# Hypothesis Testing Tutorial

## Hypothesis on one sample

The file `Healthy.dat` contains data on the thickness (in $\mu$m) of the retinal nerve fibre layer (RNFL) relative to healthy patients. The file is organized in 4 columns representing the four quadrants in which the retina is normally divided: temporal superior ($1^{st}$ column), temporal inferior ($2^{nd}$ column), nasal superior ($3^{rd}$ column) and nasal inferior ($4^{th}$ column). Use hypothesis testing to answer the following questions regarding the RNFL in the temporal inferior quadrant:

- Is the mean RNFL thickness significantly different from 100 $\mu$m? Use a 95% confidence level and compute the $p$-value.
- Using a 99% confidence level, is the mean RNFL thickness significantly greater than 86 $\mu$m in healthy subjects? Assume that $RNFL < 86\mu m$ is a completely uninteresting result[1]. Compute the $p$-value.

The file `Glaucoma.dat` contains the same type of data as `Healthy.dat` but obtained from a group of glaucoma patients. Answer the following questions regarding the RNFL in the temporal inferior quadrant:

- Is the mean RNFL thickness significantly different from 90 $\mu$m? Use a 90% confidence level and compute the $p$-value.
- Do you think the 90% confidence interval for the mean RNFL in glaucoma patients contains the value 90 $\mu$m? Compute the interval and verify your argument.

## Hypothesis on two samples

- Using a 95% confidence level, test whether or not there is any statistically significant difference in RNFL thickness between healthy subjects and glaucoma patients and provide the $p$-value. Assume unequal variance.

[1] An unlikely unrealistic scenario included here just for practice of one-sided tests