Bayesian Causal Inference 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

Bayesian Causal Inference has become a cornerstone in modern data analysis and decision-making, offering powerful tools to estimate causal effects from observational and experimental data. Bayesian Causal Inference Training Course provides participants with the skills to implement Bayesian methods in causal inference using real-world applications in health research, economics, policy evaluation, marketing, and AI systems. By blending theory with practical modeling, the course equips learners with techniques such as Bayesian regression, DAGs (Directed Acyclic Graphs), and probabilistic programming using R, Python, and Stan.

In an era of data-driven innovation, mastering Bayesian Causal Inference empowers professionals to move beyond correlation to uncover robust causal relationships. With the growing demand for interpretable, scalable, and reproducible causal models, this course integrates cutting-edge tools, scalable algorithms, and simulation-based inference techniques to address bias, confounding, and model uncertainty. Whether you are a researcher, data scientist, or policymaker, this training ensures you are equipped to solve complex causal problems using the Bayesian paradigm.

Programme Curriculum

Bayesian Causal Inference Training Course

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Objectives

By the end of the course, participants will be able to:

1. Understand foundational principles of Bayesian Causal Inference and its advantages.
2. Differentiate between causal inference and predictive modeling.
3. Construct Directed Acyclic Graphs (DAGs) for visualizing causal assumptions.
4. Apply Bayesian regression techniques to estimate causal effects.
5. Implement propensity score matching and inverse probability weighting using Bayesian methods.
6. Handle confounding, mediation, and selection bias in causal models.
7. Use MCMC and probabilistic programming tools (Stan, PyMC3) in causal analysis.
8. Interpret posterior distributions and credible intervals in a causal context.
9. Design Bayesian A/B tests and randomized controlled trials.
10. Perform sensitivity analyses to assess robustness of causal conclusions.
11. Develop hierarchical models for multi-level causal inference.
12. Leverage Bayesian networks and structural equation models.
13. Apply causal inference in real-world domains such as public health, economics, and marketing.

Target Audience

1. Data Scientists and Machine Learning Engineers
2. Academic Researchers and PhD Students
3. Public Health Analysts and Biostatisticians
4. Economists and Policy Analysts
5. AI Researchers and Developers
6. Social Scientists and Psychometricians
7. Marketing and Business Intelligence Professionals
8. Graduate Students in Statistics or Data Science

Course Duration: 5 days

Course Modules

Module 1: Introduction to Bayesian Causal Inference

- Understanding Bayesian and Frequentist paradigms
- Key elements of causal inference vs prediction
- Prior and posterior distributions
- Overview of Bayesian reasoning and causal models
- Applications in health and social sciences
- **Case Study**: Smoking and lung disease using Bayesian inference

Module 2: Causal Diagrams and DAGs

- Building and interpreting Directed Acyclic Graphs
- Backdoor criterion and d-separation
- Identifying confounders and colliders
- Graph-based causal assumptions
- Practical DAGs using dagitty and ggdag

- **Case Study**: Obesity, exercise, and confounding variables

Module 3: Bayesian Regression Models for Causality

- Linear and logistic Bayesian regression
- Causal parameters vs predictive parameters
- Priors and posterior predictive checks
- Regression with confounding adjustment
- Comparison with frequentist estimation
- **Case Study**: Education level and income modeling

Module 4: Propensity Scores and Weighting Techniques

- Bayesian propensity score modeling
- Matching, stratification, and weighting
- Doubly robust estimation
- Sensitivity analysis with prior distributions
- Implementing with brms and PyMC3
- **Case Study**: Treatment effectiveness in observational studies

Module 5: Advanced Bayesian Methods

- Hierarchical and multilevel models
- Latent variable models in causal inference
- Structural causal models (SCM)
- Bayesian instrumental variables
- Introduction to Bayesian SEM
- **Case Study**: Causal effect of training on employee productivity

Module 6: Probabilistic Programming Tools

- Introduction to Stan, PyMC3, and JAGS
- Writing models and interpreting outputs
- MCMC diagnostics and convergence checks
- Model comparison with WAIC/LOO
- Workflow best practices in Bayesian modeling
- **Case Study**: Mental health intervention effectiveness in schools

Module 7: Bayesian A/B Testing and Experiment Design

- Bayesian power analysis
- Prior elicitation for experiments
- Posterior updating and decision making
- Bandit algorithms and adaptive trials
- Bayesian decision theory in experiments
- **Case Study**: Email marketing campaign effectiveness

Module 8: Applications and Real-World Implementation

- Public policy and economic evaluation
- Health technology assessment
- Bayesian epidemiology and surveillance
- Integration with machine learning models
- Ethical considerations in causal inference
- **Case Study**: COVID-19 policy impact modeling using Bayesian tools

Training Methodology

- Instructor-led interactive virtual classes
- Hands-on coding sessions using R, Stan, and PyMC3
- Group-based problem-solving workshops
- Practical exercises using real datasets
- Guided model-building and diagnostic checks
- Final capstone project for 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
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

Start Date	End Date	Location	Price
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

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