- The basic idea of an ARIMA model is that if differencing the data at some order d produces an ARMA process, then the original process is said to be ARIMA
- A process x_t is said to be **ARIMA**(p,d,q) if

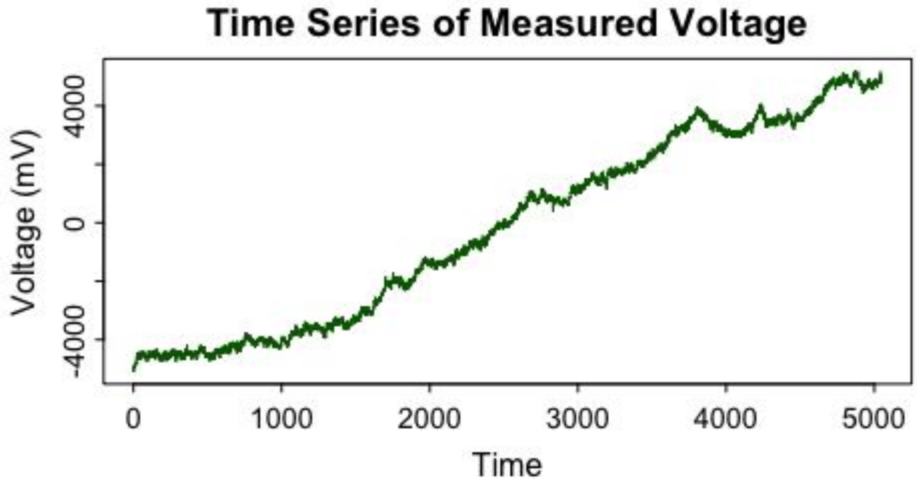
$$\nabla^d x_t = (1 - B)^d x_t$$

is ARMA(p,q). In general, the model is written as

$$\phi(B)(1 - B)^d x_t = \alpha + \theta(B) w_t,$$

where $\alpha = \delta(1 - \phi_1 - \dots - \phi_p)$ and $\delta = E(\nabla^d x_t)$

- Looking at the time series of the original measured voltage, it shows a linear pattern
- To eliminate that linearity, a first order difference was performed on the data
- In doing so, the data now models stationarity



- In an ARIMA(p,q,d) model:
  - p is the order of the autoregressive model
  - d is the order of differencing the data
  - q is the order of the moving average model

- With the ACF plot having a sharp cutoff after lag 1, that suggests a MA(1) structure. With the PACF plot having a slow, gradual decay, that indicates there is no strong AR term required for the model, which again supports a MA component rather than an AR component
- Due to the suggested MA(1) structure:
  - p = 0 since there is no AR term required
  - d = 1 since a first order difference was performed on the data
  - q = 1 because of the cutoff after lag 1
- Therefore, the appropriate model for the data is ARIMA(0,1,1)