
HMX Short Course - Unlocking Precision Medicine through Omics and AI

Learn how omics and AI are transforming the path to precision medicine.

Precision medicine, which tailors medical treatment to the unique molecular and clinical characteristics of each patient, represents a transformative goal in health care, particularly for complex or rare diseases. However, the volume and complexity of the biological data generated for each patient is a significant barrier to developing this type of care. Much of this information is derived from omics technologies, which obtain information from multiple biological layers, including genomics, transcriptomics, proteomics, and metabolomics.

In this HMX Short Course, you will build an understanding of how AI can be used to interpret and integrate these data to reveal hidden patterns that link the findings to disease mechanisms. Through interactive lessons taught by Harvard Medical School faculty, you will explore how generating predictions like these can inform personalized care decisions. Building expertise in AI-driven omics equips learners to harness cutting-edge tools that redefine innovation across biomedical research, digital health, drug development, and patient-centered care.

Participants will

- Learn about bulk and single-cell omics approaches and how omics data can be used to define cell types or states.
 - Explore about how machine learning approaches and also foundation models are being used to analyze and integrate single-cell omics data.
 - Explore about applications of omics data and AI in precision medicine, like biomarkers and drug targets.
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Topics Covered Include

- Shaping Precision Medicine with Omics and AI
- Overview of Bulk and Single-Cell Omics
- Finding Patterns in Single-Cell Omics Data
- Defining Biological Cell States
- Linking Omics to Health and Disease
- Deep Dive: Steps in the Omics Data Analysis Pipeline
- Foundation Models for Unified Models of Single-Cell Data
- Multimodal Omics Integration for Deeper Understanding of Disease
- Translating to Clinical Insights: Biomarkers
- Translating to Clinical Insights: Drug Discovery
- Rethinking Autoimmunity with AI and Omics - A Path Toward Precision Medicine

HMX Short Courses feature targeted lessons on the latest medical science information and advancements to keep learners up to date.