

Sensitivity Analysis & Uncertainty Quantification (UQ) — Hands-on

Develop a solid, practice-oriented understanding of sensitivity analysis and uncertainty quantification (UQ) for systems biology models. Starting from local sensitivities and one-at-a-time (OAT) analyses, you will move to global variance-based methods (Morris, Sobol) and full uncertainty propagation with Monte Carlo and Latin hypercube sampling. The focus is on building robust, reproducible pipelines in Python/R and COPASI for ODE, logical and metabolic models, and communicating results via clear plots and reports.

Sensitivity Analysis & Uncertainty Quantification (UQ)

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Session 1

Fee: Rs 8800 [Apply Now](#)

Concepts & Local Sensitivity Analysis

Why sensitivity & UQ for systems models?

[model credibility & robustness](#) [parameters vs outputs](#) [risk & decision support](#)

Local/derivative-based sensitivity

finite differences | normalized sensitivity coefficients
one-at-a-time (OAT) analysis

Toolchain & simple workflows

Python: NumPy/SciPy, SALib (intro) | R: FME,
sensitivity package | COPASI local sensitivities

Session 2

Fee: Rs 11800 | Apply Now

Global Sensitivity: Morris, Sobol & Variance-Based SA

Sampling strategies for global SA

parameter ranges & distributions | Monte Carlo
sampling | Latin hypercube sampling (LHS)

Morris & Sobol methods

Morris screening (μ^* , σ) | Sobol first-order & total
indices | variance decomposition & interpretation

Implementation & visualization

Python SALib | R: sensitivity, lhs | tornado plots &
sensitivity bars

Session 3

Fee: Rs 14800 | Apply Now

Uncertainty Quantification & Propagation

Sources & types of uncertainty

parameter vs structural uncertainty | measurement
noise | scenario & model-form uncertainty (overview)

UQ workflows & propagation

Monte Carlo propagation | LHS-based UQ | prediction
bands & credible intervals

Tools & reporting

Python (SALib, SciPy, NumPy) **R (FME, sensitivity)**
COPASI UQ (overview)

Session 4

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Mini Capstone: SA & UQ for a Systems Model

End-to-end case study: apply SA & UQ to a chosen model
(ODE/logic/metabolic)

Theory + Practical

Interpretation & decision support

key drivers & influential parameters **robust vs fragile**
outputs **communicating risk & uncertainty**

Deliverables

PDF/HTML SA & UQ report **Python/R notebook +**
scripts **environment.yml/requirements.txt**