Using R for Crash Data Analysis Training Course

Professional Development Training Course Outline

Category	Traffic Management & Road Safety	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

In today's data-driven world, traffic safety and crash data analysis are critical for informed decision-making, policy development, and risk mitigation. Leveraging the power of R programming, this course equips participants with advanced techniques to analyze, visualize, and interpret crash datasets effectively. Participants will learn how to harness data analytics, statistical modeling, predictive analytics, and machine learning in R to identify patterns, trends, and high-risk zones. Using R for Crash Data Analysis Training Course focuses on practical application, providing real-world case studies, data visualization dashboards, and reproducible workflows, enabling data professionals, transport engineers, and safety analysts to transform raw crash data into actionable insights.

The course emphasizes a hands-on approach, combining interactive coding exercises, real crash datasets, and scenario-based learning to develop analytical proficiency. Participants will gain expertise in data cleaning, data transformation, exploratory data analysis (EDA), regression modeling, and geospatial analysis using R. By integrating predictive modeling, network analysis, and visualization techniques, this training ensures participants can make data-driven decisions to enhance road safety strategies, support accident prevention programs, and optimize resource allocation. Whether you are a beginner or a professional seeking to enhance your analytical skillset, this course provides a structured path to mastering R for traffic crash analysis.

Programme Curriculum

Using R for Crash Data Analysis Training Course

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Course Objectives

1. Understand the fundamentals of R programming for crash data analysis.
2. Apply data cleaning and preprocessing techniques to traffic datasets.
3. Perform exploratory data analysis (EDA) for crash patterns.
4. Utilize statistical modeling to identify key crash factors.
5. Implement predictive analytics for accident risk forecasting.
6. Visualize crash data using ggplot2, plotly, and interactive dashboards.
7. Conduct geospatial analysis to identify accident hotspots.
8. Integrate machine learning models for crash severity prediction.
9. Develop reproducible workflows using R Markdown and Shiny apps.
10. Perform trend analysis and time series modeling for traffic safety.
11. Conduct network analysis to study road segment vulnerabilities.
12. Interpret results for data-driven decision making in road safety planning.
13. Analyze real-world crash datasets through case studies and scenario-based exercises.

Target Audience

1. Traffic safety analysts
2. Transport engineers
3. Road safety researchers
4. Data analysts and data scientists
5. Government transportation agencies
6. Urban planners and infrastructure professionals
7. Insurance analysts and risk managers
8. Academicians and students in traffic and transportation studies

Course Modules

Module 1: Introduction to R for Crash Data Analysis

- R interface, IDEs, and packages overview

- Understanding crash datasets
- Loading and importing data
- Introduction to data frames and structures
- Case Study: National traffic crash dataset exploration

Module 2: Data Cleaning and Preprocessing

- Handling missing values
- Data type conversions
- Removing duplicates and outliers
- Standardizing categorical variables
- Case Study: Cleaning multi-year crash datasets

Module 3: Exploratory Data Analysis (EDA)

- Descriptive statistics for crash data
- Frequency distribution of crash types
- Visualizing trends over time
- Correlation analysis of variables
- Case Study: Identifying crash hotspots

Module 4: Data Visualization

- ggplot2 basics and customizations
- Interactive visualizations with plotly
- Visualizing geospatial data
- Dashboard creation using Shiny
- Case Study: Crash severity dashboard

Module 5: Statistical Analysis

- Hypothesis testing for crash factors
- Regression analysis: linear and logistic
- ANOVA and chi-square tests
- Model validation and interpretation
- Case Study: Factors influencing crash severity

Module 6: Predictive Analytics

- Building predictive models in R
- Feature selection and engineering
- Model evaluation metrics
- Scenario-based crash predictions
- Case Study: Forecasting high-risk intersections

Module 7: Machine Learning Applications

- Decision trees and random forests
- Support vector machines (SVM)
- Model tuning and cross-validation
- Ensemble learning techniques
- Case Study: Predicting crash types using ML

Module 8: Geospatial Analysis

- Introduction to GIS in R
- Mapping crash data using sf and leaflet
- Spatial clustering and hotspot analysis
- Kernel density estimation
- Case Study: Urban traffic accident mapping

Module 9: Time Series Analysis

- Trend and seasonality detection
- Moving averages and smoothing techniques
- ARIMA modeling for crash trends
- Forecasting future accident rates
- Case Study: Monthly crash trend prediction

Module 10: Network Analysis

- Understanding traffic network graphs
- Identifying critical nodes and segments
- Graph theory metrics in road safety
- Accident propagation analysis
- Case Study: High-risk road segment analysis

Module 11: Crash Severity Modeling

- Logistic regression for severity prediction
- Multi-class classification
- Risk factor identification
- Scenario simulation for mitigation strategies
- Case Study: Urban vs rural crash severity

Module 12: Reporting and Communication

- Creating reproducible reports using R Markdown
- Exporting tables, charts, and dashboards
- Summarizing insights for stakeholders
- Visual storytelling for traffic data
- Case Study: Annual traffic safety report generation

Module 13: Shiny App Development

- Introduction to Shiny framework
- Interactive dashboard design
- User input and reactive elements
- Deploying web-based analytics tools
- Case Study: Real-time crash monitoring dashboard

Module 14: Advanced Analytics Techniques

- Clustering and segmentation of crash data
- Principal component analysis (PCA)

- Predictive maintenance analytics
- Integration with external datasets
- Case Study: Segmenting high-risk driver profiles

Module 15: Capstone Project

- End-to-end crash data analysis project
- Data preprocessing, modeling, and visualization
- Presentation of actionable insights
- Peer review and evaluation
- Case Study: Comprehensive city-level crash data analysis

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call +254769199797

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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