COURSE SYLLABUS

Securing AI/ML Systems: Protecting the Intelligent Attack Surface Course

Twelve hours on securing AI and ML systems as systems — adversarial machine learning, prompt injection, model integrity, and the AI supply chain — closing with a threat-modeling workshop.

Group classes (Live Online) and onsite training are available for this course. For more information, email onsite@graduateschool.edu or visit: https://www.graduateschool.edu/courses/securing-ai-ml-systems



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Course Outline

Module 1

- Know What You're Defending: AI/ML Security Foundations
- AI, machine learning, deep learning, generative AI and foundation-model concepts
- System architecture components
- Assets, trust boundaries, interfaces and dependencies
- Traditional versus AI-specific risk
- Security, resilience, robustness, privacy and trustworthiness

Module 2

- Follow the Model: The AI/ML Security Lifecycle
- Security across design, development, training, testing, deployment, operation and retirement
- Responsibilities across developers, operators, users and service providers
- Risks in experimentation and model development environments
- Protecting development, testing, staging and production
- Security gates through the lifecycle

Module 3

- Data Is the Fuel: Securing Training and Operational Data
- Training, validation, testing, inference and operational datasets
- Confidentiality, integrity, availability and provenance
- Access control for sensitive datasets
- Data poisoning and manipulation
- Protecting collection, labeling, transformation and preprocessing
- Monitoring quality, integrity and lineage

Module 4

- Attack the Learning Process: Adversarial Machine Learning
- Attacker objectives
- Poisoning attacks against training data and learning processes
- Evasion attacks against deployed models
- Privacy attacks targeting models and training information
- Model extraction and information disclosure
- Defensive concepts for robustness and resilience

Module 5

- Guard the Model: Model Integrity & Intellectual Property
- Models, weights, parameters and configurations as protected assets
- Securing repositories and storage
- Access control for model files, checkpoints and artifacts
- Provenance and integrity verification before deployment
- Theft, substitution and tampering
- Secure versioning, approval and change management

Module 6

- Secure the AI Supply Chain: Models, Libraries & Dependencies
- Third-party models, datasets, libraries, frameworks and services as dependencies
- Evaluating externally sourced components
- Verifying provenance and integrity of acquired artifacts
- Malicious or vulnerable dependencies in development environments
- Controlling imports, updates, plugins and integrations
- Ongoing supplier monitoring

Module 7

- When AI Starts Talking: Generative AI & LLM Security
- Security implications of large language models
- Direct and indirect prompt injection
- Sensitive information disclosure and unintended exposure
- Insecure output handling and downstream risk
- Retrieval-augmented generation, plugins, tools and external data sources
- Isolation, access control, validation and least privilege for generative AI applications

Module 8

- Secure the Pipeline: MLOps, APIs & Deployment
- Protecting pipelines, orchestration platforms and automation workflows
- Securing repositories, build environments and deployment
- Protecting secrets, keys, tokens and credentials
- Authentication and authorization for AI services and APIs
- Separating development, training, testing and production privileges
- Detecting unauthorized change

Module 9

- Watch the Machine: Monitoring, Detection & Incident Response
- Security logging and telemetry for AI environments
- Monitoring model access, administrative actions, API activity and configuration change
- Detecting abnormal inputs, outputs, behavior and usage
- Distinguishing performance degradation from compromise
- AI-specific incident response
- Containment, model rollback, recovery and post-incident validation

Module 10

- Govern, Test, Defend: AI Security Risk Workshop
- Identify assets, trust boundaries and dependencies in a fictional AI system, develop AI-specific threat scenarios and attack paths, find data, model, pipeline, infrastructure and generative AI vulnerabilities, evaluate likelihood and impact, then select, prioritize and defend a risk-based hardening plan