Causal Machine Learning for Intervention Analysis 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 an era dominated by data-driven decision-making, understanding the causal impact of interventions is crucial for designing effective policies, treatments, and business strategies. Causal Machine Learning for Intervention Analysis Training Course bridges the gap between traditional econometrics and modern AI, equipping professionals with robust techniques to analyze the real-world effects of interventions using state-of-the-art machine learning tools. This course emphasizes hands-on learning through Python and R, leveraging tools such as Causal Forests, Propensity Score Matching, Targeted Learning, and Uplift Modeling to estimate treatment effects accurately in both experimental and observational settings.

With growing demand across public health, economics, marketing, and public policy for evidence-based insights, mastering causal inference with ML offers a critical advantage. Participants will learn how to design, execute, and evaluate intervention analysis frameworks, harnessing big data, counterfactual reasoning, and advanced algorithms to uncover hidden patterns and generate actionable insights. Whether you're a policy analyst, data scientist, or researcher, this course will elevate your ability to derive causality beyond correlations.

Programme Curriculum

Causal Machine Learning for Intervention Analysis Training Course

Introduction

In an era dominated by data-driven decision-making, understanding the causal impact of interventions is crucial for designing effective policies, treatments, and business strategies. Causal Machine Learning for Intervention Analysis Training Course bridges the gap between traditional econometrics and modern AI, equipping professionals with robust techniques to analyze the real-world effects of interventions using state-of-the-art machine learning tools. This course emphasizes hands-on learning through Python and R, leveraging tools such as Causal Forests, Propensity Score Matching,

Targeted Learning, and Uplift Modeling to estimate treatment effects accurately in both experimental and observational settings.

With growing demand across public health, economics, marketing, and public policy for evidence-based insights, mastering causal inference with ML offers a critical advantage. Participants will learn how to design, execute, and evaluate intervention analysis frameworks, harnessing big data, counterfactual reasoning, and advanced algorithms to uncover hidden patterns and generate actionable insights. Whether you're a policy analyst, data scientist, or researcher, this course will elevate your ability to derive causality beyond correlations.

Course Objectives

1. Understand core concepts in causal inference and machine learning for intervention analysis.
2. Apply propensity score methods to balance treatment and control groups.
3. Master Double Machine Learning (DML) for unbiased treatment effect estimation.
4. Implement Causal Forests and Meta-Learners (T-learner, S-learner, X-learner).
5. Analyze heterogeneous treatment effects (HTE) across subpopulations.
6. Design A/B tests and quasi-experiments using ML models.
7. Apply Targeted Maximum Likelihood Estimation (TMLE) for robust causal effect estimates.
8. Develop uplift models for individualized treatment response prediction.
9. Use Bayesian causal inference and graphical models for transparency and structure.
10. Assess confounding, mediation, and bias in intervention designs.
11. Leverage real-world case studies from healthcare, marketing, and economics.
12. Conduct model evaluation and sensitivity analysis for causal estimates.
13. Build a full end-to-end causal ML pipeline using R/Python and relevant libraries.

Target Audiences

1. Data Scientists aiming to implement causal frameworks in business or research.
2. Public Policy Analysts seeking data-driven strategies for program evaluation.
3. Health Economists analyzing intervention effectiveness in clinical trials.
4. Marketing Analysts optimizing campaign strategies via uplift modeling.
5. Academic Researchers working on causal effects in social sciences.
6. AI Engineers applying ML in evidence-based decision environments.
7. Statistical Consultants improving treatment estimation and impact assessments.
8. Graduate Students in economics, public health, and machine learning.

Course Duration: 5 days

Course Modules

Module 1: Introduction to Causal Inference & ML

- Difference between correlation and causation
- Rubin Causal Model and counterfactuals
- Types of interventions and data structures
- Common pitfalls in causal analysis
- Overview of ML techniques used in causal inference
- **Case Study:** Evaluating social media ad campaigns with causal models

Module 2: Propensity Score Methods

- Estimating propensity scores with ML (logit, random forests)
- Matching, stratification, and weighting techniques
- Covariate balancing and diagnostics
- Implementing with Python/R libraries

- Common challenges with propensity scores
- **Case Study:** Education intervention in low-income schools

Module 3: Causal Forests and Meta-Learners

- Introduction to Generalized Random Forests
- Implementing T-learner, S-learner, and X-learner
- Estimating HTEs and interpreting results
- Pros and cons of tree-based causal models
- Feature importance in causal inference
- **Case Study:** Personalized medicine using patient-level data

Module 4: Double Machine Learning (DML)

- Concepts behind orthogonalization and sample splitting
- Using ML models as nuisance parameter estimators
- Partialling out effects in high-dimensional data
- Application in observational studies
- Tools and packages for DML (EconML, DoWhy)
- **Case Study:** Unemployment benefits impact on job-seeking behavior

Module 5: Uplift Modeling & Individualized Treatment Effects

- Difference between predictive models and uplift models
- Uplift decision trees and random forests
- Optimization of marketing strategies using uplift scores
- Evaluation metrics for uplift models (Qini, uplift curve)
- Avoiding overfitting in personalized models
- **Case Study:** Targeted discounting for e-commerce conversions

Module 6: Advanced Estimation Techniques (TMLE, Bayesian)

- Overview of Targeted Maximum Likelihood Estimation
- Bayesian networks and structural causal models
- Directed Acyclic Graphs (DAGs) for identifying confounders
- Introduction to prior distributions in causal modeling
- Interpreting credible intervals for treatment effects
- **Case Study:** Vaccine effectiveness estimation under real-world conditions

Module 7: Experimental & Quasi-Experimental Design

- Design of Randomized Controlled Trials (RCTs)
- Instrumental Variables (IVs) and Regression Discontinuity
- Difference-in-Differences (DiD) for policy evaluation
- Natural experiments and exogenous shocks
- Validating assumptions and model fit
- **Case Study:** Minimum wage policy effect on employment levels

Module 8: Implementation, Reporting & Ethics

- Building reproducible causal ML workflows
- Interpreting results for non-technical stakeholders
- Ethical considerations in intervention modeling
- Visualization tools for causal effects
- Responsible AI practices and transparency
- **Case Study:** AI-driven interventions in mental health outreach

Training Methodology

- Interactive instructor-led lectures
- Hands-on coding labs in Python and R
- Real-world datasets for case-based learning
- Peer collaboration and group activities
- Quizzes and feedback to reinforce learning
- Final capstone project applying all techniques

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

Start Date	End Date	Location	Price
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