Graduate Certificate in AI in Biomedicine

Program Description

The Graduate Certificate in AI in Biomedicine is a 12-credit interdisciplinary program. The program provides an application-focused introduction to artificial intelligence and machine learning across key biomedical domains, including medical imaging, biosignals, and neuromusculoskeletal systems. Combining foundational methods with hands-on experience, students learn to analyze complex biomedical data, develop and evaluate AI models, and apply modern tools ranging from no-code platforms to advanced deep learning techniques. Through project-based learning with real-world datasets, the program prepares students to solve practical challenges in healthcare, research, and biotechnology while effectively communicating data-driven insights to diverse audiences.

Who would be suited to take this program?

- **Graduate students in biomedical engineering, bioengineering, computer science, or data science** seeking to apply AI in biomedical contexts.
- **Early-career professionals in healthcare, biotechnology, or research** looking to gain practical AI skills for analyzing medical images, biosignals, or human movement.
- **Rehabilitation and movement science specialists** (e.g., physical therapists, kinesiology researchers) with a strong quantitative or computational background.
- **Students aiming for interdisciplinary careers** at the intersection of AI, data science, and biomedical research who already possess programming and analytical skills.

What will I learn?

No Code Data Exploration - This course focuses on working with biomedical data and extracting useful insights without writing code. Students explore no-code tools that allow users to clean, analyze, and visualize data using drag-and-drop interfaces and AI-powered features. The course covers both traditional spreadsheet data and complex formats, such as text documents and images. Students learn to identify trends, create predictions, and discover patterns using visual tools, including supervised and unsupervised machine learning approaches. Students also learn to transform analysis results into clear presentations for various audiences. Through a semester-long project, students build a portfolio analyzing a biomedical dataset using multiple analytical methods. Students completing this course will feel confident tackling data analysis projects using visual tools, making them valuable contributors at data-driven organizations.

AI in Medical Imaging - This course focuses on the latest artificial intelligence (AI) technologies and their applications in medical imaging. Students will learn how the latest AI methods, especially deep learning and large-scale foundation models, are transforming diagnostic imaging, image reconstruction, segmentation, registration, and clinical decision support. The course bridges theoretical foundations and practical implementation, with a focus on "vibe coding" as a paradigm for human–AI collaborative engineering. Students will gain experience developing and evaluating AI algorithms using real-world datasets from modalities such as MRI, CT, X-ray, and ultrasound. Topics include foundational deep learning architectures such as Transformers, Large Language Models (LLMs), Vision Transformers (ViTs), and Vision-Language Models (VLMs), along with key training paradigms including contrastive learning and masked image modeling. The course also introduces Agentic AI and their applications in medical imaging tasks such as image reconstruction, segmentation, and registration. Generative modeling including diffusion models will be also covered.

Machine Learning in Bioengineering - This course focuses on machine learning (ML) and its transformative applications in bioengineering. Students will build a strong foundation in ML theory and algorithms, then progressively apply these concepts to real-world problems in bioengineering, such as medical image analysis, biosignal processing, and clinical decision support. The course will emphasize the unique challenges and opportunities of biomedical data (including high dimensionality, noise, probability and interpretability) while integrating the latest advances in deep learning, multimodal data fusion, and explainable AI. Through weekly labs using real world medical images, students will gain practical experience in developing, evaluating, and deploying ML solutions for modern healthcare and bioengineering challenges.

AI-Powered Neuromusculoskeletal Data Analysis - This course focuses on applications of artificial intelligence (AI) in neuromusculoskeletal data analysis, particularly in small-scale physiological processes such as muscle activation and neural control. Students will learn how to apply AI techniques to analyze motoneuronal signals and musculoskeletal images. This course will also cover explainable AI (XAI) to interpret AI-based decision-making. Through a combination of lectures, hands-on activities, and student presentations and projects, this course aims to equip students with the knowledge and skills necessary for AI-powered neuromusculoskeletal data analysis in real-world applications.

Why study AI in Biomedicine at NJIT?

The Graduate Certificate in AI for Biomedical Engineering at NJIT offers an integrated, multi-scale approach to applying AI across medical imaging, neuromusculoskeletal systems, bioengineering, and human movement analysis. Students gain hands-on experience with real-world datasets, sensors, and both coding and no-code tools in an interactive, project-based environment. Built on NJIT's research-active Biomedical Engineering department and supported by initiatives like AI Exploration Day, the program equips graduates with the skills and interdisciplinary expertise needed for careers in healthcare, biotechnology, and research, as well as for further advanced study in AI-driven biomedical engineering.

What are the Career Opportunities?

*Biomedical Data Scientist / AI Specialist

*Clinical or Research AI Engineer

*Medical Imaging Analyst

*Human Movement or Rehabilitation Analyst

Prerequisites

An undergraduate degree in engineering, with an undergraduate cumulative grade point average (GPA) of at least 3.0 on a 4.0 scale is required. Applicants with a science degree and relevant industrial experience may be considered for conditional admission.

The Graduate Certificate in Ai in Biomedicine can be applied towards an MS in Biomedical Engineering. Students with an undergraduate degree in Biomedical Engineering may transfer all certificate courses with a minimum grade of B to the MS program. Students from other disciplines may apply up to two certificate courses towards the MS in Biomedical Engineering.

What are the Required Courses?

The Graduate Certificate in Tissue Engineering and Regenerative Medicine can be completed by taking four courses (12 credits). The requirements must be satisfied as indicated in the following Course List.

Code	Title	Credits
BME 657	No Code Data Exploration	3
BME 658	AI in Medical Imaging	3
BME 659	Machine Learning in Bioengineering	3
BME 660	AI-Powered Neuromusculoskeletal Data Analysis	3