

# Beginning Time Series Analysis and Forecasting with R

---

## INTRODUCTION



**Martin Burger**

R PROGRAMMING TUTOR

[www.r-tutorials.com](http://www.r-tutorials.com)



# Overview



**Managing expectations**

**Prerequisites**

**Time series analysis background**

**Datasets**



# What You Can Learn in This Course



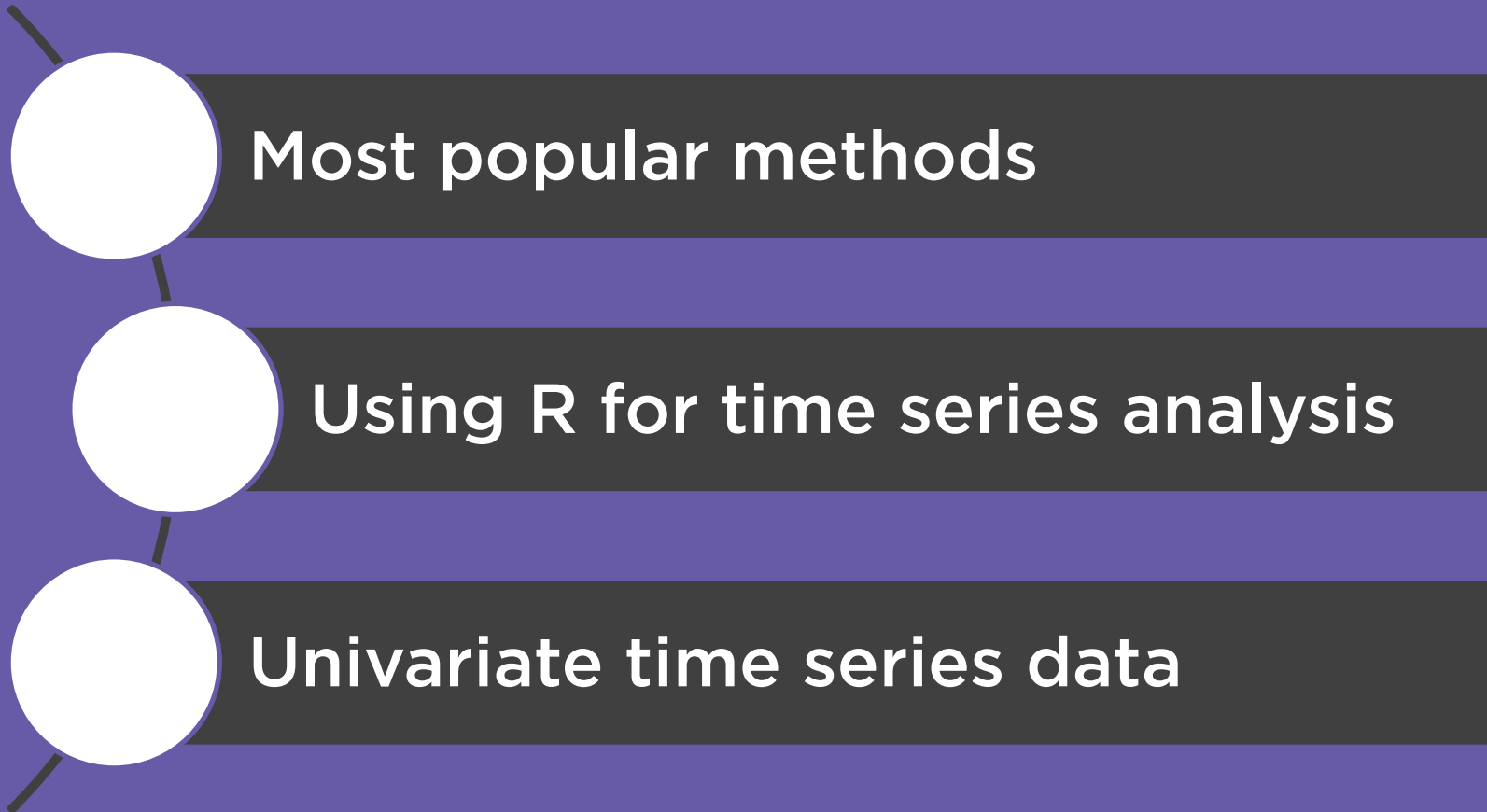
**Managing expectations**



**Prerequisites and preparation**



# Introductory Course on Time Series Analysis



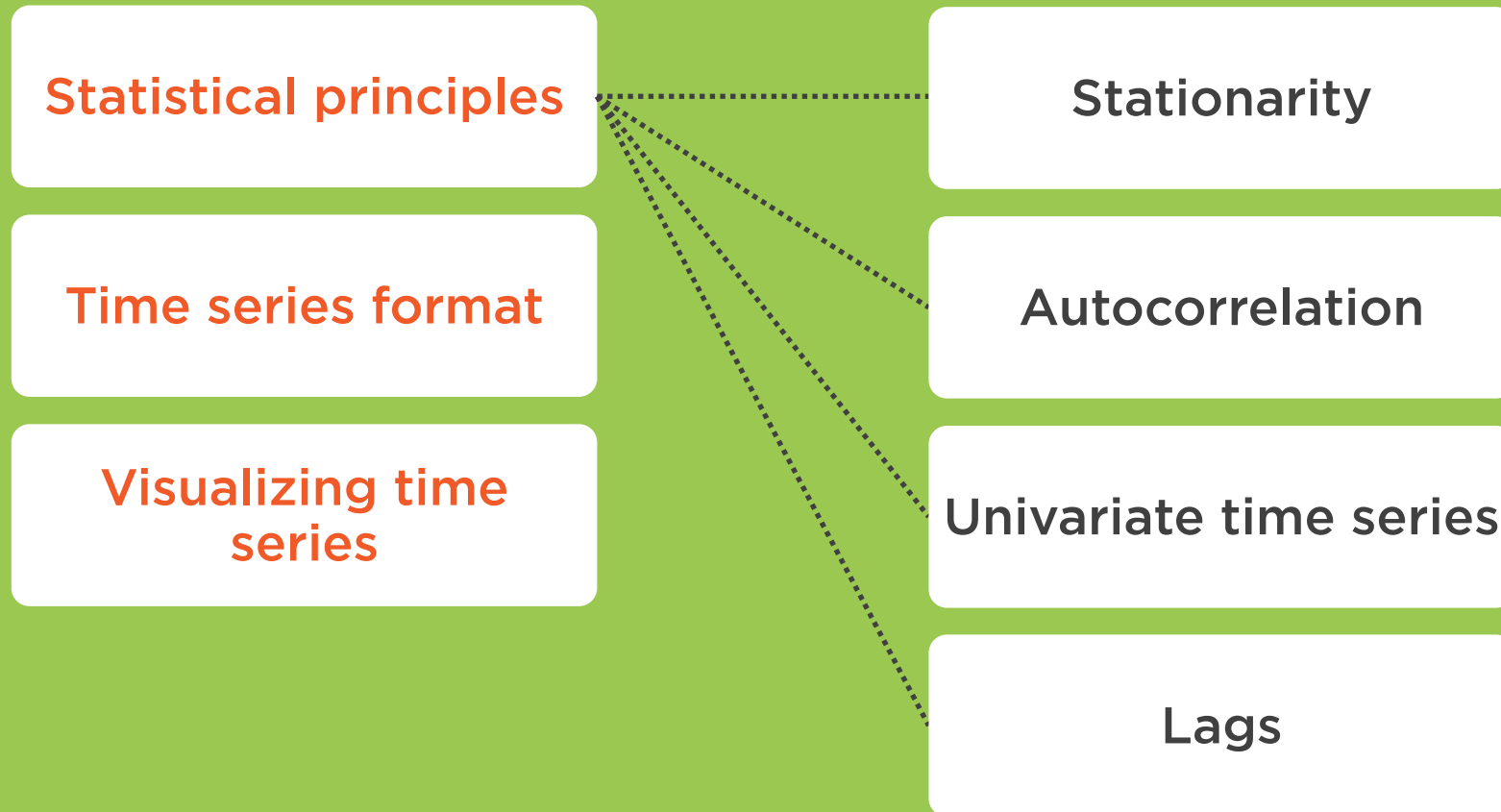
# Module: Introduction

**General course outline**

**Datasets to be used**



# Module: Traits of Time Series Data



# Module: Simple Time Series Models

**Mean method**

**Naïve method**

**Drift method**

**Model comparison**

**Model selection**



# Module: Advanced Time Series Models

A circular icon with a dark blue outline, containing the text "ARIMA" in white.

ARIMA

A circular icon with a dark blue outline, containing the text "Exponential Smoothing" in white.

Exponential  
Smoothing

A circular icon with a dark blue outline, containing the text "R Functions" in white.

R  
Functions





After completing this course,  
you will be able to analyze and  
forecast standard univariate  
datasets in R.



# Prerequisites and Preparation



Technical tools



Knowledge

# Software Requirements

**R and RStudio installed on  
your computer**

**Two add-on packages to  
install in RStudio**





**Install the packages once,  
activate them in each session.**

```
> library( )
```



# Add-on Packages



Library 'forecast' by Rob Hyndman

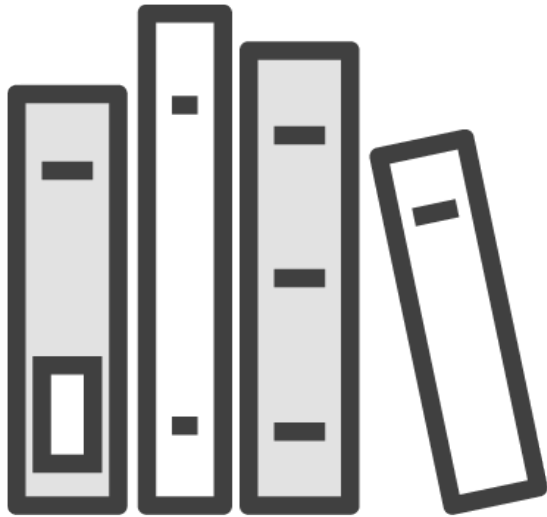
Library 'tseries'



# Downloadable R Code



# Preparation Material



**RStudio: Get Started by Casimir Saternos**  
**Basic understanding of coding**





## Principles

Where to find time series and how to process it?

Which models/ model systems exist?

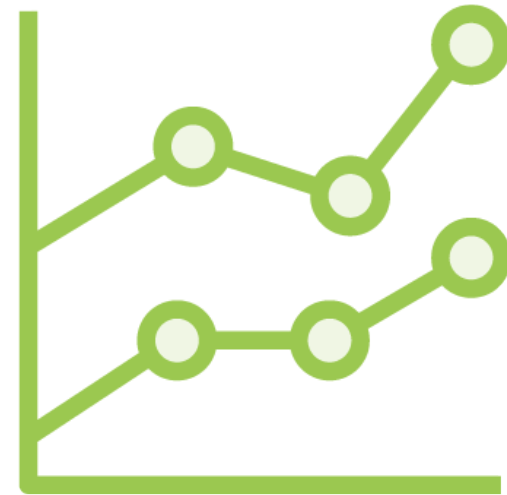




# Predictions vs. Forecasting

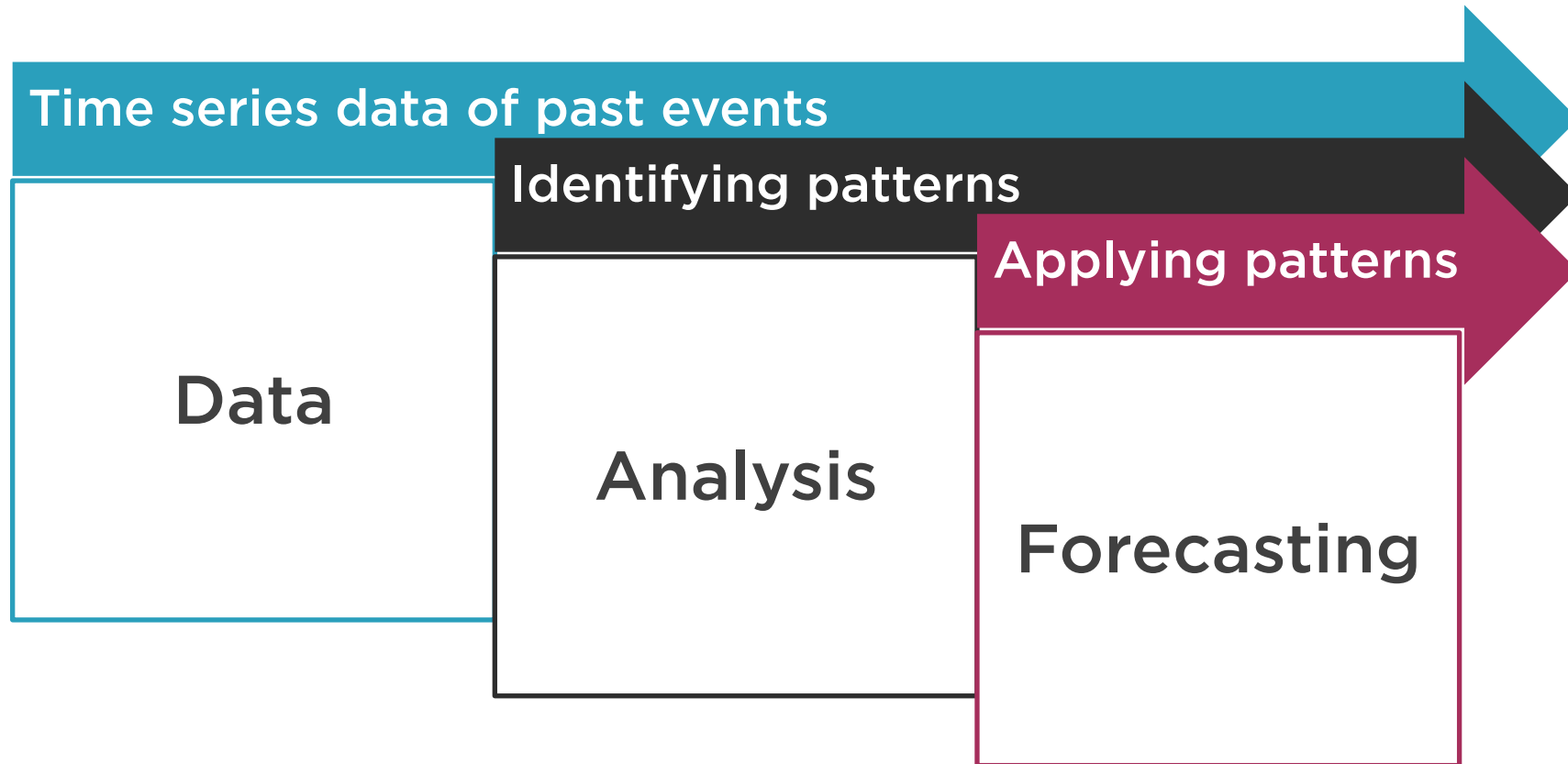


**Predictive Speculations**



**Quantitative Forecasting**

# How This Process Work





## Stock data

Example: closing prices of the last twelve months

Harvesting stock data in R with the library 'quantmod'



# Further Examples of Time Series Data



**Weather Forecasting and  
Meteorology**



**Medical and Biological Research**



---

Univariate  
Time  
Series

# Linear

ARIMA

---

Exponential Smoothing

---

Simple Methods

---

# Non- linear

---

K Nearest Neighbors

---

Clustering

---

Neural Nets

---

Support Vector Machines

---

Q Learning

---

Decision Trees

---



# Datasets We Use



Lynx trappings in  
Canada



Temperature  
measurements in  
Nottingham



Randomly generated  
series

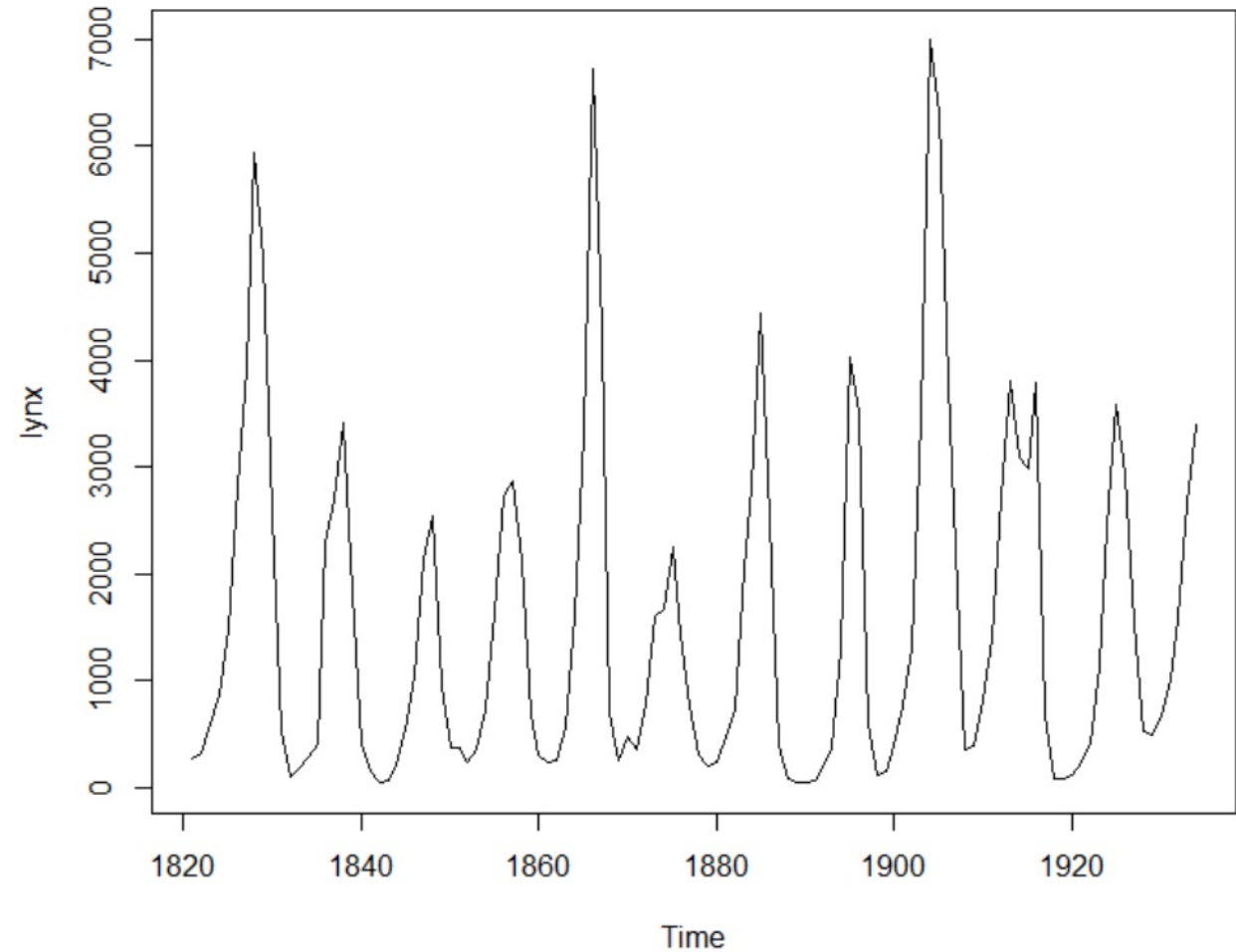
Annual Canadian lynx  
trappings

1821-1934

Integers

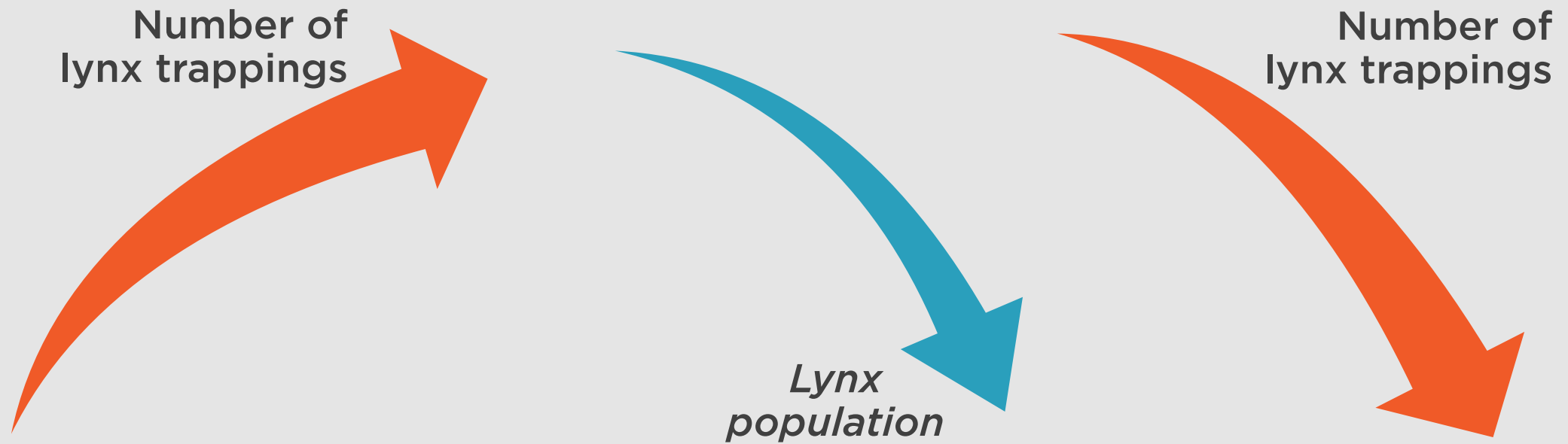
Length = 114

Pulse at every 7-10  
years





# Autocorrelation in 'lynx'



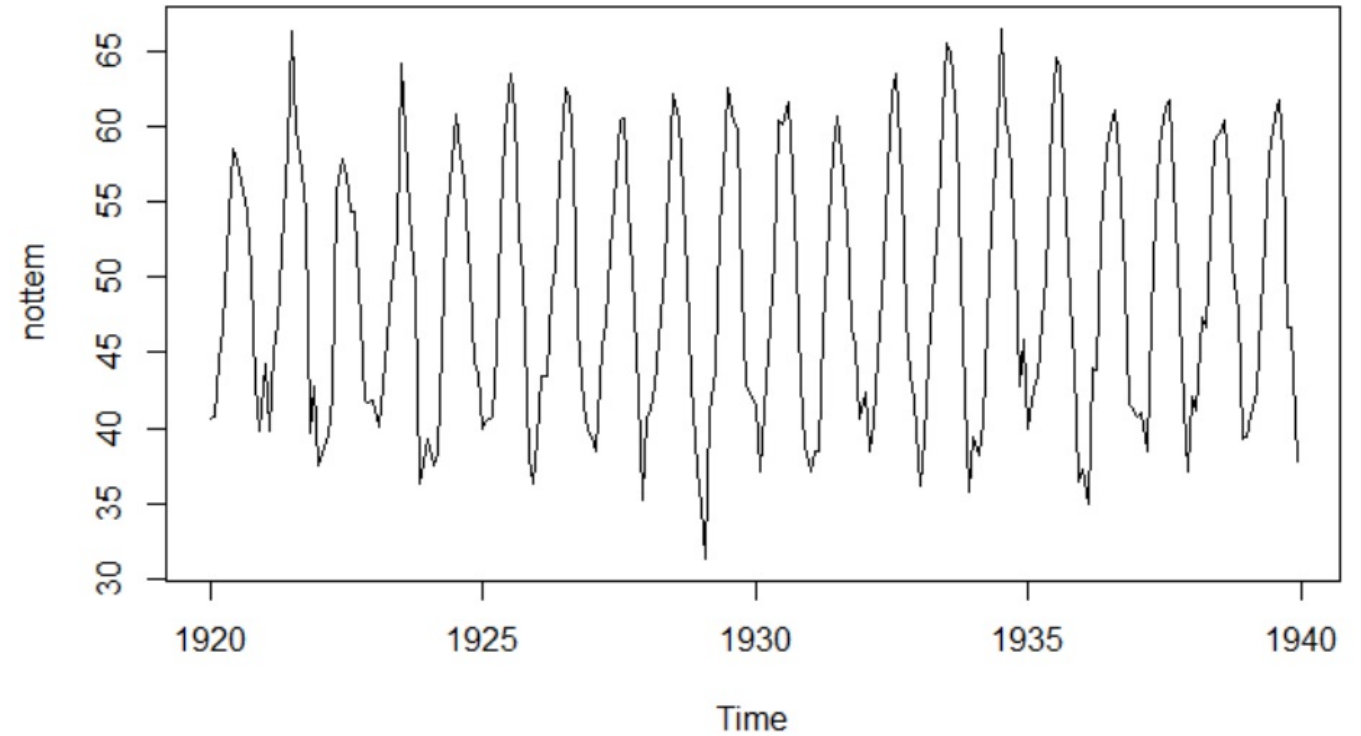
Monthly average  
temperature in °F

Nottingham

1920-1939

Length: 240

Seasonal



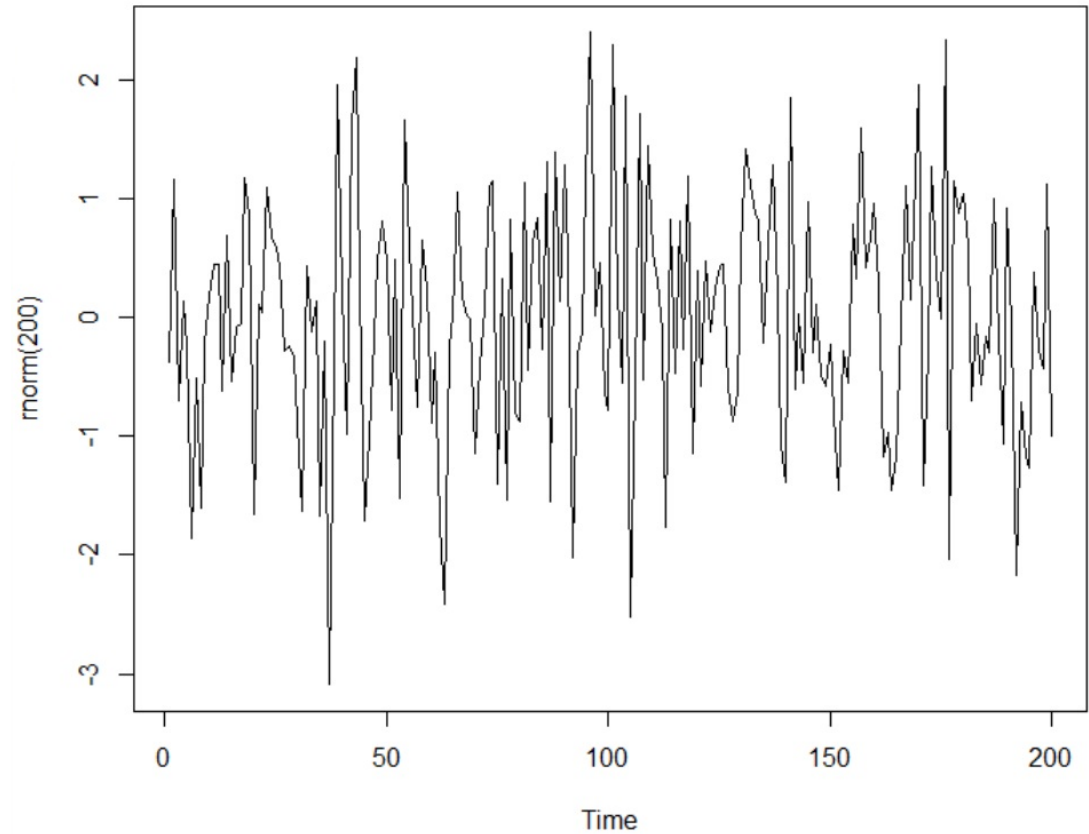
Random number  
generation

Function `rnorm()`

Normal distribution

Zero mean

Standard dev. = 1



# Introduction



**Course Overview**



**Introduction to Time  
Series**



**Datasets**

