pg 3	$\sim \mathcal{N}(\mu,\sigma^2)$	big	yes	$\mu \in \left(\bar{X} - \frac{\sigma}{\sqrt{n}} z_{1-\alpha}, \infty\right)$
no inf	C5 - pg 3	$\sim \mathcal{N}(\mu,\sigma^2)$	big	yes	$\mu \in \left(-\infty, \bar{X} + \frac{\sigma}{\sqrt{n}} z_{1-\alpha}\right)$
bilateral	C5 - pg 3 bot	whatever	big	no	$\mu \in \left(\bar{X} - \frac{S^*}{\sqrt{n}} z_{1-\alpha/2}, \bar{X} + \frac{S^*}{\sqrt{n}} z_{1-\alpha/2}\right)$
unilateral	C5 - pg 4	whatever	big	no	like rows 2 and 3 but with S^*
bilateral	C5 - pg 5	$\sim \mathcal{N}(\mu,\sigma^2)$	smol	no	$\mu \in \left(\bar{X} - \frac{S^*}{\sqrt{n}} t_{1-\alpha/2,n-1}, \bar{X} + \frac{S^*}{\sqrt{n}} t_{1-\alpha/2,n-1}\right)$
unilateral	C5 - pg 5	$\sim \mathcal{N}(\mu,\sigma^2)$	smol	no	like rows 2 and 3 but with S^* and $t_{1-\alpha,n-1}$

for the variance (dispersion)

type	where to find	X type	n size	μ known	the interval
bilateral	C5 - pg 6	$\sim \mathcal{N}(\mu,\sigma^2)$	smol	yes	$\sigma^2 \in \left(\frac{\sum_{i=1}^n (X_i-\mu)^2}{\chi^2_{\alpha/2,n}}, \frac{\sum_{i=1}^n (X_i-\mu)^2}{\chi^2_{1-\alpha/2,n}}\right)$
bilateral	C5 - pg 6	$\sim \mathcal{N}(\mu,\sigma^2)$	smol	no	$\sigma^2 \in \left(\frac{(n-1)(S^*)^2}{\chi^2_{\alpha/2,n-1}}, \frac{(n-1)(S^*)^2}{\chi^2_{1-\alpha/2,n-1}},\right)$

for n large, look at C5 pg 7 - obs 1.3 tl;dr we make it a normal distribution

for two selections

look at C5 pg 8-10

"Testarea ipotezelor statistice"[1] - tl;dr

For the average

$(H_0) : \mu = \mu_0$

name	where to find	X type	n size	σ known	thing$_0$	bilateral tl;dr
Z test	C6 - pg 6-9	$\sim \mathcal{N}(\mu,\sigma^2)$	big	yes	$z_0 = \frac{\bar{x}-\mu_0}{\sigma/\sqrt{n}}$	$z_0 \in \left(-z_{1-\alpha/2}, z_{1-\alpha/2}\right)$
T test	C6 - pg 10-13	$\sim \mathcal{N}(\mu,\sigma^2)$	smol	no	$z_0 = \frac{\bar{x}-\mu_0}{s^*/\sqrt{n}}$	$t_0 \in \left(-t_{1-\alpha/2,n-1}, t_{1-\alpha/2,n-1}\right)$

[1] yea, ik, not the proper quotes

For the variance (dispersion)

$(H_0) : \sigma = \sigma_0$

χ^2-test
At C6 - pg 13-14

$\chi_0^2 = \dfrac{(n-1)(s^*)^2}{\sigma_0^2}$

H_0 is acepted (or pedantically "not rejected") if:
$\chi_0^2 \in (\chi^2_{1-\alpha/2,n-1}, \chi^2_{1-\alpha/2,n-1})$

also see S10/S11 - pg 4

F test for dispertion ratios

see C6 p14 - 16 also see S10/S11 - pg9

"Teoria concordanței" - tl;dr

the rank thing is (sometimes) calculated as the mean of the indices the value is equal - just look at 2b

- ex 1: Spearman & pearson coefficient
- ex 2: Pearson coefficient with an outlier
- ex 3: $\rho_{X,Y} = 0$ with $\alpha = 0.05$
  - is $y = x^3 - 1$ in contradiction with the other stuff
  - the usual stuff
- ex 4: Spearman coefficent with some frequencies
- the other ones are about the same thing mostly

Sun Tzu said: “The opportunity to secure ourselves against restanță lies in our own hands, but the opportunity of passing the exam is provided by the professor himself.”