BIOMEDICAL INFORMATICS (BMIN-GA)

BMIN-GA 3 Advanced Topics in Biomedical Informatics (2 Credits)
Typically offered all terms
This course serves to review many of the key methodologies used in biomedical informatics. During this course we will cover a range of topics including systems biology, multi-omics analysis, medical imaging, artificial intelligence and natural language processing. We will spend approximately 15 minutes at the start of class discussing methodologies and general concepts. The last portion of the class will be spent with student-led presentations of journal articles assigned for that week. Specific students will be assigned for that session but all students are expected to thoroughly review the papers and research background questions prior to class. Discussions are meant to foster conversation and critical thinking in the context of biology and differences in background knowledge will be taken into account in grading.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 1001 Methods in Quantitative Biology (3 Credits)
Typically offered Fall
This course provides an overview of foundational knowledge and essential methods relevant for all areas of biomedical informatics. Students will explore recurring themes and application domains most frequently used in the field. The course will be technical and rigorous, and it will include a number of computer science topics. The course content has been selected by the curriculum committee, and the topics will change over time. The majority of the coursework will be programming assignments and readings.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 1002 Bioinformatics (3 Credits)
Typically offered all terms
This course is intended for biomedical scientists who wish to gain hands-on experience with bioinformatics techniques using the Python programming language. Emphasis will be placed on performing data analysis using software development best practices which will be discussed during the course
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 1003 Introduction to Healthcare AI (3 Credits)
Typically offered Fall
The healthcare system generates vast amounts of data of many different kinds, which are used by an enormous variety of stakeholders. Understanding the complexity of this system requires training in the field of Health Informatics, which is founded on sociotechnical science that addresses the interaction of information technology, individuals and organizations. This course provides an introduction to the field of Health Informatics, which studies information and communication processes in patient care, population health, clinical research, and related areas. The learning style is strongly student-driven, using “flipped classroom”, participatory exercises, teamwork and presentations. Throughout the course, students work together in teams to define a project, analyze related literature, develop plans, and give a presentation in the final week.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 1004 Machine Learning (3 Credits)
Typically offered all terms
This course is designed to equip students with an understanding of the most commonly used machine learning methods. The course is structured to provide a blend of theoretical knowledge and practical applications. The curriculum includes a series of hybrid lectures, recorded videos, lab sessions, and presentations, with a focus on various aspects of machine learning such as clustering, dimension reduction, regression, classification, tree-based methods, support vector machines, neural networks, and reinforcement learning. The course focuses on the application of machine learning in healthcare, with lectures dedicated to its use in medical imaging, text data, and omics data. Students will also have the opportunity to explore large language models. The course encourages active learning, with students required to present several times on their chosen class project during the course.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 1005 Programming for Data Analysis (2 Credits)
Typically offered all terms
Understanding code-based approaches to data analysis provide researchers with career opportunities, as well as the ability to conduct reproducible, rigorous research without having to invest in expensive software. R is a widely used language for data science and statistical analysis and provides researchers with tools to unlock insights from their data. This class will introduce students to R using the RStudio development environment, walk them through features and functions of the program to complete original analysis on a dataset of their choosing.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 1358 Introduction to Programming (2 Credits)
Typically offered occasionally
This introductory hands-on course is designed to help students with little or no computing background to start writing programs to facilitate research and analysis work. We will cover fundamental concepts in programming, using Python as the implementation language. Additionally, we will cover some libraries from the python informatics/analytics ecosystem. By the end of the course, students should have a good understanding of program components, logic and design, and will be able to quickly write error-free scripts to solve non-trivial problems. In addition to writing programs, some time will also be spent on tooling required to make the process of software development efficient and stress-free, as well as best-practices in software engineering.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 2002 Practicum I (4-6 Credits)
Typically offered occasionally
The primary goal of the practicum is to provide dedicated time for students to gain exposure to computational, informatics and/or AI research and develop a deeper understanding of the scientific process and development of skills in research and scholarship. This includes critical thinking, data analysis, literature review, and scientific writing.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 2003 BMI Master Practicum II (4-6 Credits)
Typically offered all terms
The primary goal of the practicum is to provide dedicated time for students to gain exposure to computational, informatics and/or AI research and develop a deeper understanding of the scientific process and development of skills in research and scholarship. This includes critical thinking, data analysis, literature review, and scientific writing.
Grading: GSAS Graded
Repeatable for additional credit: Yes

BMIN-GA 2004 Professional Studies in BMI (0 Credits)
Typically offered Fall and Spring
This course introduces students to ongoing research at NYU Langone Health and supports them in identifying a practicum research mentor. Students will be guided through key milestones outlined in the student handbook, including deadlines related to practicum research and presentations. The course also includes assignments designed to help students engage meaningfully with their practicum research and prepare for its successful completion.
Grading: GSAS Pass/Fail
Repeatable for additional credit: No

BMIN-GA 3001 Advanced Topics in Bioinformatics (4 Credits)
The course is meant to provide students with an overview of and practical experience with bioinformatics techniques.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 3002 Clinical Decision Support (3 Credits)
Clinical decision support can be thought of as the use of information technology to support medical decision-making. In this course, students will learn the fundamentals of clinical decision support with the end result being the design of their own clinical decision support tool.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 3003 Proteomics (3 Credits)
This course will give an introduction of proteomics and mass spectrometry workflows, experimental design, and data analysis with a focus on algorithms for extracting information from experimental data.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 3004 Applied Sequencing Informatics (3 Credits)
This course provides practical training in informatics methods for analysis of next-generation DNA sequencing (NGS) data.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 3005 Consulting in Biomedical Informatics (3 Credits)
This is an elective course for graduate students enrolled in the Biomedical Informatics program. Students will participate in BPIC consultations, prepare reports, present consultations to faculty mentors and their peers. The students will meet weekly to discuss former consultations as case studies, ongoing consultation and strategies for effective informatics consulting.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 3007 Deep Learning for Biomedical Data (3 Credits)
Students will learn the most common deep learning methods emerging in medicine. Students will be able to differentiate various deep learning methods and choose the most appropriate ones for specific research methods.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 3008 Evaluation Methods for Predictive Risk Models (3 Credits)
The course aims to give data scientists the multidisciplinary skills to evaluate systems and apply findings to generate change that improves organizational and system level outcomes.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 4451 Data Analysis and Biostatistics (2-4 Credits)
Data Analysis and Biostatistics
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 4498 Advanced Integrative Omics (3 Credits)
This course will focus on the analysis and integration of public and in-house proteogenomic data for mismatch repair (MMR) deficient endometrial tumors to identify biomarkers associated with recurrence and response to immune checkpoint therapy.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 4527 Artificial Intelligence, Generative AI, and Data Science (3 Credits)
This course will describe fundamental and advanced concepts of Artificial Intelligence (AI), Artificial General Intelligence (AGI), and Data Science (DS) with a focus on their applications pertinent to Biomedical Informatics. The following subjects will be covered: 1) Machine Learning (ML), Neural Networks (NN), Deep Learning (DL), and Reinforcement Learning (RL) as well as more in-depth concepts like AutoML, 1) Natural Language Processing (NLP), and Large Language Models (LLM) 2) Data Preparation, Processing, Analytics, Management, Engineering, Mesh, and Visualization as well as Exploratory Data Analysis (EDA) and Results Validation 3) Robotics, Imaging, Genomics, Transcriptomics, Proteomics, and Metabolomics Throughout the course, students will discuss real-world use cases (e.g. wearables) to learn how the different approaches can be implemented with a focus on Biomedical Informatics and Innovation. The course includes hands-on practical assignments, checkups, and discussions as well as project presentations at the course's finale.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 4528 Single-Cell Omics (3 Credits)
This course will provide an overview of the principles and applications of single-cell data analysis with a focus on single-cell RNA-seq libraries. Topics to be covered in the course will include, but not limited to: an overview of single-cell platforms, experimental design, quality control, filtering, normalization, batch correction, dimensionality reduction, clustering, cell annotation, differential expression, and cell ordering. Through a combination of lectures, hands-on laboratory exercises, and discussions, students will gain the knowledge and skills necessary to harness the power of single-cell techniques for a wide range of research applications. Basic knowledge of the programming language R is a prerequisite for participation in the course.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 4533 Healthcare Data Management (3 Credits)
The course on Healthcare Data Management provides the students with a comprehensive understanding of the most common types of biomedical data and how to design and query biomedical databases using SQL. The course covers a wide range of topics, including an overview of Electronic Health Records (EHR) and omics data types. It also delves into database systems commonly used in healthcare settings, data security and privacy, data warehousing and data mining, and emerging trends in data management.
Grading: GSAS Graded
Repeatable for additional credit: No

BMIN-GA 4552 GHA Skills Lab (4 Credits)
Students utilize problem-based learning to integrate skills in variant curation, risk assessment, and interprofessional consultation. While interpreting a series of individual genomes in different clinical contexts, students develop familiarity with the perspectives of professionals providing care across a range of medical specialties, as well as the anatomy and physiology of associated organ systems. Cases become increasingly complex as students analyze data and facilitate interprofessional consultations more independently.
Grading: GSAS Graded
Repeatable for additional credit: No