STAT 443: Lab 9

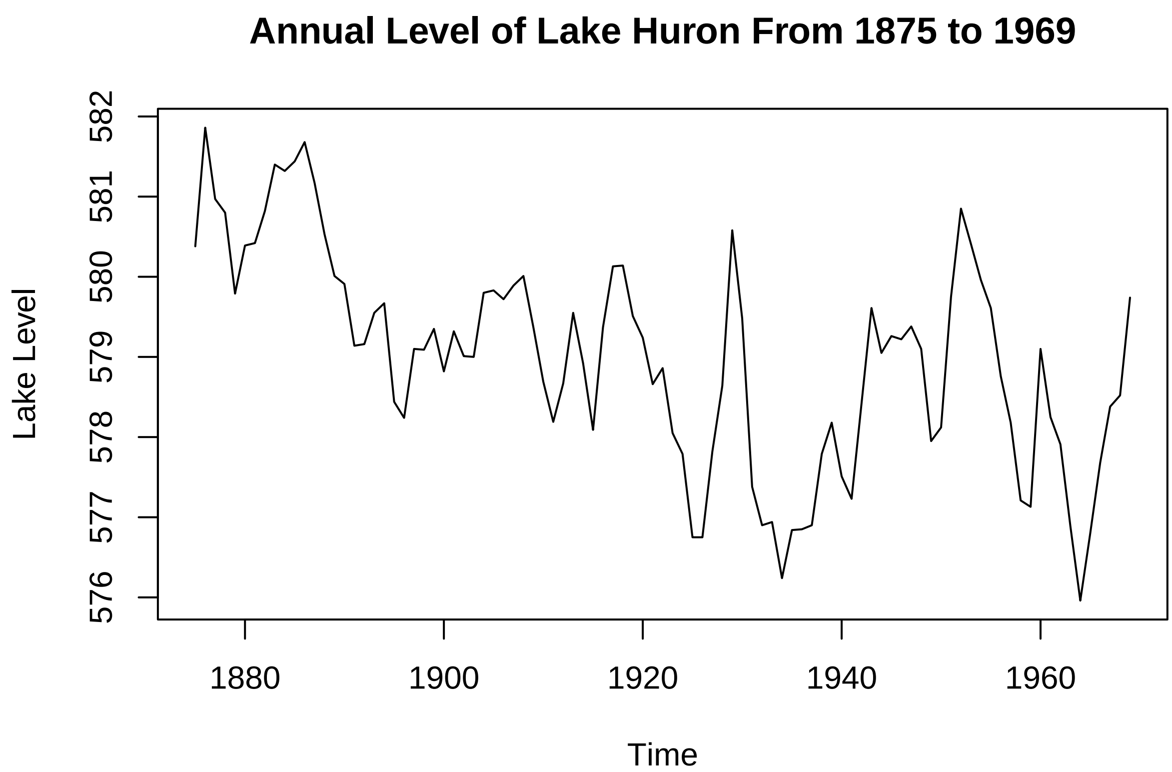
Wenxuan Zan (61336194)

20 March, 2023

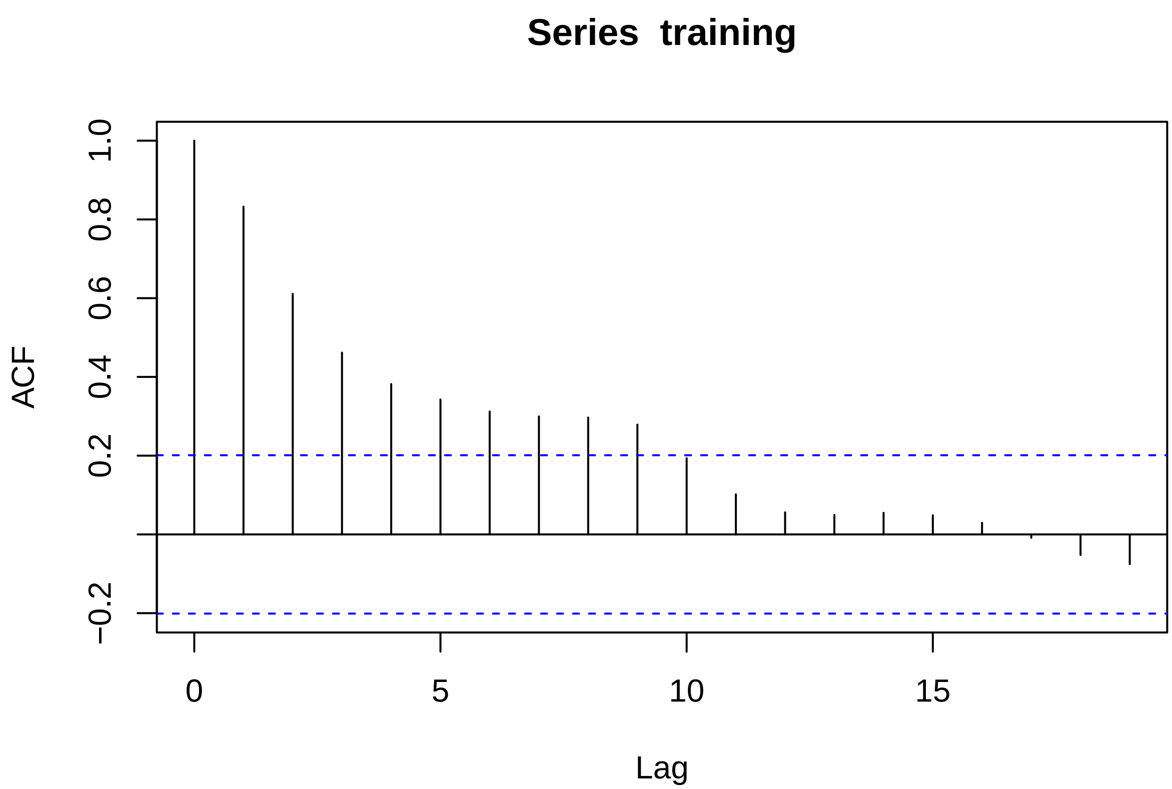
```r
data("LakeHuron")
training <- window(LakeHuron, start = c(1875), end = c(1969))
testing <- window(LakeHuron, start = c(1970), end = c(1972))
```

Question 1

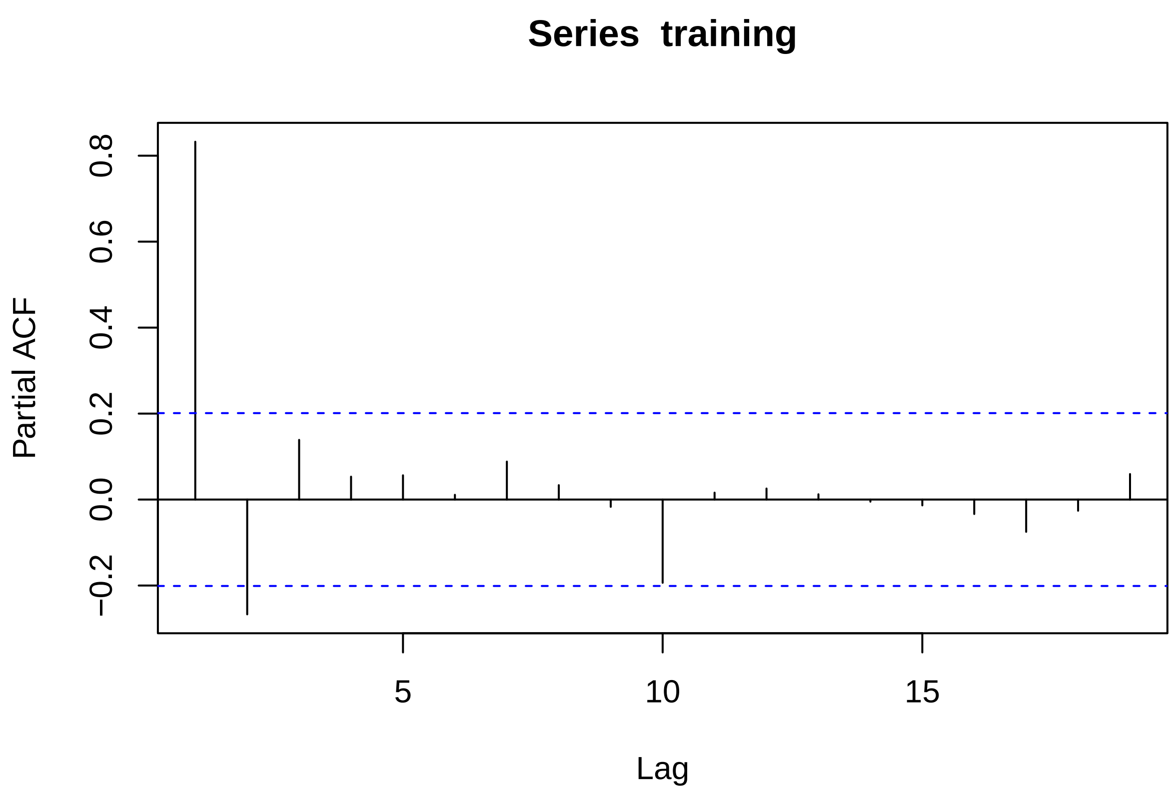
```r
plot(training,
     ylab = "Lake Level",
     main = "Annual Level of Lake Huron From 1875 to 1969")
```




```r
acf(training)
```




```
pacf(training)
```



Looking at the ACF plot, the values of auto-correlation decrease exponentially and the partial ACF plot shows a cut-off at lag 2. I would suggest a ARMA(2,0) model given the above observations.

Question 2

```r
model <- arima(training, order = c(2,0,0), include.mean = TRUE)
model
```

```
##
## Call:
## arima(x = training, order = c(2, 0, 0), include.mean = TRUE)
##
## Coefficients:
##          ar1      ar2  intercept
##       1.0617  -0.2707   579.0319
## s.e.  0.1006   0.1030     0.3339
##
## sigma^2 estimated as 0.484:  log likelihood = -101.01,  aic = 210.01
```

Fitted model:

$$X_t - \hat{\mu} = 1.0617(X_{t-1} - \hat{\mu}) - 0.2707(X_{t-2} - \hat{\mu}) + Z_t;$$

where $\hat{\mu} = 579.0319$ and $\quad Z_t \sim WN(0, 0.484)$