DATAMINE

geovariances

TRAINING CATALOG

2026

44 avenue de Valvins
Avon, France

www.geovariances.com
info@geovariances.com

TABLE OF CONTENTS

About Geovariances

Who We Are

Geovariances is a globally renowned provider of premium geostatistics solutions, offering advanced software, expert consulting, and industry-leading training. Founded in 1986 as a spin-off of the Centre for Geostatistics at the Paris School of Mines, we have been at the forefront of geostatistical innovation for four decades.

Our commitment to scientific rigor and technical excellence is reflected in our long-standing exclusive partnership with the Centre for Geostatistics. We empower mining companies to improve production performance and make informed, data-driven decisions by integrating geostatistics into their operations. Our solutions help businesses evaluate alternative scenarios, better understand geological complexities, and reduce operational risks.

At Geovariances, we recognize the challenges mining professionals face in achieving operational efficiency while managing uncertainty. That's why our team of dedicated experts collaborates closely with clients to tailor geostatistical approaches to their specific needs, delivering reliable, actionable insights that optimize their decision-making processes.

Our Global Offering

ISATIS.NEO – THE POWER OF GEOSTATISTICS AT YOUR FINGERTIPS

Isatis.neo is Geovariances' flagship geostatistical software, trusted by leading industry players for its analytical strength, usability, and transparency. Equipped with a user-friendly interface, intuitive workflows, and robust algorithms, Isatis.neo delivers deep insight into mineral resource projects while ensuring full auditability and reproducibility of results.

As the most comprehensive geostatistics desktop solution on the market, Isatis.neo supports a wide range of estimation and simulation methods. It enables users to meet the highest technical standards in resource evaluation and project risk analysis.

TRAINING, CONSULTING & MENTORING SERVICES

Geovariances offers a broad portfolio of training courses in applied geostatistics, delivered by seasoned specialists with deep domain expertise. Whether you are new to geostatistics or seeking to enhance your knowledge in advanced modeling techniques, our training programs are designed to build both theoretical understanding and practical competence.

In addition, we provide customized consulting and mentoring services, supporting clients in areas such as:

- Mineral resource estimation
- Drillhole spacing and sampling strategy
- Risk and uncertainty analysis
- Geostatistical workflow optimization

Our services are available onsite, online, or at Geovariances offices worldwide, ensuring flexible access to world-class expertise.

Learn more at: Geovariances Technical Resources.

Meet the Team

DISCOVER OUR EXPERTS

At Geovariances, our strength lies in the expertise of our people. Our team is composed of highly qualified professionals with a proven track record of delivering outstanding results across the mining value chain—from exploration and resource estimation to project management and operational optimization.

Pedram Masoudi, Ph.D. – Senior Consultant in Geostatistics

Pedram is a specialist in geostatistics and a lead trainer for Isatis.neo. He applies geostatistics to mineral resource estimation and classification under international standards such as JORC, as well as to geological and domain modeling. His additional strengths include Python programming and machine learning, with broader experience in geotechnical site characterization, petroleum exploration, and contaminated soil studies.

Roberto Rolo, Ph.D. – Data Science and Resource Expert

Roberto is a Mining Engineer from UFOP with a master's and Ph.D. in geostatistics from UFRGS. His expertise includes implicit geological modeling, ore grade estimation, and the design of simulation workflows that comply with international mineral reporting codes. He is also highly skilled in Python and machine learning applications in the geosciences.

Travel Policy

To ensure the health and safety of our employees during travel, Geovariances adheres to the following guidelines:

Air Travel:

Preference to regular passenger aircraft for travel, and if charter planes are necessary, they must meet a minimum standard of twin-turbo engine with at least two crew members. We reserve the right to refuse travel on planes that do not meet this standard, and any resulting delays will be charged to the customer. We will travel in business class or its equivalent for international flights over six (6) hours.

Ground Transportation:

Rental vehicles must be full-size sedans equipped with ABS brakes and a minimum of four airbags. If the vehicles provided do not meet this standard, Geovariances reserves the right to upgrade them, with associated costs to be borne by the client.

Driving Limits:

Daily driving time is limited to a maximum of 10 hours. Any additional costs incurred to comply with this limit will be charged to the contracting party.

Helicopter Travel:

Helicopter transportation will be evaluated on a case-by-case basis, considering safety and operational requirements.

Start Your Journey in Mining Geostatistics

Mineral Resource Estimation by Linear Geostatistics – MRE

Learn the fundamental concepts of geostatistics to confidently estimate your mineral resources.

OBJECTIVES

This course provides a solid foundation in geostatistical methods for mineral resource estimation. The skills you will develop will assist you in:

- **Estimating long-term and short-term resources**,
- **Producing resource models** for mine design,
- **Conducting spatial analysis** of drillhole data.

It comprises two modules that can be taken separately:

- **In Module 1, you will learn and practice the standard workflow for estimating resources in a univariate context**. This module covers in-depth data analysis, detailed variographic analyses, block modeling, grade distribution interpolation using kriging, estimation validation, and unbiased grade-tonnage curves for short-term resources.
- **Module 2 allows you to progress into the multivariate context** by exploring statistical tools such as Principal Component Analysis, applying kriging and co-kriging methods for estimating multi-element orebodies and obtaining multivariate models respecting the ratio between main metals, oxides, and elements.

MODULE 1 – COURSE CONTENT

- **Understand the importance of geostatistics** in mineral resource estimation: build a solid foundation for informed decision-making.
- **Explore and analyze your data effectively** using Exploratory Data Analysis (EDA) and spatial data analysis techniques.
- **Assess data stationarity** to ensure consistency and reliability in your estimates.

DURATION

Module 1: 14 hours / 2 days

Module 2: 14 hours / 2 days

LEVEL

Basic

TYPE

Theory and practice

MODE

Online or in-person course

Open or in-company sessions

PRICE

Open session (online): EUR 1 100 per module per person

In-company: On demand

DATAMINE

geovariances

- **Prepare your data with confidence** using regularization techniques such as compositing and declustering to reduce bias.
- **Master variographic analysis**: variogram clouds, directional variograms, and interpretation of spatial structures.
- **Model variograms** using automatic, semi-automatic, manual, or interactive tools tailored to your needs.
- **Apply the most relevant kriging methods**: ordinary kriging, block kriging, and weight distribution analysis.
- **Build an optimal sample neighborhood** with Kriging Neighbourhood Analysis (KNA) to enhance estimation accuracy.
- **Validate your models and estimations** through cross-validation and robust validation techniques.
- **Generate grade-tonnage tables and curves** to support your technical and economic modeling.

MODULE 2 – COURSE CONTENT

- **Use Principal Component Analysis (PCA)** to extract the most relevant information from complex multivariate datasets.
- **Estimate non-stationary variables** by applying kriging with external drift or universal kriging for more accurate resource modeling.
- **Analyze grade correlations** to understand elements' relationships better and enhance your geostatistical models.
- **Examine joint spatial structure** by calculating and interpreting cross-variograms and cross-covariances, even on purely heterotopic datasets.
- **Interpolate correlated grades** using advanced cokriging methods: ordinary cokriging, collocated cokriging, and rescaled cokriging.

OUTLINES

- **Balanced learning approach**: The course combines theory with practical applications, ensuring concepts are understood and applied effectively.
- **Hands-on software training**: Engage in computer-based exercises using Isatis.neo software, reinforcing learning through real-world data scenarios. A training license is provided
- **Personalized feedback**: Receive individualized guidance and feedback from experienced trainers during online sessions to support your learning journey.
- **Comprehensive resources**: Access detailed course materials, including documentation, journal files, and datasets, to reinforce learning and facilitate application post-training.

WHO SHOULD ATTEND

Professionals seeking a sound theoretical and practical knowledge of mining geostatistics.

PREREQUISITES

A basic understanding of resource concepts such as **grade**, **tonnage**, and **cut-off** is recommended. To expand your knowledge, we recommend attending the complementary advanced short course, "*Recoverable Resource Estimation by Nonlinear Geostatistics - RRE*".

Improve Your Skills in Mining Geostatistics

Recoverable Resource Estimation by Nonlinear Geostatistics – RRE

Develop advanced skills in geostatistics and master nonlinear techniques for recoverable resource estimation and risk analysis.

OBJECTIVES

This course provides a solid foundation in geostatistical methods fo estimation. The skills you will develop will assist you in:

- **Estimating long-term resources**,
- **Estimating grade-tonnage curves** during exploration.

It comprises three modules that can be taken separately:

- **Module 1 dives into the importance of nonlinear techniques in generating unbiased grade-tonnage curves**, especially in sparse sampling conditions. You will gain a deep understanding of Uniform Conditioning (UC) and confidently apply it to compute grade, tonnage, and metal quantities across various cut-offs.
- **Module 2 explores Multiple Indicator Kriging and Conditional Expectation**, helping you master when and how to apply each technique effectively.
- **Module 3 introduces two powerful conditional simulation techniques** for continuous variables like grades. You'll also learn how to post-process results to generate accurate grade-tonnage curves.

MODULE 1 – COURSE CONTENT

Introduction

- Why kriging isn't enough: Understand the limitations of kriging and how wide high drill hole spacing can lead to smoothing effects that underestimate variability.
- Master the fundamentals of recoverable resource estimation and learn how to apply them in real-world mining projects.

DURATION

Module 1: 7 hours / 1 day
Module 2: 10 hours / 1.5 days
Module 3: 10 hours / 1.5 days

LEVEL

Advanced

TYPE

Theory and practice

MODE

Online or in-person course

Open or in-company sessions

PRICE

Open session (online):
Module 1: EUR 550 / person
Module 2: EUR 790 / person
Module 3: EUR 790 / person

In-company: On demand

Transforming data

- **Model the Gaussian anamorphosis**: Transform any distributions into Gaussian ones, a necessary step for nonlinear modeling.
- **Change of support made clear**: Grasp the impact of support size on grade variance—core vs. block grades.

Exploring Uniform Conditioning (UC)

- **Learn the fundamentals of UC** to estimate recoverable resources for different cut-offs.
- **Understand the Information Effect**, how sampling density impacts your estimates, and how to correct them.
- **Localized Uniform Conditioning (LUC)**: Apply UC within panels at the block or SMU level to produce models compatible with mine planning.
- Manage **multi-domain and multivariate deposits**.
- **Produce robust grade-tonnage curves** and generate robust estimates of grade, tonnage, and metal quantities by cut-off grade from UC results to support your resource evaluations.

MODULE 2 – COURSE CONTENT

Introduction

- **Master the fundamentals of recoverable resource estimation** and understand its critical role in resource modeling and mine planning.

Multiple Indicator Kriging (MIK)

- Dive into MIK theory, workflow, and key variants to effectively estimate resources.
- **Discover best practices** for applying MIK using Isatis.neo, including key settings and strategic choices.
- **Weigh the pros and cons of MIK** and understand where and when it delivers the best results.
- **Generate accurate grade-tonnage curves** using MIK outputs for confident decision-making.

Conditional Expectation (CE)

- **Learn basic CE principles and theory**, and how the technique fits into the nonlinear estimation toolkit.
- **Explore CE variants**, including their link to multi-Gaussian kriging approaches.
- **Explore Ordinary Multi-Gaussian Kriging** as a foundation for implementing CE in practice.
- **Compare the strengths and limitations of CE** and discover its ideal application domains.
- **Produce robust grade-tonnage curves** from CE results to support your resource evaluations.
- **Get hands-on with Isatis.neo**: Learn the available CE options, including block estimates and multivariate modeling.

MODULE 3 – COURSE CONTENT

Introduction

- **Understand the fundamentals of recoverable resource estimation** and its critical role in resource modeling and mine planning.

Simulations

- Master simulation general concepts. Learn the theory.
- **Model the Gaussian anamorphosis**: Transform any distributions into Gaussian ones, a necessary step for nonlinear modeling.
- **Discover two widely used conditional simulation methods**: Turning Bands Simulation (TBS) and Sequential Gaussian Simulation (SGS). Understand their theoretical foundations, practical applications, and where each method performs best.
- **Unlock the power of Direct Block Simulations**: Bypass the traditional point-scale modeling approach with this efficient technique that generates block-scale simulations directly, saving valuable time and disk space without compromising accuracy.

Post-processing of simulation results

- Produce robust grade-tonnage curves from simulations to support your resource evaluations.

OUTLINES

- **Balanced learning approach**: The course combines theory with practical applications, ensuring concepts are understood and applied effectively.
- **Hands-on software training**: Engage in computer-based exercises using Isatis.neo software, reinforcing learning through real-world data scenarios.
- **Personalized feedback**: Receive individualized guidance and feedback from experienced trainers during online sessions to support your learning journey.
- **Comprehensive resources**: Access detailed course materials, including documentation, journal files, and datasets, to reinforce learning and facilitate application post-training.

WHO SHOULD ATTEND

Geologists, Mining engineers, and professionals involved in feasibility studies or medium to long-term planning who wish to deepen their theoretical and practical knowledge of mining geostatistics.

PREREQUISITES

A basic understanding of linear geostatistics and resource concepts like **grade**, **tonnage**, **and cut-off** - or having completed the course "*Mineral Resource Estimation by Linear Geostatistics - MRE*", which covers fundamental geostatistics for resource estimation - provides an ideal foundation for this advanced course.

Geostatistical Inputs to Resource Classification

Master geostatistical tools to evaluate confidence and support mineral resource classification.

OBJECTIVES

- **Understand resource classification principles.**
  Gain foundational knowledge of resource reporting and classification frameworks with a specific focus on the JORC Code.
- **Master geostatistical methods for confidence assessment.**
  Explore a range of geostatistical techniques, such as kriging, conditional simulations, and uncertainty quantification, that help assess the reliability of resource estimates. Identify their strengths, limitations, and suitability for different classification contexts.
- **Apply classification criteria to resource models.**
  Learn practical approaches to classifying resources using quantitative criteria derived from kriging or simulation results. Develop skills to apply advanced geostatistical tools for robust, auditable classification of resources into Inferred, Indicated, and Measured categories.

COURSE CONTENT

- **Review of JORC definitions regarding mineral resource classification**: Competent Person, inferred-indicated-measured resources, resource reporting, resource classes.
- **Resource classification using the kriging neighbourhood parameters**.
- **How to enhance the accuracy of resource estimates** through Kriging Neighbourhood Analysis and cross-validation to improve confidence levels.
- **Resource classification using linear geostatistics**: exploration of various classification criteria that can be applied to kriging outputs, such as standard deviation, variance, kriging efficiency, relative variance, variance of estimator, variance of interpolation, and risk index.

DURATION

17 hours / 2,5 days

LEVEL

Advanced

TYPE

Theory and practice

MODE

Online or in-person course

Open or in-company sessions

PRICE

Open session (online): EUR 1 350 / person

In-company: On demand

DATAMINE

geovariances

- **Resource classification using conditional simulations**: exploration of various classification criteria that can be applied to simulation outputs, such as conditional variance, relative conditional variance, probability of deviation from the mean, and coefficient of variation.
- **Resource classification using advanced quantities** such as the global estimation variance, the Spatial Sampling Density Variances (SSDV), and the related specific volume, coefficient of variation, and risk index.

OUTLINES

- **Balanced learning approach**: The course combines theory with practical applications, ensuring concepts are understood and applied effectively.
- **Hands-on software training**: Engage in computer-based exercises using Isatis.neo software, reinforcing learning through real-world data scenarios.
- **Personalized feedback**: Receive individualized guidance and feedback from experienced trainers during online sessions to support your learning journey.
- **Comprehensive resources**: Access detailed course materials, including documentation, journal files, and datasets, to reinforce learning and facilitate application post-training.

WHO SHOULD ATTEND

This course is designed for mining professionals who wish to familiarize themselves with the various geostatistical techniques that can be used to assess resource confidence levels and classify mineral resources accordingly.

PREREQUISITES

As the course covers advanced geostatistical concepts, it is strongly recommended that participants have a solid understanding of variography, kriging, and simulation. Alternatively, participants may have completed the "*Mineral Resource Estimation by Linear Geostatistics - MRE*" training course.

Geological Modeling by Geostatistics

Learn to build realistic and uncertainty-aware models using advanced geostatistics and enhance your geological understanding.

OBJECTIVES

- Unlock the skills to build reliable, realistic, data-driven geological models that capture uncertainty, boosting the credibility of your subsurface interpretations and empowering you to make smarter, more confident decisions.
- Get hands-on with powerful geostatistical methods, like Indicator Kriging and simulations (SIS, TGS, PGS), and apply them using Isatis.neo's intuitive tools, including implicit modeling and the Unfolding feature for tackling complex stratigraphy with confidence.

COURSE CONTENT

Foundations & Indicator Kriging

- Theory: Origins, variants, and use cases of indicator kriging.
- Hands-on: applications in geological and domain modeling using Isatis.neo.

Conditional Simulations

- Sequential Indicator Simulation (SIS), Truncated Gaussian Simulation (TGS), Plurigaussian Simulation (PGS) methods: Theoretical principles and workflows.
- Practical modeling using specific options in Isatis.neo.

Implicit Modeling

- Introduction to implicit modeling of stratigraphic units and intrusive complexes using potential fields.

Unfolding

— Handle geological structures that have been folded or deformed.
— Learn how to "unfold" these structures and convert complex geometries into a flattened space where continuity is more isotropic and easier to model.

DURATION

21 hours / 3 days

LEVEL

Advanced

TYPE

Theory and practice

MODE

Online or in-person course

Open or in-company sessions

PRICE

Open session (online): EUR 1 650 / person

In-company: On demand

DATAMINE

geovariances

OUTLINES

- **Balanced learning approach**: The course combines theory with practical applications, ensuring concepts are understood and applied effectively.
- **Hands-on software training**: Engage in computer-based exercises using Isatis.neo software, reinforcing learning through real-world data scenarios.
- **Personalized feedback**: Receive individualized guidance and feedback from experienced trainers during online sessions to support your learning journey.
- **Comprehensive resources**: Access detailed course materials, including documentation, journal files, and datasets, to reinforce learning and facilitate application post-training.

WHO SHOULD ATTEND

Ideal for professionals in mineral resource evaluation, geological surveys, geotechnical engineering, and petroleum exploration who want to strengthen their geological or facies modeling skills. Whether you're aiming to build more robust models or integrate uncertainty assessments into your workflows, this training will help you make better-informed, data-driven decisions.

PREREQUISITES

- A solid understanding of linear geostatistics, such as variogram analysis and kriging, is recommended. The course *"Mineral Resource Estimation by Linear Geostatistics - MRE"* provides an excellent foundation.
- Prior experience to Turning Bands Simulation is highly recommended.

Drill Hole Spacing Analysis – DHSA

Unlock the power of drill-hole spacing analysis to optimize your sampling strategy and maximize resource confidence.

OBJECTIVES

Make smarter drilling decisions by mastering geostatistical simulations. Learn how to quantify grade uncertainty as a function of drill spacing and production volume, and design optimal drilling meshes that balance costs, recovery, and dilution. Gain practical skills to improve resource classification, support strategic mining decisions, and effectively reduce geological risk.

COURSE CONTENT

Theory:

- Review of Turning Bands Simulation (TBS)
- Principles of DHSA
- Recovery vs dilution: Evolution of uncertainty as a function of drillhole spacing
- An introduction to the panel as production domain

Practice in Isatis.neo:

- Review of kriging and its smoothness properties
- Review of TBS and scenario reduction
- Overview of the DHSA workflow
- Defining the production period and calculating associated uncertainties
- Optimizing the Grade Control hole density for improved mining recovery-dilution control
- Optimizing drillhole spacing

OUTLINES

- **Balanced learning approach**: The course combines theory with practical applications, ensuring concepts are understood and applied effectively.

DURATION

14 hours / 2 days

LEVEL

Advanced

TYPE

Theory and practice

MODE

Online or in-person course

Open or in-company sessions

PRICE

Open session (online): EUR 1 100 / person

In-company: On demand

DATAMINE

geovariances

- **Hands-on software training**: Engage in computer-based exercises using Isatis.neo software, reinforcing learning through real-world data scenarios.
- **Personalized feedback**: Receive individualized guidance and feedback from experienced trainers during online sessions to support your learning journey.
- **Comprehensive resources**: Access detailed course materials, including documentation, journal files, and datasets, to reinforce learning and facilitate application post-training.

WHO SHOULD ATTEND

This course is designed for mining professionals - including resource, exploration, and mine geologists, as well as mining engineers and consultants - who aim to develop cost-effective sampling strategies and optimize drill programs to achieve more reliable short-term grade estimations, greater classification confidence, and reduced risk.

PREREQUISITES

This course covers advanced concepts in geostatistics. Participants are recommended to have a foundational understanding of variography and kriging. The course *"Mineral Resource Estimation by Linear Geostatistics - MRE"* provides an excellent foundation.

Multiple-Point Statistics Simulations with Isatis.neo – MPS

Go beyond variograms. Learn to simulate complex geology and subsurface properties with cutting-edge MPS tools.

OBJECTIVES

This course introduces you to Multiple-Point Statistics (MPS), a powerful simulation technique for **modeling complex spatial variability using training images**. Developed in collaboration with the University of Neuchâtel, the course combines **theoretical foundations with hands-on practice using Isatis.neo and its integrated DeeSse engine**. You'll learn to select suitable training images, prepare your data, and generate realistic subsurface models, whether **categorical or continuous**. Ideal for applications in mining, hydrogeology, remote sensing, and reservoir modeling, MPS equips you to assess uncertainty and model features driven by geological morphology, such as channelized permeability or ore grades in vein deposits.

COURSE CONTENT

Theory:

- Overview of the MPS approach
- Exploration of the various tools to manage non-stationarity (rotation, scaling, proportions, and trends)
- Advanced neighborhood parameters optimization
- Continuous MPS simulation
- Multivariate MPS simulation
- Multi-resolution MPS simulation
- MPS simulations for gap filling

Practice in Isatis.neo:

- First application using a simple and historical case study
- Simulating various geometric patterns to gain a deeper understanding of MPS behavior
- Simulating horizon depth as a continuous variable
- Upscaling permeability to work with a multivariate dataset

DURATION

14 hours / 4 half days

LEVEL

Intermediate

TYPE

Theory and practice

MODE

Online or in-person course

Open or in-company sessions

PRICE

Open session (online):

EUR 1 100 / person

In-company: On demand

DATAMINE

geovariances

- Simulating a fracture network at multi-resolutions
- Simulating sedimentary deposits in the French Roussillon plain
- Filling in undefined areas with geophysical properties

OUTLINES

- **Balanced learning approach**: The course combines theory with practical applications, ensuring concepts are understood and applied effectively.
- **Hands-on software training**: Engage in computer-based exercises using Isatis.neo software, reinforcing learning through real-world data scenarios.
- **Personalized feedback**: Receive individualized guidance and feedback from experienced trainers during online sessions to support your learning journey.
- **Comprehensive resources**: Access detailed course materials, including documentation, journal files, and datasets, to reinforce learning and facilitate application post-training.

WHO SHOULD ATTEND

This course is tailored for professionals and researchers involved in spatial modeling who want to enhance their ability to simulate complex geological structures and facies distributions using Multiple-Point Statistics (MPS). Ideal participants include:

- **Geologists & geomodellers**

Working in mining, oil & gas, or hydrogeology, those who need to model intricate geological patterns—such as channels, fractures, or stratigraphy—that are difficult to capture with traditional variogram-based approaches.

- **Reservoir engineers**

Focused on building realistic facies or property models that improve reservoir characterization and flow simulations.

- **Environmental & hydrogeological scientists**

Needing to simulate spatial heterogeneities in aquifer systems with geological realism.

- **Geostatisticians and data scientists**

Looking to deepen their expertise in MPS and apply advanced simulation techniques using training images and high-resolution geological analogs.

- **Consultants and technical advisors**

Supporting clients with subsurface modeling projects who want to stay at the forefront of geostatistical innovation.

- **Researchers and academics**

Engaged in spatial data analysis, stochastic simulation, or geoscientific modeling who want to explore MPS in practical workflows.

Machine Learning Applied to Geosciences and Mining

Gain insight into Machine Learning concepts and practices for the mining industry. Apply them to domain modeling.

OBJECTIVES

In this hands-on course, you'll unlock the power of machine learning to elevate mineral resource modeling and geoscientific workflows. You'll learn how to define geological or geometallurgical domains, apply classification and regression algorithms, and seamlessly integrate Python's scikit-learn with Isatis.neo, all tailored for mining applications. Through a balanced mix of theory and practical exercises, you'll build routines that enhance resource characterization.

COURSE CONTENT

- **Module I: General aspects of Machine Learning and introduction to Python**
- **Module II: Unsupervised learning**

  Data transformations, clustering techniques: theory and practice, cluster quality evaluation.
- **Module III: Supervised learning**

  Predictive models: theory and practice, model validation, hyperparameter tuning, model application.

OUTLINES

- **Balanced learning approach**: The course combines theory with practical applications, ensuring concepts are understood and applied effectively.

DURATION

21 hours / 3 days

*** The course can be reduced to two days by removing Module II or Module III from the program.***

LEVEL

Intermediate

TYPE

Theory and practice

MODE

Online or in-person course

Open or in-company sessions

PRICE

Open session (online): EUR 1 650 / person

In-company: On demand

DATAMINE

geovariances

- **Hands-on software training**: Engage in computer-based exercises using Isatis.neo software, reinforcing learning through real-world data scenarios.
- **Personalized feedback**: Receive individualized guidance and feedback from experienced trainers during online sessions to support your learning journey.
- **Comprehensive resources**: Access detailed course materials, including documentation, journal files, and datasets, to reinforce learning and facilitate application post-training.

WHO SHOULD ATTEND

This course targets professionals seeking to gain both theoretical and practical knowledge of Machine Learning and its applications in geosciences and the mining industry.

PREREQUISITES

Basic knowledge of statistics, algebra, and geostatistics is recommended. Familiarity with Python is optional.

Data Analysis, Mapping, and Subsurface Property Modeling with Geostatistics

Harness geostatistical methods for insightful data analysis, accurate surface mapping, robust subsurface property modeling, and effective uncertainty quantification.

OBJECTIVES

- **Enhanced data insight**: Develop a deep understanding of your data through advanced geostatistical analysis, leading to more informed decision-making.
- **Improved mapping quality**: Learn to create high-quality maps by integrating various data types, ensuring comprehensive spatial representations.
- **Uncertainty quantification**: Master techniques to quantify uncertainties in your models, providing a clear assessment of confidence levels in your results.
- **Technique selection**: Understand the assumptions underlying different geostatistical methods to select the most suitable approach for your data.

COURSE CONTENT

DAY 1: ANALYSING DATA AND THEIR VARIABILITY IN SPACE AND MAPPING

Introduction:

- Explore the **added value of geostatistical methods** over traditional deterministic interpolation techniques.
- Gain insights into **usual deterministic interpolation methods** (nearest neighbor, moving average, inverse distance, etc.) and their application limits.Review of Turning Bands Simulation (TBS)

DURATION

14 hours / 2 days

LEVEL

Fundamentals

TYPE

Theory and practice

MODE

Online or in-person course

Open or in-company sessions

PRICE

Open session (online): EUR 1 100 / person

In-company: On demand

DATAMINE

geovariances

Exploratory data analysis (EDA) and validation:

- Utilize statistical tools **for data analysis and quality control**, identifying outliers and understanding data distributions: mean, variance, histogram, correlation coefficients, linear regression, etc.
- Visualize data in 2D and 3D to comprehend spatial patterns.

Spatial variability assessment:

- Understand and quantify **spatial variability** through experimental variogram calculation, interpretation, and modeling.
- Learn to **fit theoretical variogram models**.

Interpolation by kriging:

- Grasp the principles and **properties of kriging** and address the **smoothing effect**.
- Define appropriate **neighborhoods** (single or moving, size, number of samples, etc.).
- Analyze **kriging weights** based on sample positions and variogram models.

DAY 2: REFINING THE MAPS

Cross-validation:

- Implement cross-validation to validate variogram models and ensure model reliability.

The different variants of kriging:

- Apply simple, ordinary, with variance in measurement error, etc.

Multivariate geostatistics:

- Analyze correlations between multiple data types, quantitative and semi-quantitative (e.g., remote sensing data, DEMs, soil occupation, physicochemical models, lithology, etc.), using scatter plots and correlation coefficients.
- Analyse the spatial relationships between variables by calculating and modeling multivariate variograms.
- Integrate secondary variables into interpolation through cokriging techniques, including collocated cokriging, to reduce interpolation uncertainty.
- Analyze the inputs of cokriging in comparison to kriging.

Non-stationary geostatistics:

- Address data showing trends or drifts using non-stationary geostatistical methods.

Simulations and risk analysis:

- Introduction to simulations for risk analysis, highlighting their added value with practical examples.

Practical exercises:

- Engage in hands-on exercises to apply learned concepts to real-life cases, reinforcing understanding and skill development.

OUTLINES

- **Balanced learning approach**: The course combines theory with practical applications, ensuring concepts are understood and applied effectively.
- **Hands-on software training**: Engage in computer-based exercises using lsatis.neo software, reinforcing learning through real-world data scenarios.
- **Personalized feedback**: Receive individualized guidance and feedback from experienced trainers during online sessions to support your learning journey.
- **Comprehensive resources**: Access detailed course materials, including documentation, journal files, and datasets, to reinforce learning and facilitate application post-training.

WHO SHOULD ATTEND

This course is ideal for professionals working with spatial data across various fields, including:

- Geoscientists and reservoir engineers involved in geomodeling and reservoir characterization and looking for a practical, synthetic, and pragmatic introduction to geostatistical methods for reservoir characterization.
- Environmental consultants and engineers aiming to enhance data analysis and mapping capabilities.
- Academics and researchers.
- Agricultural engineers, air quality specialists, climatologists, epidemiologists, foresters, geotechnical engineers, soil scientists, and others interested in spatial data analysis.

PREREQUISITES

No prior knowledge of geostatistics is required; however, a basic understanding of elementary statistics is recommended to facilitate comprehension of course material.

Boost your proficiency in Isatis.neo and Isatis.py

Isatis.neo Fundamentals

Get up to speed with Isatis.neo: learn to navigate and apply core features with ease.

OBJECTIVES

Isatis.neo offers a streamlined, powerful environment for exploring spatial data, creating accurate models, and easily quantifying uncertainty. This course ensures that, in just one day, you'll feel confident in boosting your analysis and incorporating best-practice geostatistics into your daily projects.

COURSE CONTENT

- **Isatis.neo overview**
  Navigate the intuitive user interface, 3D viewer, Python-powered calculator, and batch automation tools.
- **Data import**
  Import diverse data types, including points, block models, and wireframes, and prepare datasets for analysis.
- **Data analysis**
  Perform robust exploratory data analysis (EDA): QC with histograms, scatter plots, anisotropy analysis, outlier detection, trend analysis, and variography (2D & 3D).
- **Estimation**
  Conduct estimation workflows including neighborhood analysis, kriging (point and block), cross-validation, and model validation.
- **Conditional simulations**
  Get an introduction to conditional simulations to better assess uncertainty.

OUTLINES

- **Hands-on software training**: Practice with real-world datasets and receive a temporary Isatis.neo license.
- **Personalized feedback**: Receive individualized guidance and feedback from experienced trainers during online sessions to support your learning journey.

DURATION

7 hours / 1 day

LEVEL

Basic

TYPE

Practice

MODES

Online or in-person course

Open or in-company sessions

PRICE

Open session (online): EUR 550 / person

In-company: On demand

DATAMINE

geovariances

– **Comprehensive resources**: Access detailed course materials, including documentation, journal files, and datasets, to reinforce learning and facilitate application post-training.

WHO SHOULD ATTEND

This course is ideal for professionals with a foundation in geostatistics who want to take full control of their spatial data workflows in Isatis.neo, whether you work in mining, petroleum, or environmental science.

PREREQUISITES

This course is dedicated to practical exercises with Isatis.neo, and no theoretical reminders about geostatistics will be provided. Participants are, therefore, required to have a fundamental knowledge of geostatistics.

Isatis.neo Scripting

Learn how to capitalize on Isatis.neo batch and Python capabilities to create repeatable workflows and perform customized calculations.

OBJECTIVES

Unlock the full potential of Isatis.neo and boost productivity by mastering batch mode and Python scripting. Learn to automate geostatistical workflows, tailor calculations, and apply targeting data processing.

The course consists of two modules that can be attended independently of each other.

COURSE CONTENT

Module 1: Working with batch files

Automate with ease – Learn how to record tasks and build workflows for mineral resource estimation that run seamlessly across multiple domains or variables:

- Understand the structure of batch files, including variables and arrays
- Record and automate processes using the batch recorder
- Build loops, conditional logic ("if" statements), and stopping rules to create flexible and robust workflows

Module 2: The Isatis.neo Python Calculator

Script customized calculations – Enhance your geostatistical modeling by leveraging Python scripting within Isatis.neo:

- Get introduced to the basics of Python scripting
- Import and apply popular Python libraries
- Write and execute scripts to implement your geostatistical routines
- Explore and experiment with different scripting modes and options

DURATION

Module 1: 3 hours / 0.5 day

Module 2: 3 hours / 0.5 day

LEVEL

Intermediate

TYPE

Theory and practice

MODE

Online or in-person course

Open or in-company sessions

PRICE

Open session (online): EUR 250 per module per person

In-company: On demand

DATAMINE

geovariances

OUTLINES

- **Hands-on software training**: Practice with real-world datasets and receive a temporary Isatis.neo license.
- **Personalized feedback**: Receive individualized guidance and feedback from experienced trainers during online sessions to support your learning journey.
- **Comprehensive resources**: Access detailed course materials, including documentation, journal files, and datasets, to reinforce learning and facilitate application post-training.

WHO SHOULD ATTEND

Ideal for geoscientists, resource geologists, reservoir engineers, and technical consultants with Isatis.neo experience who want to master automation and scripting or advance their data-driven workflows with Python-enhanced calculations.

PREREQUISITES

Some familiarity with Isatis.neo is recommended, which you can gain by completing the "*Mineral Resource Estimation by Linear Geostatistics - MRE*" course. Prior experience with scripting or Python is helpful but not required.

Isatis.py Hands-on

Learn Python coding essentials and how to seamlessly embed Isatis.py tools into geostatistical workflows.

OBJECTIVES

This course provides a practical introduction to **Python programming**, with a focus on geostatistical workflows using the high-performance **Isatis.py library**. You'll start by learning to **interpret and write Python scripts** (module 1), then apply them to real-world tasks such as **data preparation** and **Exploratory Data Analysis** (module 2), **variography** and **kriging** (module 3), **conditional simulations** (module 4), **multivariate modeling** (module 5), and **categorical variable modeling** (module 6). You'll also explore how to integrate **Isatis.py** into your projects to generate visuals, streamline processes, and efficiently manage large datasets, benefiting from its built-in multi-threading and parallel computing capabilities.

COURSE CONTENT

The course consists of six modules that can be attended independently of each other.

Module 1 – Introduction to Python

Kickstart your Python journey with this beginner-friendly course. Learn to interpret and write Python scripts, integrate Isatis.py tools, and automate geostatistical tasks to boost productivity and streamline your workflows.

- **Working in a Python environment**: exploring the basics of Anaconda and Python.
- **Variables and arrays**: defining variables and arrays for easy application to various domains or datasets.
- **Control structures**: automating workflows using loops and conditional statements.
- **Library management**: installing and leveraging external Python libraries for enhanced functionality.

DURATION

3 hours per module

LEVEL

Intermediate

TYPE

Theory and practice

MODE

Online or in-person course

Open or in-company sessions

PRICE

Open session (online): EUR 250 per module per person

In-company: On demand

DATAMINE

geovariances

– **Task automation**: recording simple tasks to streamline repetitive computations as input data is updated, or for auditing purposes.

Module 2 – Exploratory Data Analysis

Learn to embed lsatis.py tools for **data analysis**, **transformation**, and **visualization** into Python scripts. You will cover the following topics:

– 2D and 3D data visualization
– Declustering
– Principal Component Analysis (PCA)
– Desurveying and compositing
– Contact analysis

Module 3 – Kriging

Learn to embed lsatis.py tools for **variography** and **kriging** into Python scripts. You will cover the following topics:

– Analysis of spatial continuity using variograms
– Simple kriging
– Ordinary kriging
– Estimation validation
– Selection from polygons

Module 4 – Continuous Simulations

Learn to embed lsatis.py tools for **continuous variable simulations** and **uncertainty quantification** into Python scripts. You will cover the following topics:

– Selection from meshes
– Anamorphosis
– Big data management (through HDF5 files)
– Turning Bands Simulations
– Sequential Gaussian Simulations
– Block versus point simulations
– Simulation validation
– Simulation with local anisotropies
– Uncertainty visualization

Module 5 – Multivariate Estimation

Learn to embed lsatis.py tools for **multivariate estimation** and **simulation** into Python scripts. You will cover the following topics:

– Ordinary co-kriging
– Rescaled co-kriging
– Multivariate simulations

– Multivariate data imputation
– Projection Pursuit Multivariate Transform (PPMT)
– Reproducing complex multivariate relationships

Module 6 – Indicator Estimation and Simulation

Learn to embed lsatis.py tools to **estimate and simulate categorical variables**, and generate facies models, within Python scripts. You will cover the following topics:

– Indicator kriging
– Plurigaussian Simulations
– Sequential Indicator Simulations

OUTLINES

– **Hands-on software training**: Engage in computer-based exercises using lsatis.py, reinforcing learning through real-world data scenarios.
– **Personalized feedback**: Receive individualized guidance and feedback from experienced trainers during online sessions to support your learning journey.
– **Comprehensive resources**: Access detailed course materials, including documentation, Python script files, and datasets, to reinforce learning and facilitate application post-training.

WHO SHOULD ATTEND

Designed for geologists, geoscientists, and data scientists seeking to develop their skills in creating customized, flexible, and efficient geostatistical workflows using Python scripts and the lsatis.py library.

PREREQUISITES

Except for the first module, which introduces Python coding, prior experience with Python scripting is required. A solid background in practical geostatistics is also recommended.

2026 Training Schedule

2026 Sessions

– *Mineral Resource Estimation by Linear Geostatistics - MRE*
Module 1: Univariate Context
January 26-27
July 6-7

– *Mineral Resource Estimation by Linear Geostatistics - MRE*
Module 2: Multivariate Context
January 28-29
July 8-9

– *Recoverable Resource Estimation by Nonlinear Geostatistics - RRE*
Module 1: Uniform Conditioning
February 16
August 10

– *Recoverable Resource Estimation by Nonlinear Geostatistics - RRE*
Module 2: Multiple Indicator Kriging and Conditional Expectation
February 17-18 (1,5 days)
August 11-12 (1,5 days)

– *Recoverable Resource Estimation by Nonlinear Geostatistics - RRE*
Module 3: Simulations
February 18-19 (1,5 days)
August 12-13 (1,5 days)

– *Drill Hole Spacing Analysis - DHSA*
March 16-17
September 1-2

– *Machine Learning Applied to Geosciences and Mining*
April 7-9
October 12-14

– *Geostatistical Inputs to Resource Classification*
May 4-6 (2,5 days)
November 2-4 (2,5 days)

– *Geological Modeling by Geostatistics*
June 1-3
November 16-18

– *Multiple-Point Statistics Simulations with Isatis.neo - MPS*
June 8-11 (4 half-days)
December 7-10 (4 half-days)

– *Data Analysis, Mapping, and Subsurface Property Modeling with Geostatistics*
September 14-15

ⓘ Note that *Isatis.neo Fundamentals*, *Isatis.neo Scripting* and *Isatis.py Hands-on* practical courses are available **upon request**.

DATAMINE

geovariances

GEOVARIANCES

DATAMINE FRANCE

For any questions or to register, contact us at:

binet@geovariances.com

www.geovariances.com

44 avenue de Valvins
Avon, France

www.geovariances.com
info@geovariances.com