Anomaly Detection in Research Datasets Training Course

Professional Development Training Course Outline

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 big data, machine learning, and data-driven decision-making, anomaly detection has become a critical tool for identifying outliers and inconsistencies in large datasets. Anomaly Detection in Research Datasets Training Course is designed to equip researchers, data scientists, and analysts with robust techniques to uncover anomalies using advanced analytics, statistical methods, and cutting-edge AI algorithms. By mastering these skills, participants will significantly enhance the integrity, accuracy, and reliability of their research findings across various domains, including healthcare, finance, cybersecurity, and social science.

This hands-on course combines practical tutorials, real-world case studies, and industry-standard tools such as Python, R, Scikit-learn, and TensorFlow to provide participants with the ability to build, evaluate, and interpret anomaly detection models. With an emphasis on data preprocessing, feature engineering, and model validation, the course ensures that participants can confidently apply anomaly detection techniques in diverse research scenarios, ensuring robust, reproducible results.

Programme Curriculum

Anomaly Detection in Research Datasets Training Course

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Course Objectives

1. Understand the fundamentals of anomaly detection in research datasets
2. Explore machine learning models for detecting outliers
3. Apply statistical anomaly detection techniques
4. Implement unsupervised learning for anomaly detection
5. Utilize supervised algorithms to classify anomalies
6. Conduct time series anomaly detection for research data
7. Develop real-time anomaly detection pipelines
8. Evaluate model performance using key metrics
9. Master anomaly detection with Python and R
10. Perform data cleaning and feature selection for anomaly detection
11. Analyze research-specific anomaly detection use cases
12. Integrate deep learning for detecting complex anomalies
13. Build end-to-end anomaly detection workflows

Target Audience

1. Academic Researchers
2. Data Scientists
3. Research Analysts
4. Graduate Students
5. Research Engineers
6. Policy Analysts
7. Public Health Researchers
8. Financial Analysts

Course Duration: 5 days

Course Modules

Module 1: Introduction to Anomaly Detection

- Overview of anomalies in datasets
- Types of anomalies (point, contextual, collective)
- Importance of anomaly detection in research
- Overview of industry applications
- Key challenges and considerations
- *Case Study:* Detecting fraudulent data in public health surveys

Module 2: Statistical Methods for Outlier Detection

- Z-score and modified Z-score techniques
- Tukey’s fences and box plots
- Grubbs' test and Dixon's Q test
- Hypothesis testing for anomalies
- Data normalization techniques
- *Case Study:* Outlier analysis in climate change research

Module 3: Machine Learning for Anomaly Detection

- Overview of ML-based approaches
- Decision trees and isolation forests
- SVMs and ensemble techniques
- AutoML tools for anomaly detection
- Model tuning and optimization
- *Case Study:* ML-based fraud detection in academic publishing

Module 4: Unsupervised Learning Approaches

- Clustering techniques (K-means, DBSCAN)
- Dimensionality reduction (PCA, t-SNE)
- Density-based outlier detection
- Role of neural embeddings
- Evaluating model outputs without labels
- *Case Study:* Identifying anomalies in biodiversity datasets

Module 5: Time Series Anomaly Detection

- Characteristics of time-series data
- Trend and seasonality decomposition
- ARIMA and Prophet models
- LSTM networks for time series anomalies
- Handling missing values and lag features
- *Case Study:* Detecting energy usage anomalies in smart cities research

Module 6: Deep Learning for Anomaly Detection

- Introduction to deep learning in anomaly detection
- Autoencoders and reconstruction errors
- GANs for anomaly generation
- CNNs for spatial anomaly detection
- Model interpretability in DL models
- *Case Study:* Identifying anomalies in medical imaging datasets

Module 7: Anomaly Detection Tools and Platforms

- Using Python libraries (Scikit-learn, PyOD)
- R packages for anomaly detection
- Introduction to cloud platforms (AWS SageMaker, Google Colab)
- Integration with Jupyter Notebooks
- Visualization tools (Seaborn, Matplotlib)
- *Case Study:* Tool comparison in detecting anomalies in education research data

Module 8: Designing an End-to-End Anomaly Detection Workflow

- Data ingestion and preprocessing
- Feature selection and engineering
- Model building and testing
- Visualization and reporting results
- Deployment in research pipelines
- *Case Study:* Full workflow on clinical trial data anomaly detection

Training Methodology

- Interactive lectures with visual content

- Hands-on exercises and tool demonstrations
- Group-based problem-solving sessions
- Real-life case studies and datasets
- Personalized feedback and Q&A discussions

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
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

Start Date	End Date	Location	Price
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