**Edit (23/4):** The whole derivation described here is actually more extensive than necessary and relying on the Delta method is overkill. In fact, since the relationship coefficient *r* is simply a constant, we can use standard properties of the variance to get that

using the notation described below.

**A brief note on confidence intervals used in `Heritability.R`**

In the `Heritability.R` script, I use family-based data consisting of first-degree relative pairings to estimate the heritability of a given trait of interest. This is done by using polychoric correlation (also known as tetrachoric correlation in the case when the trait of interest is modeled by binary/dichotomous variables, as is the case for my data) from which the estimated polychoric correlation *ρpcorr*, can be used to estimate the trait heritability by division of *ρpcorr*by the relationship coefficient *r* (Tenesa and Haley, 2013). Thus, heritability *h2*can be estimated as:

Since we use first-degree relative pairings within our cohort, the relationship coefficient *r* is simply 0.5. Thus, estimating the heritability is simply a problem of estimating the polychoric correlation, something which is simply done using the `polychor()` function from the `polycor` package in R.

However, we are not only interested in the point estimate of heritability but would also desire the 95% confidence interval. The `polychor()` function mentioned above allows us to obtain the standard error of the polychoric correlation, here denoted as . Now under the key assumption that the estimated polychoric correlation follows a normal distribution, we compute the standard Wald confidence interval for as

where is the 1-α quantile of the standardized normal distribution.

But this does not tell us what the confidence interval for the heritability would be. We know that heritability is estimated, in our data, as the estimated polychoric correlation divided by the relationship coefficient *r*. If we denote the standard error of the heritability as , does it then hold that ? In fact, I would argue that it does! Per the Delta method, we have that if

then for a function g, it holds that

which gives us a link between the standard error for the polychoric correlation and the standard error of the heritability.

When applied to our example, we have that

which means that Adding all of this together we get that