ARTIFICIAL INTELLIGENCE IN HEALTH CARE (AIHC) – POSTDOCTORAL MASTERS

- David R. Holmes, III Ph.D., *Program Director*

Application

Candidates must complete a formal application. More details are available on the MCGSBS Master's Programs web page. Additional details specific to the CTS Master's Program can be found here (https://www.mayo.edu/research/centers-programs/center-clinical-translational-science/education/postdoctoral-masters-degree-program/application-process.html). Applicants must be approved by the track program director and admission endorsed by MCGSBS.

Eligibility

Applicants must be employed at Mayo Clinic. The employment appointment, as documented at the time of application, must be greater in length than the time required for completion of all requirements of the program. Eligible roles include: Any Mayo Clinic physician, scientist, fellow or resident with a doctoral degree in a discipline applicable to clinical research or medical student who plans to have a research career. Visiting clinicians, research trainees and research collaborators are not eligible.

Time Requirement

Applicants must have adequate protected time to complete course and research requirements within designated program length. Applications with inadequate protected time to complete the program will**not**be accepted. Time to completion can vary by program and Mayo Clinic role from two to five years. All scholars must be in their program a minimum of 1 year in order to meet the MCGSBS residency requirement. Scholars must complete all program requirements within 5 years.

Students must have dedicated time for their program commitments and abide by course attendance requirements as defined in course syllabi. Students must be appropriately engaged in their program and demonstrate continued progress towards graduation.

Registration Requirement

At least 75% of the coursework for the Master's degree must be completed in MCGSBS. It is expected that a minimum of one year will be devoted to research. Students must be enrolled in a minimum of one course per term. If students are not registered for courses, they will be considered inactive to some reporting agencies and subject to any implications of the inactive status, e.g. eligibility for student loan deferral if applicable.

Minimum Credit Requirements

Students must complete a minimum of 45 credits, which can include a maximum of 16 Research credits. (See individual specialty track descriptions for specific course requirements.)

Transfer Credits

A total of 6 didactic credits may be transferred into the program. For more details, see the Credit Transfer Policy on the MCGSBS Policies and Procedures intranet site.

The Master's degree track in Artificial Intelligence in Health Care is open only to Mayo Clinic employees who have a doctoral degree in a discipline applicable to clinical research. Doctoral candidates may be considered. Potential candidates for the degree must hold Mayo Clinic appointments of sufficient duration to complete the program requirements.

Pre-Requisite Course Work

1. Introduction to statistics: Data summarization and statistical testing (like CTSC 5600)
2. Linear Algebra: Matrix Math
3. Calculus: Single variable ("Calc 1")
4. Introduction to Scientific Programming (Python and/or R preferred)

Course Requirements

The curriculum for the Master's degree consists of **45 credits**. The student must complete all of the required courses listed below:

Code	Title	Hours
Track Requirements		
AIHC 5010	Introduction to Machine Learning	3
AIHC 5020	Introduction to Data	3
AIHC 5030	Introduction to Deployment, Adoption & Maintenance of Artificial Intelligence Models/Algorithms	2
AIHC 5200	AI Math Foundations	2
AIHC 5500	Artificial Intelligence and Machine Learning Journal Club	1
CTSC 5300	Foundations of Epidemiology	1
CTSC 5350	Ethical Issues in Artificial Intelligence and Information Technologies	1
AIHC 5615	Fundamentals of Statistics for Artificial Intelligence	2
Advanced Coursework		
Select 5 credits [1]		5
Research [2]		
MGS 6100	Master's Thesis Proposal	3
MGS 6840	Master's Research (4 cr/qtr - 4 qtrs required)	16
Concentration		**6**
Select 6 credits from the listed concentrations		6
Total Hours		**51**

[1] Students can choose to focus their elective credits into one of the concentration areas listed below or select their elective credits based on recommendations from their mentor or based on their professional goals.

[2] It is expected that a minimum of one year will be devoted to research.

Concentrations Requirements

Signals & Systems

Code	Title	Hours
BME 6720	Deep Learning for Medical Imaging	3
BME 5704		3
Total Hours		**6**

Discovery Science

Code	Title	Hours
CTSC 5140		2
CTSC 5410	Molecular Variant Evaluation	2
CTSC 5500	Genomic Analysis of Complex Traits	1
CTSC 6160	Genomic Analysis and Data Interpretation for Rare and Undiagnosed Diseases	2
Total Hours		**7**

Discovery Science - Molecular Genetics

Code	Title	Hours
BMB 5400		
CTSC 5400	Introduction to Bioinformatics Concepts and Core Technologies for Individualized Medicine Approaches	1
MPET 6450	Applied Data Science and Artificial Intelligence in Pharmacology	2
Total Hours		**3**

Applied Clinical Informatics

Code	Title	Hours
AIHC 5960	Introduction to Medical Informatics	2
AIHC 5961	Health Information Technology Evaluation: Clinical Informatics Methods	1
AIHC 5962	Clinical Surveillance, Alerting, and Data Representation	1
AIHC 5963	Health Information Security	1
AIHC 5964	AI & HIT Implementation	1
Total Hours		**6**

Translational & Regulatory

Code	Title	Hours
AIHC 5045	FDA & ISO Software Verification & Validation	1
CTSC 5020	Regulatory Issues in Clinical Research	1
CTSC 5025	Introduction to Regulatory Science	1
CTSC 5035		1
CTSC 5400	Introduction to Bioinformatics Concepts and Core Technologies for Individualized Medicine Approaches	1
CTSC 5720	Clinical Trials Design and Conduct	1
Total Hours		**6**

Written Qualifying Exam (WQE)

The WQE is designed to demonstrate a student's ability to integrate and synthesize the core competencies of the program. Students must pass the WQE to complete the degree requirements.

Thesis Defense (Final Oral Examination)

The final oral examination cannot be completed until the following criteria have been met:

- The Written Qualifying Examination has been passed,
- All coursework has been completed with a GPA of 3.0 or higher,
- All program milestones have been met, and
- AIHC Postdoctoral Programs Committee has reviewed and approved the thesis proposal

Publication Requirement

Master's thesis research must make a substantial contribution to the biomedical literature, and preparing work for publication is an important part of research training. The expectation is that thesis research will result in multiple publications. To graduate, students need to publish at least two original peer-reviewed papers on which they are first author.

This is a suggested sequence based on a summer term start. Individual course plans may vary depending on true start date, program, employment/ personal commitments, and research interests. Note that this sequence only covers the Core courses and Concentration courses. Students are responsible for additional elective credits which are required by the program.   Be sure to confirm you have met your requirements using your degree planning tool. Course offerings may vary slightly. Current course offerings are posted in the course catalog.

Code	Title	Hours
First Year - Summer Term		
AIHC 5020	Introduction to Data	3
CTSC 5300	Foundations of Epidemiology	1
Concentration		1
CTSC 5020	Regulatory Issues in Clinical Research	
CTSC 5025	Introduction to Regulatory Science	

Code	Title	Hours
First Year - Fall Term		
AIHC 5200	AI Math Foundations	2
AIHC 5615	Fundamentals of Statistics for Artificial Intelligence	2
Concentration		2
AIHC 5960	Introduction to Medical Informatics	
MPET 6450	Applied Data Science and Artificial Intelligence in Pharmacology	

Code	Title	Hours
First Year - Winter Term		
MGS 6100	Master's Thesis Proposal	3
AIHC 5010	Introduction to Machine Learning	3
CTSC 5350	Ethical Issues in Artificial Intelligence and Information Technologies	1
Concentration		
BMB 5400		
CTSC 5500	Genomic Analysis of Complex Traits	
CTSC 5410	Molecular Variant Evaluation	
CTSC 5400	Introduction to Bioinformatics Concepts and Core Technologies for Individualized Medicine Approaches	

	CTSC 5720	Clinical Trials Design and Conduct	
	CTSC 6120	Case Studies in Translation	
	AIHC 5961	Health Information Technology Evaluation: Clinical Informatics Methods	
	AIHC 5962	Clinical Surveillance, Alerting, and Data Representation	

Code		Title	Hours
First Year - Spring Term			
AIHC 5030		Introduction to Deployment, Adoption & Maintenance of Artificial Intelligence Models/Algorithms	2
AIHC 5500		Artificial Intelligence and Machine Learning Journal Club	1
Concentration			
	AIHC 5963	Health Information Security	
	AIHC 5964	AI & HIT Implementation	
	AIHC 5045	FDA & ISO Software Verification & Validation	
	BME 5704		
	BME 6720	Deep Learning for Medical Imaging	
	CTSC 6160	Genomic Analysis and Data Interpretation for Rare and Undiagnosed Diseases	

Code	Title	Hours
Second Year - All Terms		
MGS 6840	Master's Research (Enroll once per term for minimum 4 terms.)	4