

AI+ Pharma Practitioner (1 Day)

Program Detailed Curriculum

Executive Summary

This comprehensive certification program equips pharmaceutical professionals, healthcare researchers, and healthcare managers with the expertise to harness artificial intelligence for drug discovery, clinical trials optimization, and precision medicine. The curriculum covers fundamental AI principles, applications of AI technologies, practical case studies, and hands-on projects using accessible no-code tools. Participants will gain practical insights into leveraging AI to enhance efficiency, accuracy, and innovation in pharmaceutical practices.

Course Prerequisites

- Basic understanding of pharmaceutical sciences or healthcare management.
- Familiarity with foundational concepts in biology, chemistry, and data analysis.
- Interest in applying AI tools practically, without requiring programming skills.

Module 1

AI Foundations for Pharma

1.1 AI and Machine Learning Basics

- Fundamental concepts and terminology: artificial intelligence, machine learning, deep learning.
- Detailed exploration of supervised, unsupervised, and reinforcement learning paradigms.
- AI applications specific to pharmaceutical contexts: drug discovery, diagnostics, patient monitoring.

1.2 AI Algorithms and Models

- Comprehensive study of decision trees, neural networks, support vector machines, and clustering algorithms.
- Real-world application in predictive modeling for pharmacokinetics and drug interactions.

Use Case:

- Predictive modeling for adverse drug reactions and drug-drug interactions using historical patient datasets.

Hands-On:

- Build predictive models using no-code tools (Teachable Machine, Google Vertex AI).

Module 2

AI in Drug Discovery and Development

2.1 AI in Molecular Drug Design

- In-depth analysis of molecular docking, quantitative structure-activity relationships (QSAR), and virtual screening methods.
- AI-driven computational approaches for designing novel therapeutic molecules.

2.2 AI in Drug Repurposing

- Comprehensive exploration of AI methodologies in repurposing existing pharmaceuticals.
- Real-world case analysis including recent successes in drug repurposing during pandemics.

Case Study:

- AI-driven drug repurposing successes (e.g., COVID-19 therapeutics).

Hands-On:

- Practical sessions on AI-driven molecular design and drug repurposing strategies.

Module 3

Clinical Trials Optimization with AI

3.1 AI-Enhanced Patient Recruitment

- Deep dive into predictive analytics for patient recruitment and retention.
- Strategies for targeted patient outreach using machine learning.

3.2 Clinical Data Management and Monitoring

- Extensive use of AI-driven automation for clinical data collection, quality assurance, and monitoring.
- Application of real-time predictive analytics to improve trial outcomes.

Case Study:

- Pfizer's use of AI-driven analytics for streamlining clinical trial timelines and efficacy.

Hands-On:

- Implementing clinical data analytics using no-code platforms such as KNIME and DataRobot.

Module 4

Precision Medicine and Genomics

4.1 Personalized Treatment Strategies

- Exploration of AI-driven personalization through genomic, epigenetic, and clinical data.
- Case studies illustrating patient-specific treatment successes.

4.2 Biomarker Discovery

- Deep dive into AI methods for identifying and validating biomarkers.
- Real-world applications of biomarkers in therapeutic decisions.

Case Study:

- AI-assisted biomarker discovery and validation in cancer treatments.

Hands-On:

- Hands-on genomic analysis, Exploring AI-Driven Genomic Interpretation using CBioPortal.

Module 5

Regulatory and Ethical AI in Pharma

5.1 Ethical Considerations and AI Governance

- Exploration of AI-driven personalization through genomic, epigenetic, and clinical data.
- Case studies illustrating patient-specific treatment successes.

5.2 AI Compliance and Regulatory Frameworks

- Detailed analysis of FDA, EMA, and WHO regulatory guidance for AI applications.
- Practical approaches to regulatory submissions for AI-enabled pharma products.

Case Study:

- Analyzing ethical and regulatory challenges encountered in major AI-driven pharma initiatives.

Hands-On:

- Development of AI governance strategies using no-code policy creation platforms.

Module 6

Implementing AI in Pharma Projects

6.1 AI Project Management

- Detailed methodologies for AI integration in pharmaceutical projects from initiation to deployment.
- Step-by-step guide for stakeholder management, project timelines, and deliverables.

6.2 Evaluating AI Tools and ROI

- Comprehensive evaluation framework for selecting AI tools based on performance, user-friendliness, and cost-effectiveness.
- Techniques for calculating and presenting AI project ROI.

Hands-On:

- Practical AI project management using Notion and Airtable for tracking, collaboration, and management.

Module 7

Future Trends and Sustainability in Pharma AI

7.1 Emerging AI Technologies in Pharma

- Exploration of cutting-edge AI technologies including quantum computing and blockchain applications in pharma.
- Forecasting AI-driven trends that will shape pharmaceutical practices.

7.2 AI for Sustainable Healthcare

- Strategies for leveraging AI in sustainability-focused pharmaceutical operations.
- Case examples of AI promoting ethical healthcare practices and resource optimization.

Case Study:

- Analysis of sustainability initiatives driven by AI in pharmaceutical industry leaders.

Hands-On:

- Scenario planning and predictive analytics sessions utilizing dashboards for future-focused decision making.

Module 8

Capstone Project

Project Overview

- Participants implement a comprehensive AI strategy addressing a real-world pharmaceutical challenge, leveraging knowledge from all previous modules.

Project Components

- Defining project scope, selecting appropriate AI methodologies, and executing data-driven analysis.
- Final presentation with detailed project outcomes, strategic insights, and practical recommendations.

Evaluation Criteria

- Projects assessed through a combination of peer reviews, tool implementation effectiveness, analysis depth, and strategic insight.

Upon successful completion, participants receive a certificate acknowledging their expertise in integrating AI into pharmaceutical and healthcare contexts.

Additional Module

Future Trends and Sustainability in Pharma AI

9.1 What are AI Agents?

9.2 How Does an AI Agent Work in the Pharma Value Chain

9.3 Core Characteristics of AI Agents

9.4 Importance of AI Agents (General + Pharma)

9.5 Significance of AI Agents in Pharma

9.6 Types of AI Agents?

- **Simple Reflex Agent (Rule-Based Quality Control)** : Understand how simple reflex agents, using predefined rules, are applied in quality control systems to make quick decisions based on specific conditions, ensuring products meet required standards without complex decision-making processes.
- **Model-Based Agent (Clinical Trial Simulator)**: Learn how model-based agents are used in clinical trial simulators to represent and predict complex trial scenarios, using internal models to simulate patient responses, treatment effects, and outcomes for better trial planning and analysis.
- **Goal-Based Agent (Synthetic Route Planner)** : Explore how goal-based agents help in synthetic route planning by evaluating multiple pathways to achieve a desired chemical outcome, optimizing resources and time by selecting the most efficient route for chemical synthesis.
- **Utility-Based Agent (R&D Portfolio Manager)**: Understand how utility-based agents aid in research and development portfolio management by assessing different projects based on their potential value and risks, making decisions that maximize return and align with strategic goals.
- **Learning Agent (Pharmacovigilance Investigator)** : Learn how learning agents improve pharmacovigilance investigations by continuously analyzing adverse event data, adapting their methods, and refining their ability to detect and assess drug safety signals more effectively over time.

9.7 Applications and Trends in Pharma

9.8 Case Study: Accelerated Lead Optimization with a Generative AI Agent

9.9 Hands-on Lab