ARTIFICIAL INTELLIGENCE IN HEALTH CARE (AIHC)

AIHC 5010 Introduction to Machine Learning (3 Credits)
H. Liu, T. Kline (Winter) – This course offers a broad introduction to both the theoretical and practical aspects of the design and implementation of modern machine learning techniques. On the theory side, the course will focus on understanding key concepts of the algorithms and the relationships between them. On the applied side, the course will focus on effectively using machine learning methods to solve real-world problems. Programming skills in Python of R is required.
Grading: Standard Letter

AIHC 5020 Introduction to Data (3 Credits)
J. Juskewitch, A. Knopp (Summer) – Data is the foundation of knowledge generation and the raw material by which machine learning and artificial intelligence are fueled. The use of machine learning and artificial intelligence for the betterment of patient care and healthcare delivery is now coming into its own. An in-depth understanding of the nature of data is a crucial aspect for understanding and leveraging machine learning and artificial intelligence to its fullest. This foundation course will delve into the many attributes of data with a particular focus on the clinical data generated in the medical evaluation and treatment of patients along with the additional regulatory, privacy/confidentiality, and security issues involved with use of clinical data sets. Data summarization and statistical testing, Programming skills in Python of R is preferred.
Grading: Standard Letter

AIHC 5030 Introduction to Deployment, Adoption & Maintenance of Artificial Intelligence Models/Algorithms (2 Credits)
A. Aakre, S. Overgaard (Spring) – This course will provide a high-level overview with multiple concrete examples of how to vet artificial intelligence for health care. Creating a model or algorithm is just one step in the journey to real-world artificial intelligence (AI). Deploying means turning your model/algorithm into a useable service that is integrated into an existing production environment where it can take in an input, return an output and deliver value. You will learn to assess whether and when an AI algorithm should be used, and the steps required in AI translation and project execution. You will learn how to define an algorithm's business model, perform a business and financial effects assessment plan, and ensure that your AI solution meets ethical and regulatory requirements.
Prerequisites: (CTSC 5300 and AIHC 5010 and AIHC 5615 and AIHC 5020)
Grading: Standard Letter

AIHC 5045 FDA & ISO Software Verification & Validation (1 Credit)
M. Lifson, D. Vidal (Spring) – This course will include a full overview of the lifecycle of regulated software from ideation through Food & Drug Administration (FDA) clearance and into post market monitoring and changes. You will be given the tools and resources needed to navigate regulations in this new and innovative area of medical practice. This course is required for the (AIHC) Regulatory/Translational Concentration and can also be taken as an elective for any other student.
Grading: Standard Letter

AIHC 5200 AI Math Foundations (2 Credits)
D. Holmes, N. Hugenberg (Fall) – This course will provide a mathematical foundation for the study of machine learning and artificial intelligence applications, with examples emphasizing best practices for biomedical and clinical research. Primary topics are calculus, linear algebra, probability and statistics, and computer programming in MATLAB. Students are expected to have some background in these topics already, but this course will establish a common ground for all AIHC students to work from.
Grading: Standard Letter

AIHC 5300 Introduction to Mayo Clinic Cloud (1 Credit)
D. Holmes, K. Schultz (Fall, Winter, Spring, Summer) – This course will provide an overview of the Mayo Clinic Cloud (MCC) environment, enabling learners to get started in MCC and use AI Factory 2.0 and Cloud App Factory.
Grading: Sat / Unsat

AIHC 5500 Artificial Intelligence and Machine Learning Journal Club (1 Credit)
D. Holmes , K. Peterson, J. Reed (Spring) – The goal of this course is to enable students to become thought leaders in the domain of AI in health care. This is achieved through exposure to a broad range of AI topics and methodologies via weekly seminars. Each student will give two seminar presentations about notable AI-related publications. Seminars will also include presentations from guest speakers (from inside and outside of Mayo Clinic) about AI-related projects, tools, and methodologies.
Grading: Sat / Unsat

AIHC 5615 Fundamentals of Statistics for Artificial Intelligence (2 Credits)
N. Hugenberg (Fall) – This course will review basic concepts in statistics, specifically with regards to hypothesis testing for a variety of experimental designs regression techniques as useful statistical modeling approach, practical examples using the selected concept, and presentation of findings. The focus of this course will be in the implementation of software code to complete the model development, assessment of the statistical model utility, and visualization of the performance.
Grading: Standard Letter

AIHC 5960 Introduction to Medical Informatics (2 Credits)
V. Herasevich, B. Pickering (Fall) – This course is intended to provide an introduction to the principles of medical and clinical informatics. Information science (IS) and Information Technology (IT) is now playing a major role in clinical medicine and research studies, from managing data to integration of data, information, and knowledge. Information infrastructure, guided by appropriate principles and expertise, could determine the success or failure of a study.
Grading: Standard Letter

AIHC 5961 Health Information Technology Evaluation: Clinical Informatics Methods (1 Credit)
V. Herasevich, B. Pickering (Winter) – Governments and clinical providers are investing in health information technologies with little evidence as to their ultimate value. For years, health information technology (HIT) has been implemented with the goals of improving clinical care processes, health care quality, and patient safety. A systematic approach to the evaluation and testing allows for comparison of different HIT interventions with the goal of promoting those which improve clinical care and outcomes. In addition, structured evaluations of a projects impact are an essential element of the justification for investment in HIT. The question of the day is no longer "why perform evaluations," but "how to perform evaluations." This course will present basic concepts, theory, and methods associated with HIT evaluation.
Grading: Standard Letter

AIHC 5962 Clinical Surveillance, Alerting, and Data Representation (1 Credit)
V. Herasevich, B. Pickering, A. Bhattacharyya (Winter) – Electronic Health Records are designed to improve patient health care and information management. Traditionally organized as databases, modern EMRs still lack deep integration with related workflows and decision support system available in other industries rather than healthcare. Clinical systems divert attention to serious medical situations by delivering notifications to the right place, at the right time, and to right person. However, further development is needed. On other hand, clinical data representation in current EMR solutions utilized standard controls and frameworks with 30+ years legacy. This course is designed to provide fundamental knowledge for understanding clinical surveillance and alerting systems, as well as modern clinical data visualization approaches.
Prerequisites: AIHC 5960 (may be taken concurrently)
Grading: Standard Letter

AIHC 5963 Health Information Security (1 Credit)
V. Herasevich, P. Zummo (Spring) – Increased access to advances in information technology enhances healthcare opportunities. However, it also presents significant threats to personal information and confidential data. Improved access, along with developing and implementing new technology, has made cybersecurity one of the most emerging industries and disciplines. A cyberattack on a hospital could not only compromise operations, but also endanger patient care which has become increasingly dependent on information technology. This course will provide introductory knowledge, theory, and methods associated with Information Security including policy, procedures, architectures, and risk assessment and focuses on strategical thinking to address cybersecurity challenges in healthcare context.
Prerequisites: AIHC 5960 (may be taken concurrently)
Grading: Standard Letter

AIHC 5964 AI & HIT Implementation (1 Credit)
V. Herasevich, B. Pickering (Spring) – Improved healthcare delivery and patient outcomes are the ultimate goals of software applications in healthcare. However, beside evaluation of impact that applications appropriate translation to clinical practice is critical task. This course is designed for people that are new to project management and give a solid foundation of implementation process.
Prerequisites: AIHC 5960 (may be taken concurrently)
Grading: Standard Letter

AIHC 6000 Independent Study in Artificial Intelligence in Healthcare (1-3 Credits)
D. Holmes (Fall, Winter, Spring, Summer) – Independent studies are arranged on an individual basis in selected advanced topics in artificial intelligence in healthcare. Learners are expected to define a topic area and parameters in consultation with a member of the teaching faculty and/or the program director. Specific assessments may vary but are required to demonstrate mastery of the topic. Independent studies are intended to emphasize laboratory/project-based learning (augmented with lecture/book content); this is in comparison to Tutorials which are intended to be primarily theoretical discussions on a topic (augmented with homework/labs). In addition to individual assignments for the course, students will be expected to submit a summary of their learning experience as a final assignment for review by the AIHC Executive Committee.
Grading: Sat / Unsat

AIHC 6020 Data Curation in Healthcare (2 Credits)
N. Hugenberg (Summer) – Data is required by all applications big and small. Data in Healthcare has been generated inside of departments and other organizations, often in unique and unrelated data models. This has resulted in data silos that have prevented that data from achieving full value to patients, providers, administrators, payers, and researchers. This course introduces the concept of data in all of its representations with emphasis on data models and the various Databases in contemporary usage and includes the curation and governance of that data. Data supports Healthcare applications for patient care, administration, public health reporting, research, utilization reporting and planning, and claims management. Healthcare data has a need to be cataloged, curated and governed to ensure that it is accurate, useful, and protected. Processes involved in the curation of data include data collection, validation, cleansing, transformed, translated, secure, reliable, and understood by all parties. Over the course of twelve lectures and labs, we will explore data and databases, the importance of data curation, the different methods for achieving curated information, the security of that information, and the techniques used to curate the data used in Healthcare today. This course will utilize labs for hands-on experiences related to the merging, transforming, filtering, and protecting data that makes up the healthcare environments for today and tomorrow.
Grading: Standard Letter

AIHC 6300 Certificate Capstone Project (1 Credit)
D. Holmes (Fall, Winter, Spring, Summer) – For artificial intelligence in health care (AIHC) certificate students only. Registration typically occurs for the spring quarter. Completion of the capstone project is required for successful completion of the certificate program. The topic is chosen by students and is based on their specific interest with appropriate guidance from the assigned mentor and/or program director. This course may only be taken once for credit.
Grading: Sat / Unsat

AIHC 6500 Tutorial in Artificial Intelligence in Healthcare (1-3 Credits)
D. Holmes (Fall, Winter, Spring, Summer) – Tutorials are arranged on an individual basis in selected advanced topics in artificial intelligence in healthcare. Learners are expected to define a topic area and parameters in consultation with a member of the teaching faculty and/or the program director. Specific assessments may vary but are required to demonstrate mastery of the topic. Tutorials are courses which are intended to be primarily theoretical discussions on a topic (augmented with homework/labs); this is in comparison to Independent Studies are intended to emphasize laboratory/project-based learning (augmented with lecture/book content). In addition to individual assignments for the course, students will be expected to submit a summary of their learning experience as a final assignment for review by the AIHC Executive Committee.
Grading: Sat / Unsat