

**Advanced R Programming**

**Course Number:** RPROG-106  
**Duration:** 4 days

**Overview**

Accelebrate's Advanced R course teaches students more sophisticated R skills, including using advanced regular expressions, machine learning, random effects modeling, Bayesian Inference, advanced R time series, and much more.

**Important Note:** We have listed more topics here than could be covered in 4 days and we would tailor the selection of topics covered to your specific needs. Please [contact us](file:////contact) for a quote and to arrange a discussion with one of our senior R instructors about customizing this class to your experience and goals.

**Prerequisites**

All students should have attended Accelebrate's [Introduction to R Programming](file:////training/r-programmers) course, or have equivalent knowledge.

**Materials**

All Advanced R training students receive comprehensive courseware.

**Software Needed on Each Student PC**

* A recent release of R 4.x
* IDE or text editor of your choice (RStudio recommended)

**Objectives**

* Use advanced regular expressions in R
* Apply advanced missing data techniques
* Work with advanced R time series
* Use data.table for big data
* Work with linear models
* Extend R to time to event and survival analyses
* Work with Bayesian Inference using R

**Outline**

* Advanced Regular Expressions in R
  + Using Perl-Style Regular Expressions in R
* Machine Learning Approaches in R
  + Pre-processing Data
  + Feature Selection
  + Supervised Learning:
    - Classification Models
    - Regression Models
  + Unsupervised Learning:
    - Clustering
* Advanced Missing Data Techniques
  + Understanding the different types of Missing Data
  + Implications for Analysis
  + The AMELIA package
  + Multiple Imputation
* Advanced R Time Series
  + The ts class
  + The zoo package
  + The xts class
  + Lubridate for advanced date handling
  + Autocorrelation Plots
  + Seasonal, trend, and noise plots
  + Financial Charting with R
* Using data.table for Big Data
  + Why do we need data.table?
  + Why is it
  + The i and the j arguments in data.table
  + Merging data with data.table
  + Group-by functions with data.table
  + Using data.table in functions
* Generalized Linear Models
  + Logistic Regression
  + Poisson Regression
  + Gamma Regression
* Extend R to Time to Event or Survival Analyses
  + Visualizing Hazards Across Time
  + Understanding the Log Rank Test
  + Cox Proportional Hazards Modeling
    - Understand Time Varying Covariates
    - Understand Time Dependent Covariates
    - Understanding the Hazard Ratio
    - Implement Frailty Models for Clustered Data
  + Parametric Survival Models
    - Weibull Model
    - Exponential Model
    - Predicting Failure Times
* Random Effects Modeling in Linear Regression
  + Random effects introduction
  + Covariance structures
  + Interpreting random effects in models
  + Longitudinal Data
  + Clustered Data
  + Prediction in Random Effects
* Extension: Random Effects Modeling in Logistic Regression
  + Random effects introduction
  + Covariance structures
  + Interpreting random effects in models
  + Marginal versus Conditional Models
    - Stratified Logistic regression
    - GEE Models in Logistic Regression
* Bayesian Inference Using R
  + Linear model
  + Logistic Model
  + Random Effects / Fixed effects model