Factor Analysis and Principal Component Analysis Training Course

Professional Development Training Course Outline

Category	General Training	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

In today's data-driven world, the ability to distill large datasets into meaningful insights is a competitive edge. Factor Analysis and Principal Component Analysis Training Course are advanced multivariate statistical techniques widely used in machine learning, psychology, market research, social sciences, and finance. This comprehensive training course provides a deep dive into these dimensionality reduction methods, equipping professionals with the skills needed to analyze complex datasets, reduce data redundancy, and extract significant patterns to support strategic decision-making. With real-world case studies, data visualization strategies, and practical applications, participants will confidently apply FA and PCA to large datasets using tools like SPSS, R, Python, and Excel.

Designed for beginners to advanced-level learners, this hands-on course enhances your analytical and interpretive abilities. Participants will gain actionable insights into how latent variables, eigenvalues, rotated component matrices, and exploratory factor analysis shape high-impact decisions in data science, research, and applied analytics. Learn how to visualize factor loadings, perform scree plot analysis, and determine the number of components effectively. By the end of the training, learners will confidently apply FA and PCA for research analysis, data preprocessing, and machine learning model optimization.

Programme Curriculum

Factor Analysis and Principal Component Analysis Training Course

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Course Objectives

1. Understand the fundamental principles of Factor Analysis and Principal Component Analysis.
2. Identify differences between FA and PCA in data science applications.
3. Perform Exploratory and Confirmatory Factor Analysis using R and SPSS.
4. Interpret eigenvalues, factor loadings, and variance explained.
5. Apply dimensionality reduction techniques to real-world datasets.
6. Use scree plots, KMO tests, and Bartlett's test for suitability assessment.
7. Build predictive models using PCA-preprocessed data.
8. Conduct component rotation (Varimax, Oblimin) for meaningful interpretation.
9. Integrate FA and PCA in Python (with sklearn and statsmodels).
10. Visualize factor structures using heatmaps and biplots.
11. Use FA/PCA to improve feature selection in machine learning.
12. Apply FA and PCA in business intelligence and market segmentation.
13. Understand ethical considerations and limitations in multivariate analysis.

Target Audience

1. Data Analysts
2. Business Intelligence Professionals
3. Academic Researchers
4. Psychometricians
5. Market Researchers
6. Machine Learning Engineers
7. Financial Analysts
8. Graduate Students in Social Sciences and Data Science

Course Duration: 10 days

Course Modules

Module 1: Introduction to Multivariate Statistics

- Overview of multivariate techniques
- Importance of dimensionality reduction
- Applications of FA and PCA
- Introduction to datasets
- Common software tools used
- **Case Study: Survey data overview using FA**

Module 2: Fundamentals of Factor Analysis

- What is Factor Analysis?
- Assumptions and prerequisites
- Types: Exploratory vs Confirmatory

- Role of latent constructs
- Validity and reliability in FA
- **Case Study: FA in psychological testing**

Module 3: Principal Component Analysis Basics

- Understanding components
- Eigenvalues and eigenvectors
- Total variance explained
- Interpreting PCA outputs
- Use of scree plots
- **Case Study: PCA in credit scoring analysis**

Module 4: Data Preparation and Cleaning

- Handling missing data
- Standardization and normalization
- Checking for outliers
- Sampling adequacy (KMO Test)
- Bartlett's test of sphericity
- **Case Study: Preprocessing student performance data**

Module 5: Performing FA in SPSS

- Input and options in SPSS
- Interpreting the output tables
- Rotation techniques
- Factor score generation
- Visualization in SPSS
- **Case Study: SPSS FA on market segmentation**

Module 6: Performing PCA in SPSS

- Steps in PCA execution
- Total variance and rotated components
- Saving component scores
- Generating biplots
- Variable clustering
- **Case Study: PCA on employee satisfaction**

Module 7: FA and PCA in Python

- Using sklearn.decomposition
- PCA with real data in Python
- Heatmaps and biplots with matplotlib
- Interpreting PCA loadings
- Using FactorAnalyzer package
- **Case Study: Python PCA in e-commerce**

Module 8: FA and PCA in R

- FA in psych package
- PCA using prcomp()
- Scree plot and cumulative variance
- Interpreting factor loadings
- Output visualization using ggplot2

- **Case Study: R FA on clinical trials**

Module 9: Scree Plot, KMO, and Bartlett's Test

- Importance of scree plot
- Cutoff criteria for component retention
- KMO measure explained
- Bartlett's sphericity test
- Interpreting statistical outputs
- **Case Study: Applying tests on retail sales data**

Module 10: Rotation and Interpretation

- Orthogonal vs oblique rotation
- Varimax and Oblimin techniques
- Simplifying component structure
- Interpreting rotated component matrix
- Choosing best rotation method
- **Case Study: Rotated PCA for behavioral clustering**

Module 11: PCA for Feature Selection

- Dimensionality reduction for modeling
- Variance thresholds
- Avoiding multicollinearity
- Feature importance visualization
- Use in unsupervised learning
- **Case Study: PCA in customer churn prediction**

Module 12: FA in Market Segmentation

- Cluster vs factor segmentation
- Consumer behavior modeling
- Segment profiling using FA
- Psychographic segmentation
- FA-based personas
- **Case Study: FA on brand loyalty study**

Module 13: Machine Learning with PCA

- PCA in classification models
- Logistic regression and PCA
- PCA in clustering (K-means)
- Impact on model accuracy
- Limitations in supervised learning
- **Case Study: PCA for fraud detection**

Module 14: Ethics and Pitfalls in FA/PCA

- Overfitting risks
- Misinterpretation of components
- Data bias in PCA
- Ethical reporting of results
- Transparency in analysis
- **Case Study: PCA misuse in predictive hiring**

Module 15: Final Project and Evaluation

- Project dataset selection
- Analysis plan design
- Performing FA and PCA
- Interpreting outcomes
- Peer evaluation & feedback
- **Case Study: Comprehensive PCA/FA on HR analytics**

Training Methodology

- Interactive video lectures and practical demonstrations
- Hands-on exercises with datasets using R, SPSS, and Python
- Peer-reviewed case study assignments per module
- Live sessions with Q&A and expert analysis
- Capstone project with real-world application

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
09 Nov 2026	20 Nov 2026	Online	$2,000
09 Nov 2026	20 Nov 2026	Physical	$3,000

Start Date	End Date	Location	Price
09 Nov 2026	20 Nov 2026	Physical	$6,000
09 Nov 2026	20 Nov 2026	Physical	$6,000
09 Nov 2026	20 Nov 2026	Physical	$12,000
09 Nov 2026	20 Nov 2026	Physical	$9,000
09 Nov 2026	20 Nov 2026	Physical	$12,000
09 Nov 2026	20 Nov 2026	Physical	$12,000

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

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