

HEALTH DATA SCIENCE (HDS)

HDS 800 - Mathematics and Statistics for Health Data Science

Credits: 3

This course covers the foundations of probability and inferential statistics as well as foundations of linear algebra and matrices. After completion of this course, students should be comfortable with performing basic analysis of data including descriptive statistics, data visualization and appropriate statistical tests. Different probability distributions will be introduced along with hypothesis testing, confidence intervals, linear regression, and ANOVA.

HDS 801 - Foundations of US Health Systems

Credits: 3

This course covers the foundations and functioning of the US Health System. It begins with an examination of the foundations of justice models for service allocation and system history. It then explores the functional dimensions of the system including financing, inpatient care, outpatient care, and ancillary services. Students then examine the role of public health and health policy in affecting health outcomes and how US outcomes compare globally.

HDS 802 - Programming in Healthcare Environments

Credits: 3

This course covers using Python as a programming language to write, implement, and design programs that are relevant to various aspects of programming in a health setting. After completion of this course, students should be comfortable with the basic data structures in Python and R (including arrays, dictionaries, and dataframes), conditional logic and iterators, writing Python and R functions, and using Python libraries to read external data and perform data manipulations and data analysis.

HDS 803 - Translation of Health Data

Credits: 3

This course will give you the skills you need to leverage data to reveal valuable insights and advance your career. This course teaches you the visualization skills necessary to be effective Data Storytellers which helps engage your audience in a story about the data. This course focuses on concepts as well as hands-on experience of presenting data from initial concepts to final presentation by creating meaningful displays of quantitative and qualitative data to facilitate peer/managerial decision making. Prereq: HDS 801.

HDS 804 - Health Data Systems

Credits: 3

In this course, students will learn the landscape of data used in healthcare settings, engage in active case applications and case studies, and propose a decision support system improvement. It examines modern decision support systems, types of applications, both mobile and web based, enterprise versus cloud-based systems. Specifically examined will be the Electronic Health Record (EHR) and other clinical and administrative information systems. Also examined will be interoperability and regulatory requirements. Prereq: HDS 801.

HDS 805 - Applied Machine Learning in Healthcare

Credits: 3

This course covers the foundations of machine learning in healthcare systems including algorithms related to classification and regression prediction in supervised setting, clustering and dimension reduction in an unsupervised setting. Topics include data preprocessing and classification techniques such as logistic regression, support vector machines, KNN, Na'ive Bayes', ensemble methods such as random forests, boosted trees, XGBoost, dimension reduction techniques such as principal components analysis, t-distributed stochastic neighborhood embedding, ISOMAP, locally linear embedding, UMAP, multidimensional scaling. Prereq: HDS 801, HDS 800, HDS 802.

HDS 806 - Outcomes Research

Credits: 3

This course examines the evidence developed through the lens of outcomes research relative to clinical care and public/population health initiatives. It explores the development of study design, developing a workable research question and associated proposed study methods. The course explores frequently used study designs, techniques for evaluating/selecting health outcomes measures, and analytical approaches appropriate to conducting health outcomes research. Students will construct an independent research protocol, which will be developed in increments as course evolves. Prereq: HDS 804.

HDS 807 - Unstructured Health Data

Credits: 3

This course covers the essential unstructured data formats, storage platforms and methods of retrieving and analyzing such data in the healthcare system. Specifically, the course will cover electronics health records, patient health portals, telemedicine videos, ICU sensor data, genomic data, biomedical literature, social media data, biomedical image data and physician notes. Prereq: HDS 805.

HDS 808 - Current Topics in Health Systems

Credits: 3

This course examines current health issues facing our country and world through the lens of data science. It will focus on one or more major health issues currently in the public debate, examine the issue from the known body of evidence, and suggest novel methods for better understanding the current constructs of the issues, its history, or new ways and/or data to expand the current context. Prereq: HDS 801.

HDS 811 - Health Data Science Practice

Credits: 3

In this course, students will work to develop a data science thesis project with both an outside mentor and a faculty advisor. This course essentially bridges the entire curriculum, but builds over the coursework to the final presentation at the students' second residency prior to completing the program. Each student on a team will be required to justify the 500 hours of practicum work. Students will be enrolled in the practicum on line portal throughout their entire time in the program.

HDS 820 - Health Systems Informatics

Credits: 3

This course introduces students to data structures and data manipulation found in US Health Systems from the perspective of a data scientist in the role of health informaticist. Students will learn how to conceptualize the data ecosystem from input and data collection, secondary use, storage, retrieval and analysis. The course also promotes understanding of health data coding, applicability and validity. Students will explore health insurance claims data, public surveillance system data and administrative system data. Prereq: HDS 801.

HDS 821 - Big Data Algorithms in Biological Sciences

Credits: 3

This course covers several topics in computational biology with a focus on data science algorithms for processing massive sequencing data on the cloud, such as processing data on Amazon Web Services (AWS). Students will learn the prerequisites of data analysis on a cloud service including storage of virtual private clouds, file systems and security as well as the importance of maintaining a low-cost, high-efficiency work environment. Prereq: HDS 802, HDS 805.

HDS 822 - AI and Deep Learning in Healthcare

Credits: 3

This course covers the essentials of deep learning artificial neural network models. The course will cover topics like basic structure of ANN, gradient descent, various cost functions, role of activation functions in ANN, shallow vs deep learning, hyper parameter tuning, model optimization for speed, regularization methods, transfer learning and the newest of all generative adversarial networks (GAN). Prereq: HDS 807.

HDS 823 - Advanced Statistics in Healthcare

Credits: 3

This course covers the essential advanced statistical techniques employed by Biostatisticians in clinical trials and healthcare research. After completion of this course, students should be comfortable with various advanced multivariate statistical techniques such as multiple discriminant analysis (MDA), multiple analysis of variance (MANOVA), Conjoint analysis, Factor analysis, multiple correspondence analysis (MCA), and hierarchical linear modeling (HLM). Prereq: HDS 805.

HDS 890 - HDS Independent Study

Credits: 3-6

This course will be designed by the student and the instructor. Course topics and deliverables will be established together and approved by the supervising faculty. Credit hours (not to exceed 6-credit hours) will be determined by the supervising faculty based on the size and scope of the student's intended project.