

# ARTIFICIAL INTELLIGENCE IN MEDICINE (CERT)

This program was approved for students entering the university in the Summer 2024–Spring 2025 catalog year. For more information about catalog year, go to Catalog Year Information (<https://catalog.louisville.edu/undergraduate/university-wide-unit-specific-policies/catalog-year/>).

## Graduate Certificate in Artificial Intelligence in Medicine

Unit: Speed School of Engineering (<http://engineering.louisville.edu>) (GS)

Department: Bioengineering (<https://engineering.louisville.edu/academics/departments/bioengineering/>)

Academic Plan Code(s): AIM\_CGR, AIM\_CGRO

## Program Information

*This program can be completed in a traditional classroom format or entirely online (<https://louisville.edu/online/programs/certificate-programs/certificate-in-artificial-intelligence-in-medicine/>).*

The graduate certificate in Artificial Intelligence in Medicine offers students training in the application of computational methods and machine learning techniques to the analysis of medical problems. The focus of the program is an emphasis on the mastery of skills required to analyze medical data related to patients, which include big data, medical imaging, physiological and disease progression modeling, experimental (clinical and laboratory), and healthcare information. This program will benefit healthcare through the use of modern computational techniques to manage and investigate the ever-increasing volume of patient data and the wide variety of diseases. Students will acquire skills and knowledge in computation, modeling and simulation, machine learning, medical data management, and advanced statistical analysis, with an emphasis on interdisciplinary collaboration.

The courses available for this program may include assignments and projects in collaboration with researchers at the School of Medicine. In particular, Bioengineering faculty have established collaborations with the Cardiovascular Innovation Institute, the Kentucky Spinal Cord Injury Research Center, the Brown Cancer Center, the Center for Predictive Medicine, and the Departments of Oncology and Radiology.

## Certificate Summary

Code	Title	Hours
	Bioengineering Coursework	9
	Approved Electives	3
<b>Minimum Total Hours</b>		<b>12</b>

The admission standards for the Graduate Certificate program in Artificial Intelligence in Medicine are as follows:

- All admission applications for the Graduate Certificate program shall include:
  - A completed graduate application (<http://louisville.edu/graduate/futurestudents/apply-materials/application/>) for the Graduate School
  - Application fee

- Official transcript certifying at least a bachelor's degree. All transcripts not in English must be certified as authentic and translated verbatim into English.
- The minimum requirement for admission is the baccalaureate degree or its equivalent from an accredited institution, or current enrollment in a graduate Speed School program, and completion of an introductory computer programming course or previous exposure to programming. Students without this course are encouraged to apply but may be asked to take a pre-requisite course in computer programming.
  - The successful applicant will typically have an undergraduate grade point average of 3.0 or above (on a 4.0 scale).
  - International students whose primary language is not English must show English language proficiency. Applicants must either submit an official TOEFL, IELTS or Duolingo score, or demonstrate a degree award from an acceptable English language institution. The successful applicant will typically have a total TOEFL score of 79 or higher, an overall IELTS score of 6.5 or higher or Duolingo score of 105.

Students can enroll in a Graduate Certificate program either as a non-degree seeking student or as a student simultaneously enrolled in a graduate degree program and this graduate certificate program. Students who wish to earn a graduate degree must meet all admission criteria for the degree program.

All students enrolled in a graduate certificate program are expected to make steady and satisfactory progress toward the completion of the certificate. Students who are not enrolled for a period of more than 12 months will be considered to have withdrawn from the certificate program. Students who seek to return after such a period of time must contact the graduate program director.

The following certificate requirements are mandatory of all Graduate Certificate candidates:

- The Certificate Program of Study must be completed with a 3.0 GPA or better for all graduate courses used to satisfy certificate requirements.
- Graduate certificate students must take all certificate course work at the University of Louisville. No transfer credits will be accepted towards a graduate certificate.

The Bioengineering Department has established the following grade policy for the Artificial Intelligence in Medicine Graduate Certificate program:

- A student cannot receive a C+ or lower grade in courses counting towards the certificate.

Additionally, all program requirements for this certificate must be completed within three years from admission into the program.

## Program Requirements

Code	Title	Hours
Choose 12 credit hours from the list below (9 credit hours must be from BE courses):		
BE 524	LabVIEW for Bioengineers	12
BE 530	Machine Learning in Python	
BE 540	Machine Learning in Medicine	
BE 542	Medical Image Computing	

BE 543	Computer Tools for Medical Image Analysis
BE 544	Artificial Intelligence Techniques in Digital Pathology
BE 604	Introduction to Artificial Intelligence in Bioengineering
BE 640	Computational Methods for Medical Image Analysis
BE 645	Artificial Intelligence and Radiomics
BE 685	Modeling of Biological Phenomena
CSE 532	Python and Data Analytics
CSE 545	Artificial Intelligence
CSE 546	Introduction to Machine Learning
CSE 547	Deep Learning Algorithms and Methods
CSE 590	Special Topics in Computer Science and Engineering (Big Data Analytics Tools & Tech)
CSE 632	Data Mining
<i>NOTE: Only one of either CSE 632 or PHMS 641 can count towards certificate</i>	
CSE 641	Medical Imaging Systems
CSE 660	Introduction to Bioinformatics
CSE 694	Special Topics in Computer Science and Engineering <sup>1</sup>
PHST 620	Introduction to Statistical Computing
PHST 655	Basic Statistical Methods for Bioinformatics
PHST 681	Biostatistical Methods II
PHST 710	Advanced Statistical Computing I
PHMS 641	Data Mining I
PHMS 642	Data Mining II

**Minimum Total Hours** **12**

<sup>1</sup> CSE 694 Special Topics options:

1. Current topics in Bioinformatics
2. Topics in Advanced Machine Learning Theory & Methods