AIM-Artificial Intelligence in Medicine

Courses

AIM 600. Programming Essentials for AI in Medicine. 0 Hours.
This course is designed for students with no prior experience in Python programming. Students will learn about basic coding concepts to prepare for the transition into more specialized areas, such as deep learning, by building a solid programming foundation that supports further exploration of AI technologies in medicine. Students will complete this course once admitted to the MS in AI in Medicine program.

AIM 641. Technical Introductions to Deep Learning in Medicine. 3 Hours.
The technical aspects of deep learning in medicine will introduce students to machine learning and deep learning topics that are relevant to the application and development of those techniques in the healthcare domain. These techniques deal with the prediction of labels or real values for unseen objects, based on a set of previously encountered examples, or automated discovery of patterns and commonalities in data. Students will be first introduced to the fundamentals of machine learning and its application to ensure a correct and skillful use of available techniques. We will then focus on deep learning techniques, and how they can be applied in the medical field.
Prerequisites: HCI 611 [Min Grade: C](Can be taken Concurrently)

AIM 642. Artificial Intelligence for Medical Imaging. 3 Hours.
The course will cover the design and implementation of advanced AI-based diagnostics and patient monitoring strategies using medical images from various modalities. Students learn specific preprocessing pipelines for various types of medical images; implement AI-based diagnostics as a project using open-source medical image datasets; learn various development and transfer learning strategies of AI models for medical images.
Prerequisites: HCI 611 [Min Grade: C](Can be taken Concurrently)

AIM 643. Artificial Intelligence for Biomedical Signals and Critical Care Systems. 3 Hours.
This course educates learners about artificial intelligence and machine learning applications to various biomedical signals and perioperative time-series data. The course specifically provides a detailed instruction on how to develop AI systems for real-time time-series data from ICU and other critical care systems. The course presents challenges associated with processing biomedical signals from critical care systems and how AI can assist in improving patient monitoring strategies.
Prerequisites: HCI 611 [Min Grade: C](Can be taken Concurrently)

AIM 644. Reinforcement Learning for Clinical Decision Making. 3 Hours.
This course educates students to the components that make up a reinforcement learning problem and to the important concepts to focus on when trying to solve such a problem in the context of clinical decision making. Students learn what are the different properties of a reinforcement learning problem and what are the consequences of these properties with respect to solvability. They learn how to implement these techniques with focus to the clinical domain, and how supervised learning (and specifically deep learning) can be used to help reinforcement learning techniques tackle larger problems.
Prerequisites: HCI 611 [Min Grade: C](Can be taken Concurrently)

AIM 645. Advanced Natural Language Processing (NLP) in Medicine. 3 Hours.
This theoretical course provides the students with the skills and knowledge to understand and develop state-of-the-art solutions for natural language processing tasks in the field of medicine and healthcare. After a short introduction to traditional generative grammars and statistical approaches to NLP, the course will focus on transformers and variations on their architecture (including BERT and GPT), and about which models work best for which tasks, their capacities, limitations and how to optimize these for medical applications.
Prerequisites: HCI 611 [Min Grade: C](Can be taken Concurrently)

AIM 646. Large Language Model (LLM) Development in Medicine. 3 Hours.
This practical course provides the hands-on expertise. Large Language Model (LLM) concepts such as tokenization, text classification, and sentiment analysis to more advanced topics like fine-tuning large language models for domain-specific healthcare applications. Through a blend of lectures, hands-on assignments, and project work, students will gain a deep understanding of the capabilities and constraints of current LLM technologies. They will also delve into the ethical and regulatory considerations unique to deploying LLMs in a healthcare setting.
Prerequisites: HCI 611 [Min Grade: C](Can be taken Concurrently)

AIM 647. Explainable AI in Medicine. 3 Hours.
In this course, students learn to explain the difference between different explanation approaches (e.g., global versus local models) and to critically choose which are suitable to use based on underlying assumptions and relative advantages and limitations. Students learn to evaluate the quality and ethical consequences of approaches based on the techniques taught, the understandability of explanations, and demonstrate awareness of the ethical, normative, and social consequences of their applications.
Prerequisites: HCI 611 [Min Grade: C](Can be taken Concurrently)

AIM 651. AI for Digital Diagnostics and Prognostics. 3 Hours.
Diagnosis and prognosis are the foundational acts of clinical medicine, and AI is increasingly embedded in both. This course examines how machine learning systems are designed, validated, and deployed to detect disease, stratify risk, and forecast patient trajectories across imaging, laboratory, and clinical data domains. Students develop the critical literacy to evaluate diagnostic AI claims, understand the statistical basis of prognostic modeling, and assess when AI-driven conclusions can and cannot be trusted in clinical practice.
Prerequisites: HCI 611 [Min Grade: C]

AIM 652. AI for Precision Medicine. 3 Hours.
Precision medicine aims to deliver the right treatment to the right patient at the right time, and AI is accelerating this vision by integrating genomic, proteomic, imaging, and clinical data at scale. This course examines how machine learning methods are applied to patient stratification, treatment response prediction, biomarker discovery, and therapeutic targeting. Students gain the conceptual and applied fluency to critically evaluate precision medicine AI tools and understand their potential and limitations within real clinical and research contexts.
Prerequisites: HCI 611 [Min Grade: C]

AIM 653. Data & Technical Governance for Clinical AI. 3 Hours.
Health systems are acquiring AI systems faster than governance infrastructure can keep pace. This course builds the regulatory literacy and institutional oversight capacity for clinicians and administrators who will lead AI governance at the organizational level. Topics span FDA regulatory pathways, data governance frameworks, technical accountability, vendor due diligence, and the emerging legislative landscape, equipping students to design oversight structures that are both legally sound and operationally practical.
Prerequisites: HCI 611 [Min Grade: C]

AIM 654. AI for Clinical Trial Optimization. 3 Hours.
Clinical trials are the highest-stakes and most resource-intensive pipeline in medicine. AI is transforming every phase, from protocol design and site selection to patient recruitment, adaptive interim analysis, and endpoint adjudication. This course prepares clinician investigators and research administrators to lead AI-augmented trials, critically evaluate AI-driven trial platforms, and navigate the evolving regulatory landscape governing AI in drug development.
Prerequisites: HCI 611 [Min Grade: C]

AIM 655. AI for Patient Safety. 3 Hours.
Patient safety is the organizing principle of high-quality healthcare, and AI introduces both new capabilities to prevent harm and new failure modes that must be proactively managed. This course examines how AI systems can detect, predict, and prevent adverse events, medication errors, diagnostic failures, and system-level risks, while also analyzing how poorly designed or deployed AI can itself become a source of harm. Students develop practical skills to evaluate AI safety tools, design surveillance systems, and lead institutional safety culture in AI-enabled environments.
Prerequisites: HCI 611 [Min Grade: C]

AIM 690. Special Topics in Artificial Intelligence in Medicine. 1-3 Hour.
Rotating special topics course focusing on medical synergies with artificial intelligence.

AIM 699. Thesis Research. 1-6 Hour.
Independent research culminating in master's thesis in AI in Medicine.

AIM 701. AI in Medicine Graduate Seminar. 1 Hour.
The AI in Medicine Monthly Seminar Series brings together leading experts at the forefront of artificial intelligence and healthcare to share their insights, breakthroughs, and visions for the future. Modeled after grand rounds, each session features an invited speaker who presents their work in applying AI to pressing clinical challenges, spanning medical imaging, digital pathology, genomics, electronic health records, clinical trials, and healthcare delivery. The series provides a platform for clinicians, data scientists, and researchers to engage in cross-disciplinary dialogue, examine real-world applications, and consider the ethical, regulatory, and translational dimensions of AI in medicine. Attendees will gain exposure to cutting-edge research, innovative tools, and case studies highlighting how AI is shaping diagnostics, prognostics, and personalized care.