Indian summer monsoon rainfall prediction

A comparison of ARIMA and ANN models

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Introduction

- **Challenge:** accurate forecasting of Indian summer monsoon rainfall (ISMR) from June through September.

Data

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  - training (1871-1960), and
  - testing (1961-2016) data sets

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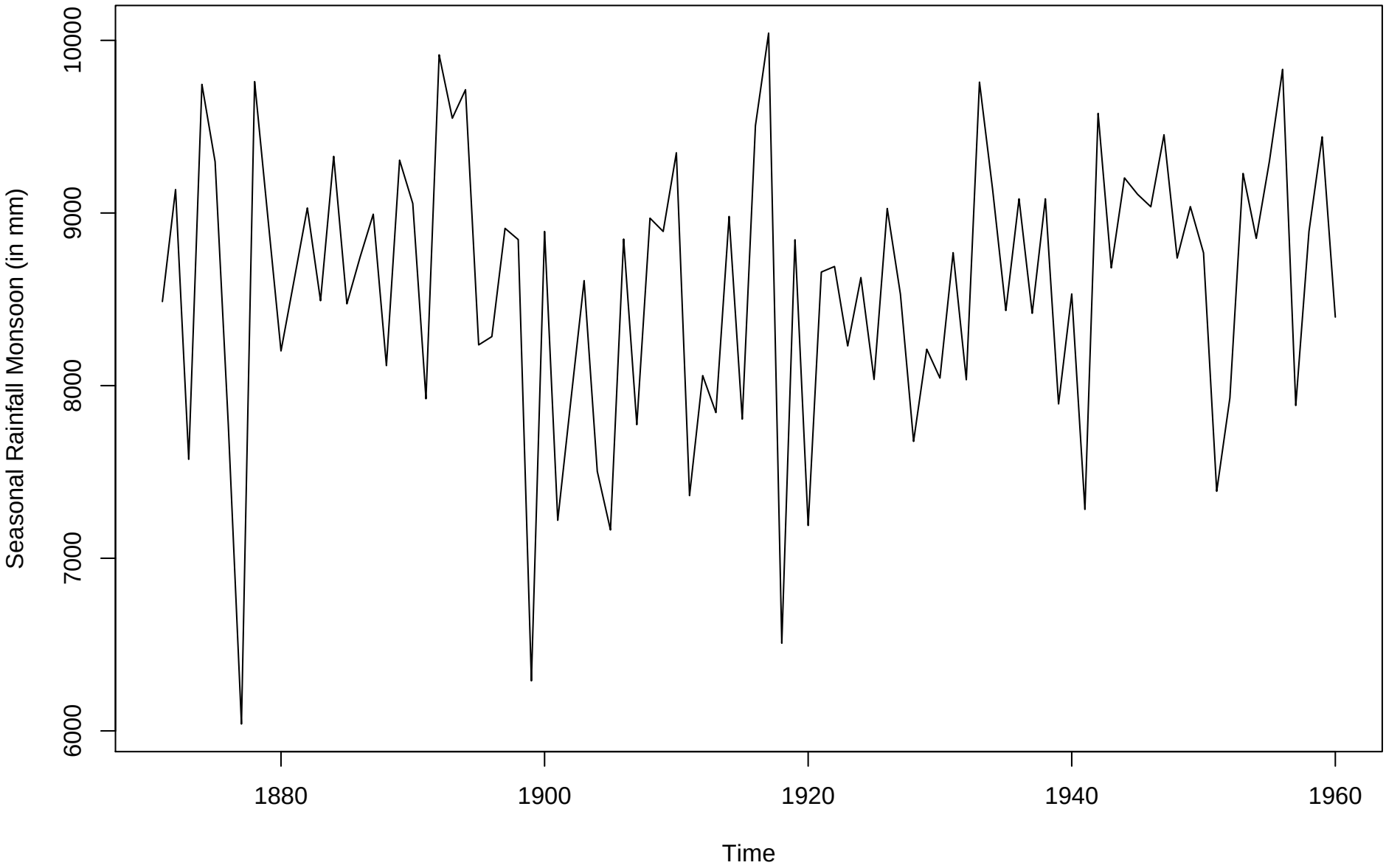
  - Non-linear Artificial Neural Network (NANN) Model

ISRM training data (1871-1960)



Augmented Dickey-Fuller Test (1871-1960)

```
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data:  trainingdata
Dickey-Fuller = -4.1077, Lag order = 4, p-value = 0.01
alternative hypothesis: stationary
```
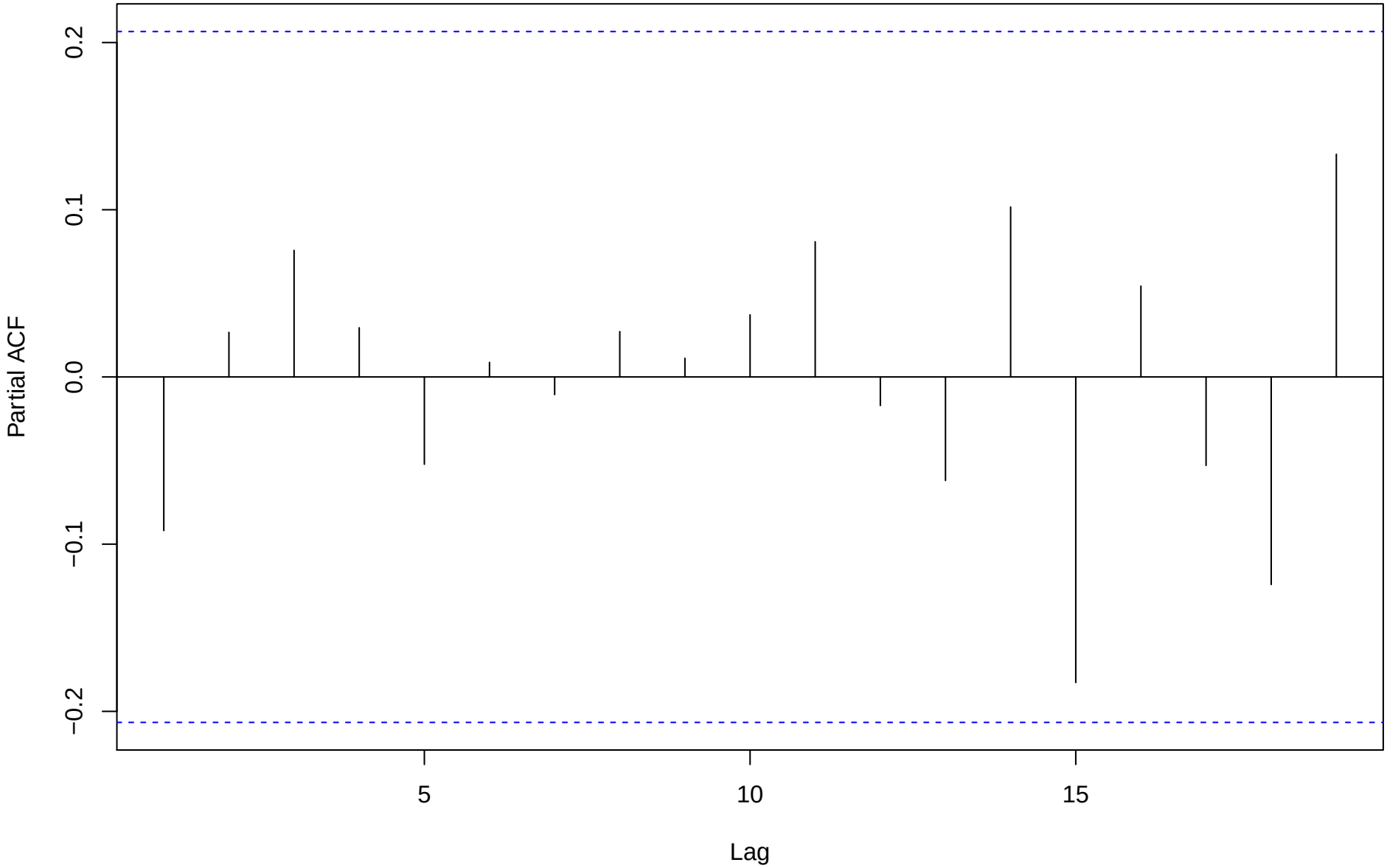
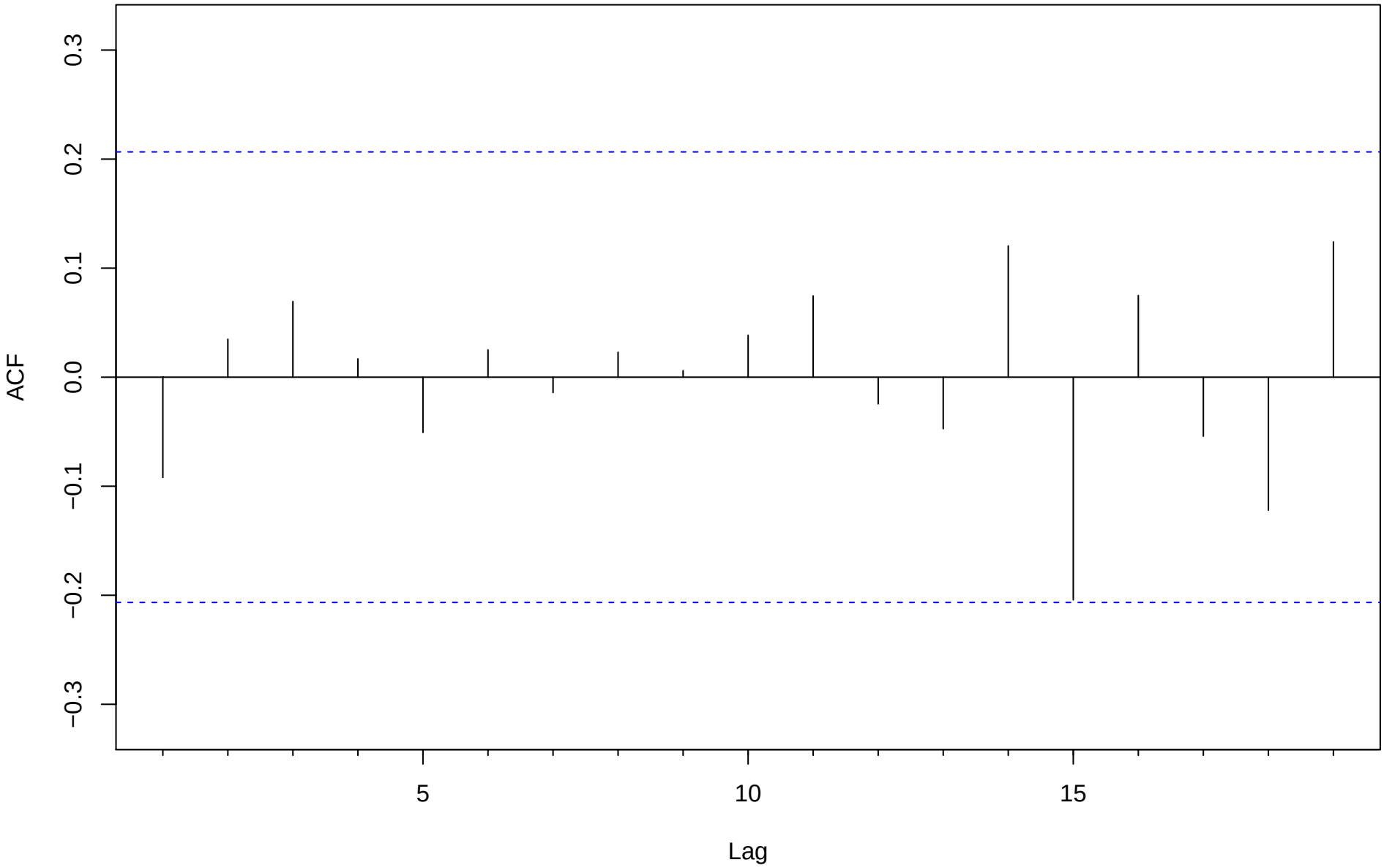

Partial Autocorrelation Function (1871-1960)



Autocorrelation Function (1871-1960)

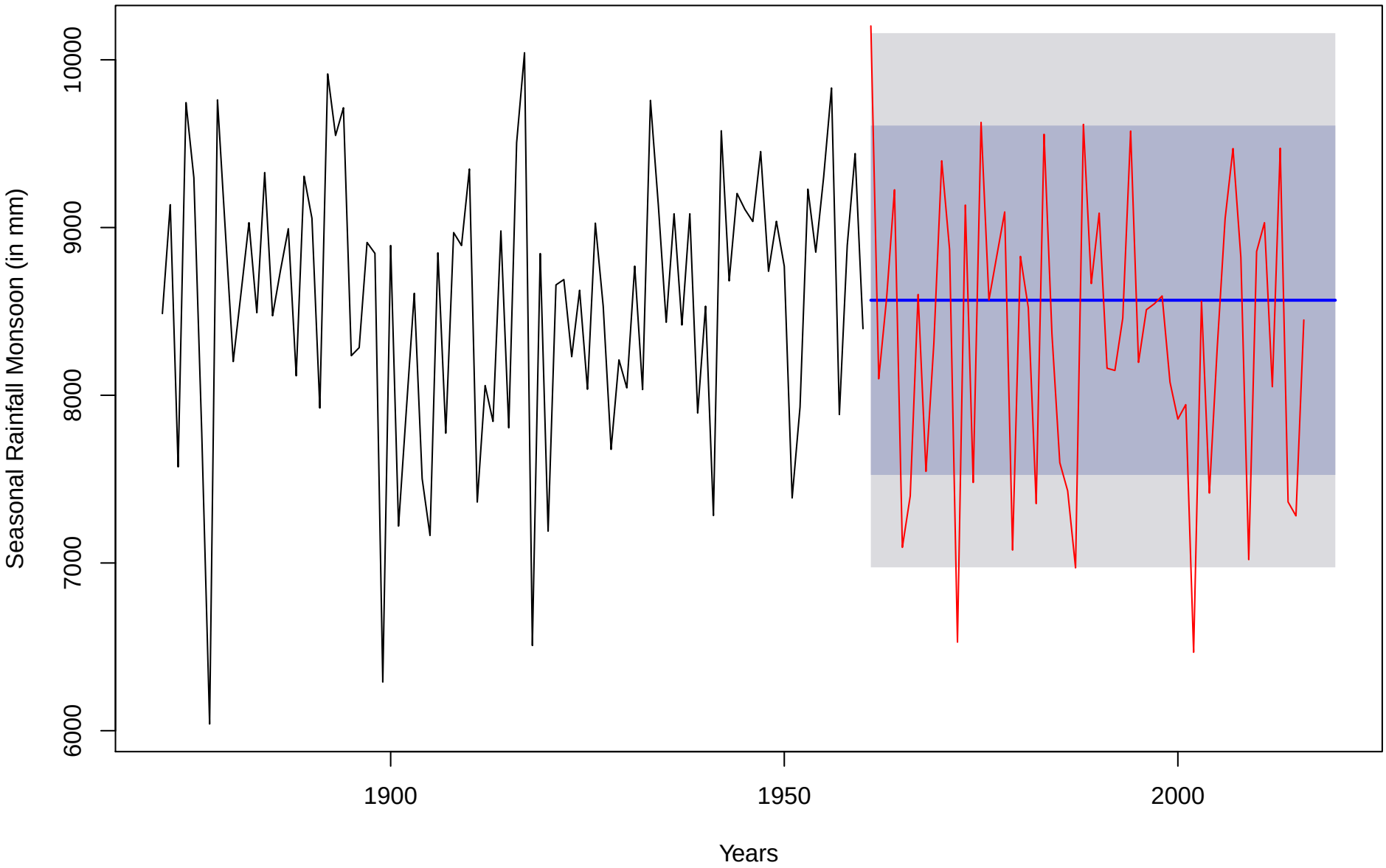


Parameter Estimation

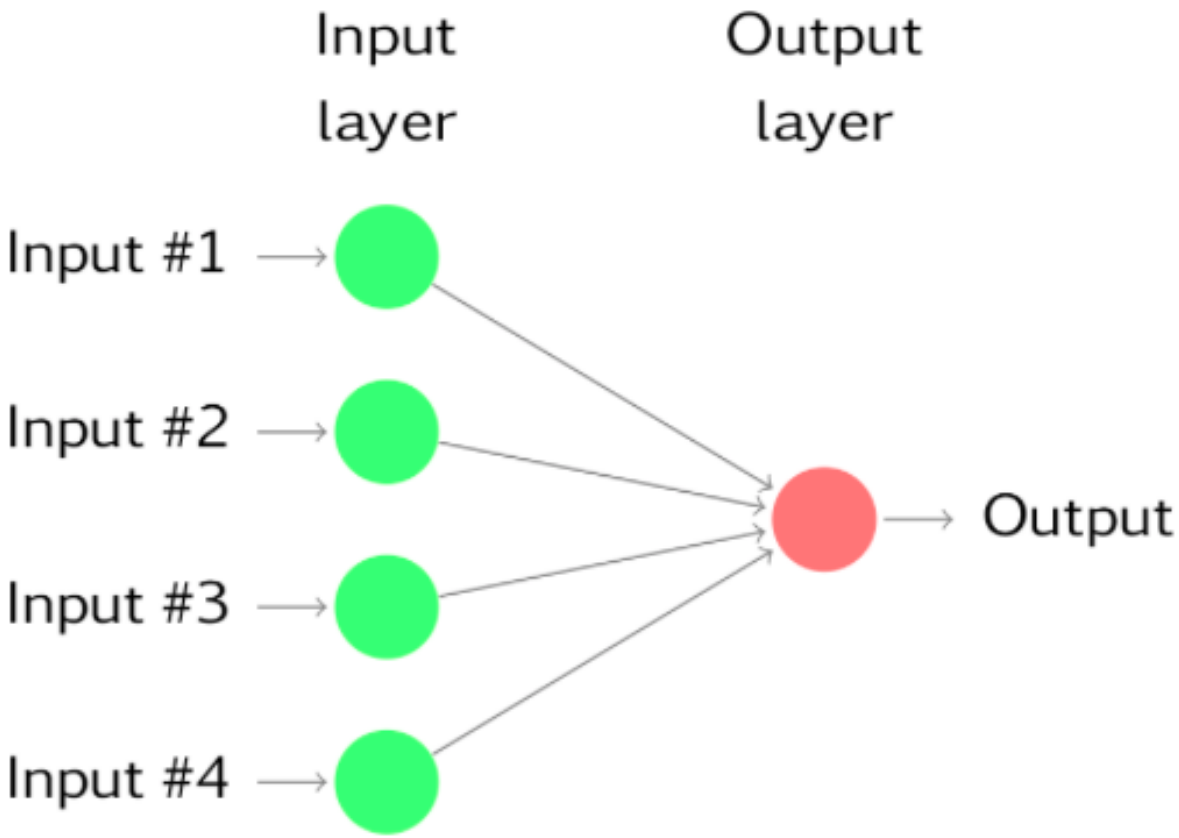
- Thus the proposed model is $ARIMA(0, 0, 0)$.

```
Series: trainingdata
ARIMA(0,0,0) with non-zero mean

Coefficients:
          mean
      8566.6444
s.e.    85.1768

sigma^2 estimated as 660294:  log likelihood=-730.22
AIC=1464.44   AICc=1464.58   BIC=1469.44
```

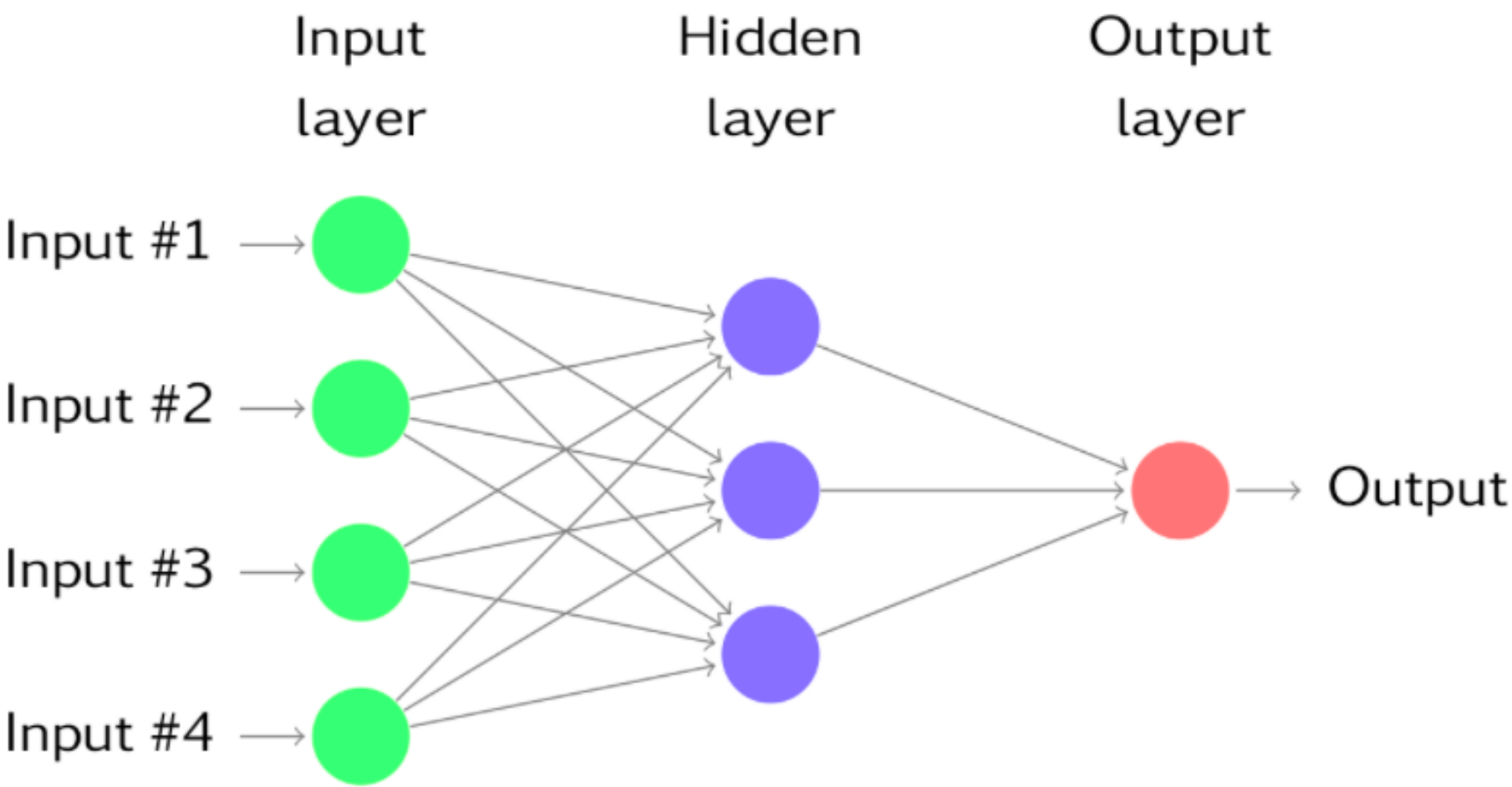
Forecasts from ARIMA(0,0,0)



Simple Neural Netwrok



Multilayer Feed-Forwad Neural Netwrok



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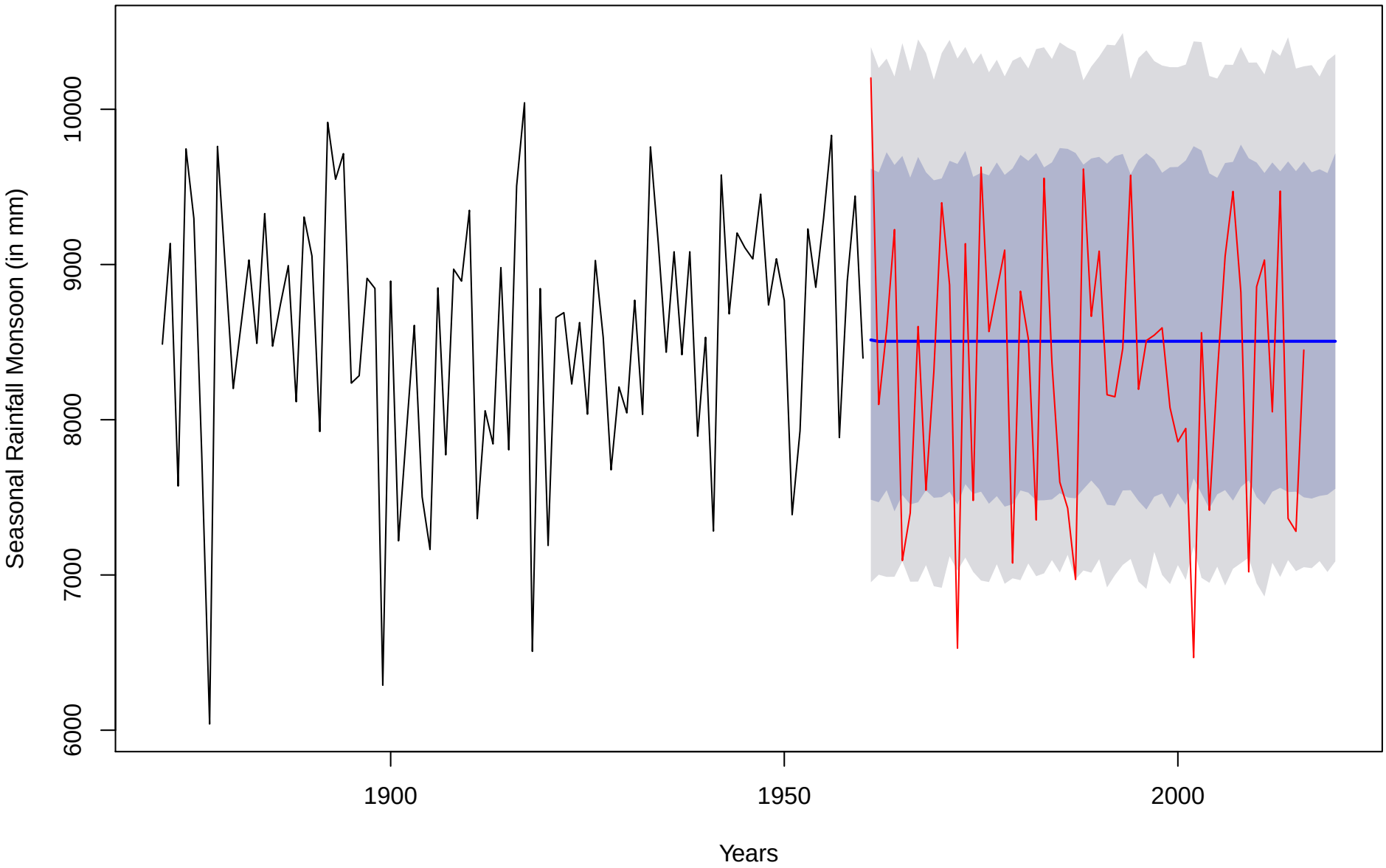
  - $k = 1$ is number of node(s) in hidden layer

Forecasts from NANN(1,1)



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- The behavior of their predication intervals differ significantly.
  - The possible reason may be that, neural networks are not based on a well-defined stochastic model.
  - Thus, prediction intervals were calculated from the simulation models.

Take Away

- Making interpretations and further policy implications using ANN we should be very cautious due to the limitations on prediction interval.

References

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