# Agent Based Modeling Training

## COURSE CONTENT

### GET IN TOUCH

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## About Multisoft

Train yourself with the best and develop valuable in-demand skills with Multisoft Systems. A leading certification training provider, Multisoft collaborates with top technologies to bring world-class one-on-one and certification trainings. With the goal to empower professionals and business across the globe, we offer more than 1500 training courses, which are delivered by Multisoft's global subject matter experts. We offer tailored corporate training; project Based Training, comprehensive learning solution with lifetime e-learning access, after training support and globally recognized training certificates.

## About Course

Agent Based Modeling (ABM) Training by Multisoft Systems is designed to help learners understand, simulate, and analyze complex real-world systems through the behavior of autonomous agents. This course provides a strong foundation in the principles of ABM, including agent behavior, interaction rules, environment design, emergent patterns, and dynamic system modeling.

# Module 1: Introduction to Agent-Based Modeling

- ✓ Understanding complex adaptive systems
- ✓ What is ABM? When and why to use it
- ✓ Key components: agents, environment, interactions, rules
- ✓ Comparison with System Dynamics & Discrete Event Simulation
- ✓ Real-world applications across industries

# Module 2: Core Concepts of Agents

- ✓ Agent attributes and behaviors
- ✓ Autonomous decision-making
- ✓ Reactive vs Proactive agents
- ✓ Learning agents and adaptive behavior
- ✓ Agent communication & social networks
- ✓ Heterogeneity and stochastic elements

# Module 3: Environments & Agent Interactions

- ✓ Types of environments (grid, network, continuous space)
- ✓ Movement rules and constraints
- ✓ Local vs global interactions
- ✓ Feedback loops & emergent phenomena
- ✓ Modeling contagion, influence, competition, and cooperation

# Module 4: Modeling Frameworks & Languages

- ✓ Overview of popular ABM platforms:
    - o NetLogo
    - o AnyLogic
    - o Mesa (Python)

o Repast

✓ Platform selection criteria
✓ Introduction to the course-specific ABM tool (customized based on learner preference)

## Module 5: Designing an Agent-Based Model

✓ Problem definition & model objectives
✓ Identifying agent types & states
✓ Mapping agent rules and interactions
✓ Building environment structure
✓ Time scheduling & simulation cycles
✓ Setting global parameters & assumptions

## Module 6:  Implementing ABM in NetLogo/AnyLogic/Mesa (Choose One or Hybrid Approach)

### 6.1 Creating Agents

✓ Defining breeds
✓ Assigning attributes
✓ Designing behavior procedures

### 6.2 Environment Setup

✓ Building grids/networks
✓ Importing GIS data (if required)

### 6.3 Designing Interactions

✓ Movement, communication, influence
✓ Resource exchange
✓ Collision & conflict resolution

### 6.4 Model Visualization

- ✓ Interface design
- ✓ Animation & data displays
- ✓ Plotting real-time results

## Module 7: Calibration, Verification & Validation

- ✓ Parameter calibration techniques
- ✓ Sensitivity analysis
- ✓ Statistical validation
- ✓ Debugging ABM
- ✓ Ensuring model reliability

## Module 8: Data Integration & Experimentation

- ✓ Importing datasets
- ✓ Running experiments and scenarios
- ✓ Parameter sweeps and Monte Carlo simulations
- ✓ Generating outputs for analysis

## Module 9: Advanced ABM Concepts

- ✓ Complex networks & graph-based modeling
- ✓ Social influence and contagion models
- ✓ Evolutionary algorithms in ABM
- ✓ Machine learning + ABM hybrid systems
- ✓ Multi-layer and multi-scale modeling