ACF Functions

**Autocorrelation is the Pearson correlation between values of a process at different times.**

The Pearson correlation coefficient, also known as Pearson’s r, is a measure of linear correlation between two sets of data. It is the ratio between the covariance of two variables and the product of their standard deviations.

For instance, for the 2 random variables, *X* and *Y*, the *Pearson’s correlation coefficient* is:

The *autocorrelation* between times and is

In terms of time lags

Subtracting the mean yields the *autocovariance* function

Normalized, the *autocorrelation coefficient* is

In the code:

* xcorr\_direction()
  + Used when calculating acf for **velocity angle**
  + Finds angle using
  + Norms
  + Poslagsmean = (dot product)
  + Return mean(poslagsmean())
* xcorr\_vector()
  + Used when calculating **polarity vector, polarity angle, velocity**
  + Poslagsmean = (dot product)
  + Return mean(poslagsmean())
* xcorr()
  + Used when calculating **abs-skew, speed, speed\_x, speed\_y**
  + Poslagsmean =
  + Return mean(poslagsmean(())

Inputs for each function and parameter to be calculated:

* Polarity vector
  + cospol = abs-skew \* cos(polarity\_angle)
  + sinpol = abs-skew \* sin(polarity\_angle)
    - = cospol
    - = sinpol
    - = cospol
    - = sinpol
* Polarity angle
  + cospolangle = cos(polarity\_angle)
  + sinpolangle = sin(polarity\_angle)
    - = cospolangle
    - = sinpolangle
    - = cospolangle
    - = sinpolangle
* Abs-skew
  + =abs-skew
  + =abs-skew
* Velocity angle
  + - =
    - =
    - =
    - =
* Velocity
  + - =
    - =
    - =
    - =
* Speed
  + =
  + =
* Speed\_x
  + =
  + =
* Speed\_y
  + =
  + =