

# MEDICAL INFORMATICS (BIG DATA IN HEALTHCARE APPLICATIONS)

## INSTRUCTOR

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## CLASS SCHEDULE

Fall 2018, as posted.

## COURSE OBJECTIVES

The course applies big data analytics tools to the datasets and processes found in modern hospitals. While healthcare has been digital for decades, hospitals are barely starting to mine their data for the information and logic it contains, and to discover the invaluable knowledge hidden in it. As a result, the ability to use hospital data productively becomes more and more imperative for operating and driving health care improvements. In this class, you will learn how to build models of complex healthcare practices, and how to apply big data techniques in clinical environments.

The course is designed for students in a wide range of backgrounds, but will require your time and attention.

## LEARNING OUTCOMES

Learning how to:

- Find and collect healthcare data needed for your projects
- Design, run and optimize complex healthcare processes
- Perform big-data research and modeling for healthcare projects
- Develop and implement data-driven healthcare solutions

## COURSE TOPICS

- Introduction: Data-driven healthcare

Data sources:

- Digital healthcare standards – how they work, and why they make sense
- HIS, RIS, PACS. IHE and workflow integration

#### Healthcare operations and management:

- Working with operational data: benefits and pitfalls
- Patient flow and scheduling optimization
- Converting big data patterns to rational management
- Clinical modeling and performance optimization.

#### Healthcare business intelligence:

- Big data platforms and tools
- Big data or big garbage?
- Healthcare analytics: why and how?

#### Clinical decision support:

- Clinical decision support
- Strategies and gaming in healthcare. Forcing healthcare improvements.

#### Medical imaging and data visualization:

- Working with digital imaging data: acquisition, diagnostic display, enhancement and analysis
- Imaging the invisible: Computed tomography
- From billions of pixels to a solid diagnosis: CAD and advanced diagnostic image processing
- Complex data visualization

#### Medical data exchange

- Networking and telemedicine
- Security and confidentiality in medicine

#### Clinical software development

- Clinical software development. Medical startups
- Bringing data applications to a hospital: disaster or success?
- Fault-tolerance, scalability, and robustness of data-driven apps
- Unusual problems: pharaohs, criminals, and pure art

### COURSE PREREQUISITES

- Basic programming skills
- We will be using Matlab for 70% of our homework – if you do not know Matlab yet, check online tutorials on [www.mathworks.com](http://www.mathworks.com) or YouTube.
- Good understanding of information technology (hardware, software, networking)

### GRADES, TESTS, HOMEWORK

- Course grade is based on homework (~80%) and final exam. There will be no midterms.
- All homework must be submitted on time (usually within a week after it was posted), late submissions won't be graded. It is your responsibility - please start early.
- Class attendance is your best strategy to have all your questions answered. Please ask questions during the class. Avoid emailing them, especially at the last minute – they may not be answered on time.
- Bonus problems will be provided as additional challenges for curious minds.
- The final exam will be given online during the final exam week (usually on the same day/time as we have for our classes)
- Individual work only, no team-projects.