# Advanced Regression Analysis in Linear and Non-Linear Models Training Course

Professional Development Training Course Outline

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|---|---|---|---|
| **Category** | Research and Data Analysis | **Duration** | 5 Days |
| **Base Fee** | $1,500 USD | **Delivery Mode** | Online / On-site Hybrid |

## Course Introduction

In the age of data-driven decision-making, mastering regression analysis is essential for professionals aiming to gain accurate insights and predict future outcomes. Advanced Regression Analysis in Linear and Non-Linear Models Training Course is designed to equip analysts, data scientists, and business professionals with advanced statistical tools and modeling techniques. This comprehensive course covers both linear regression models and the increasingly important non-linear regression techniques using real-world datasets and case studies from diverse domains. Learners will explore multiple regression, logistic regression, polynomial regression, splines, generalized additive models, and machine learning-based regression methods using R, Python, and other industry-standard tools.

As organizations move toward predictive analytics and AI-powered forecasting, understanding the limitations and strengths of different regression techniques becomes vital. Through a hands-on, practical learning approach, participants will gain the expertise to build robust models, validate assumptions, detect outliers, manage multicollinearity, and apply advanced diagnostics. By the end of the training, learners will be able to apply sophisticated modeling strategies to drive results and support strategic initiatives across sectors such as finance, healthcare, marketing, and policy-making.

## Programme Curriculum

**Advanced Regression Analysis in Linear and Non-Linear Models Training Course**

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**Course Objectives**

1. Master advanced linear regression techniques and diagnostics.
2. Explore various non-linear regression models for real-world data.
3. Implement regularization methods like Lasso and Ridge regression.
4. Utilize Python and R for regression modeling and visualization.
5. Detect and handle outliers, leverage points, and influential data.
6. Apply variable selection and feature engineering strategies.
7. Perform model validation using cross-validation and bootstrapping.
8. Understand and apply logistic and Poisson regression models.
9. Use splines and GAMs for flexible model fitting.
10. Integrate machine learning techniques into regression workflows.
11. Interpret model coefficients and assess multicollinearity.
12. Apply regression analysis to time-series and panel data.
13. Translate regression outputs into actionable business insights.

**Target Audiences**

1. Data Analysts
2. Business Intelligence Professionals
3. Economists
4. Data Scientists
5. Healthcare Analysts
6. Academic Researchers
7. Financial Risk Managers
8. Policy and Government Analysts

**Course Duration:** 5 days

**Course Modules**

**Module 1: Fundamentals of Advanced Regression**

- Review of simple and multiple linear regression
- Residual analysis and assumptions
- Introduction to multicollinearity
- Variable transformation and scaling
- Dealing with missing values
- **Case Study**: Predicting housing prices using Boston dataset

**Module 2: Model Diagnostics and Improvement**

- Checking linearity and homoscedasticity
- Cook’s Distance and leverage
- VIF and correlation matrix

- Interaction terms and their interpretation
- Model refinement techniques
- **Case Study**: Marketing campaign effectiveness analysis

**Module 3: Logistic Regression for Binary Outcomes**

- Odds ratio and logit function
- Model fitting and interpretation
- ROC curve and AUC
- Confusion matrix and metrics
- Multinomial and ordinal regression
- **Case Study**: Predicting customer churn

**Module 4: Polynomial and Spline Regression**

- Polynomial model creation and fitting
- Identifying optimal polynomial degree
- Natural and B-splines in R/Python
- Advantages of smooth curves
- Model complexity vs. interpretability
- **Case Study**: Modeling population growth trends

**Module 5: Generalized Linear Models (GLM)**

- Introduction to exponential family
- Poisson regression for count data
- Quasi-Poisson and negative binomial
- Link functions and canonical forms
- Goodness-of-fit measures
- **Case Study**: Emergency room visit prediction

**Module 6: Regularization Techniques**

- Ridge vs. Lasso regression
- Elastic Net implementation
- Cross-validation for lambda selection
- Bias-variance tradeoff
- Feature selection benefits
- **Case Study**: Stock return forecasting

**Module 7: Regression with Machine Learning**

- Decision Trees and Random Forest regression
- Gradient boosting (XGBoost)
- Hyperparameter tuning
- Model interpretation with SHAP
- Comparing ML and traditional regression
- **Case Study**: Energy consumption prediction

**Module 8: Feature Engineering and Selection**

- Categorical encoding (one-hot, label)
- Interaction and polynomial features
- Recursive feature elimination (RFE)
- PCA for dimensionality reduction
- Feature importance in tree-based models

- **Case Study**: Health insurance premium modeling

**Training Methodology**

- Instructor-led lectures with practical labs
- Hands-on coding with Python and R
- Live case studies and problem-solving sessions
- Interactive quizzes and peer discussions
- Real-world datasets and capstone project guidance
- Certificate of completion and final assessment

**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** | 27 Nov 2026 | Online | $1,000 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $1,500 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $3,000 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $3,000 |

| Start Date | End Date | Location | Price |
|---|---|---|---|
| **23 Nov 2026** | 27 Nov 2026 | Physical | $6,000 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $4,500 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $6,000 |
| **23 Nov 2026** | 27 Nov 2026 | Physical | $6,000 |

Ready to enroll or request a customized program? Book online or contact us:

**Register Online Now**

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com