

M | **BIOSTATISTICS**

**Master of Science Program in Health Data
Science (HDS)**

2022

Department at a Glance (2021 Data)

STUDENT 230

Masters 133

PhD 97

FACULTY 40

Research/
Clinical 9

Instructional
Track 31

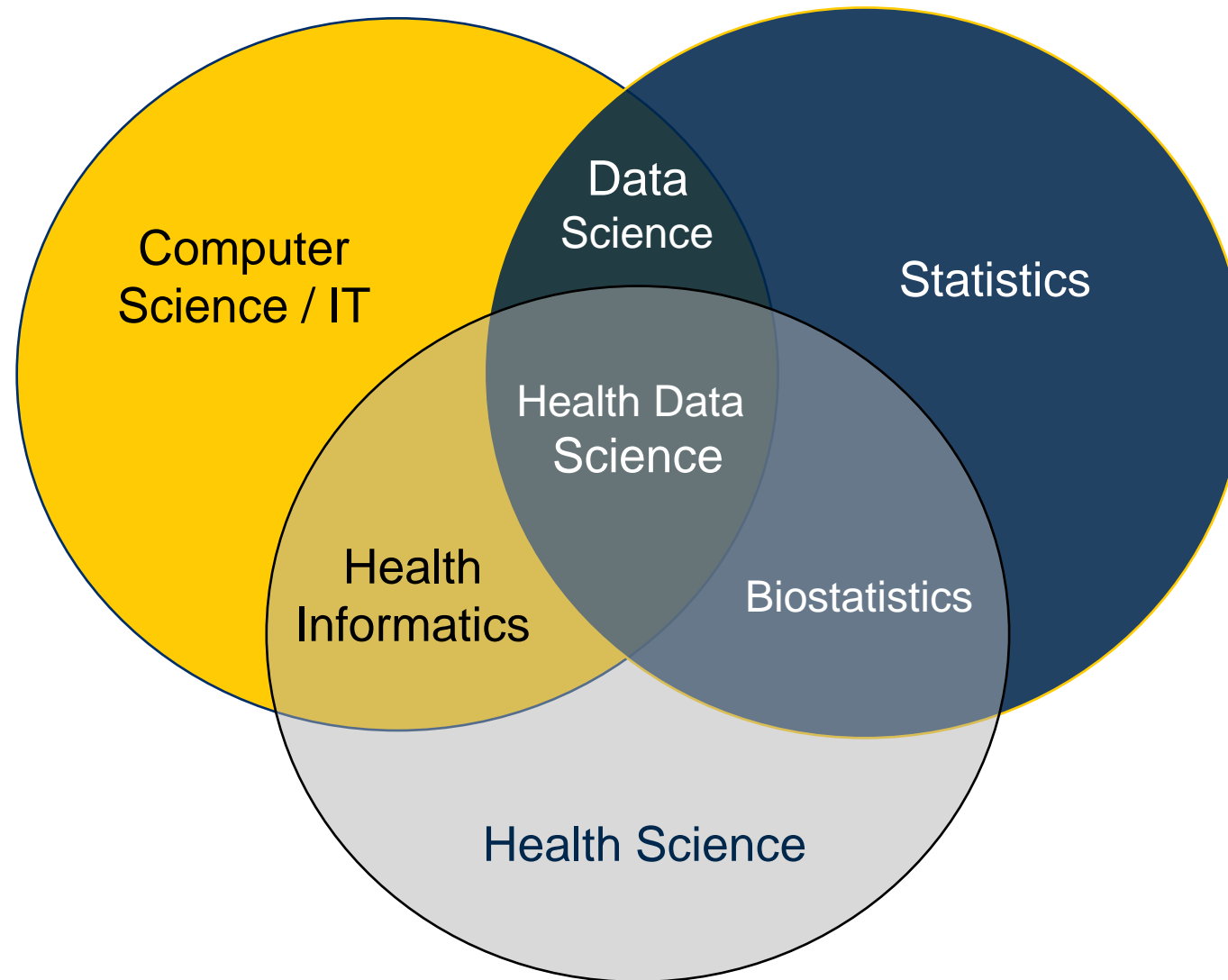
STAFF 123

Research 106

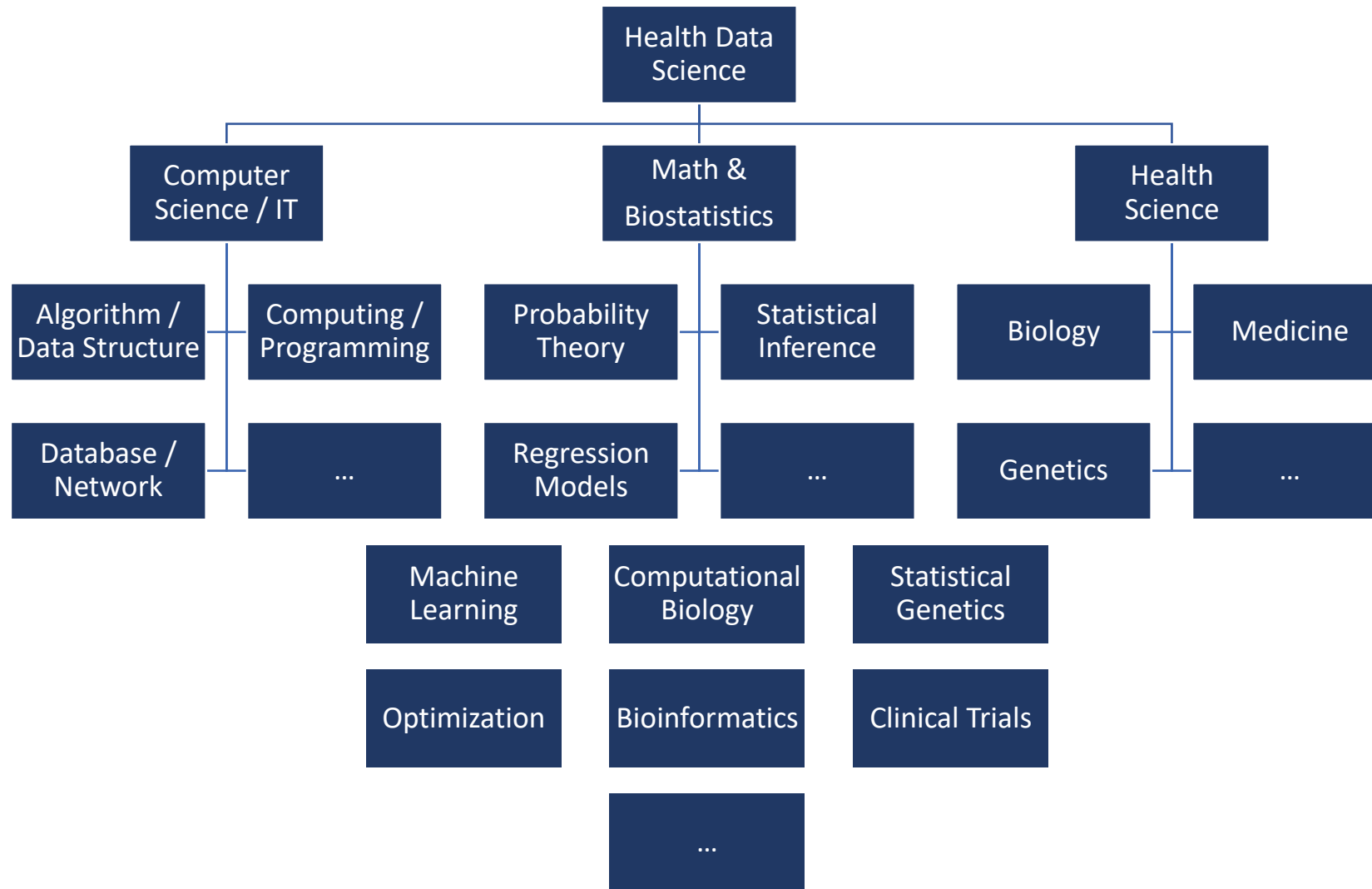
Administrative 17

393 individuals pursuing a world of good!

Health Data Science



Health Data Science – a closer look



Health Data Science in U-M Biostatistics

- A pilot HDS sub-plan in U-M Biostat MS was launched in Fall 2019.
- Focused on enhanced training of computational and data analytic skills for Biostatistics students.
- A new MS program in HDS will launch in Fall 2023, with applications begin in Fall 2022.
- Candidates should apply through the Rackham Graduate School, application link on the Biostatistics website.

MS Program in HDS in UM Biostatistics

- Two-year program (4 semesters or 20 months specifically).
- Total 48-credit hours.
- It is the first HDS MS program offered in the state of Michigan (similar programs exist in Harvard, WashU, Lancaster, etc).
- Targeting job opportunities in industry (e.g., Google Health, FlatIron, Kaiser Permanente, 23 and Me, BCBS, Genentech), government (e.g., FDA, CDC, NIH, VA), research institutes and hospitals.
- A small proportion of the students may choose to continue their pursuit of a PhD degree in health data science or biostatistics

Examples of Job Postings in HDS

SECTOR	EMPLOYER	JOB TITLE
Government Agencies	Food and Drug Administration (FDA)	<u>Data Scientist</u>
	Centers for Disease Control and Prevention (CDC)	<u>Health Scientist (Data Scientist)</u>
	Department of Veterans Affairs (VA)	<u>Data Analyst (Epidemiologist / Statistician / Health Science Specialist)</u>
Research Institutes and Hospitals	University of Maryland Medical System	<u>Healthcare Data Scientist</u>
	University of Michigan Medicine	<u>Lead Data Scientist</u>
	Mount Sinai Health System	<u>Data Analyst I - Population Health Science & Policy</u>
Medical, Healthcare or Pharmaceutical Companies	CVS Health	<u>Data Scientist (Healthcare)</u>
	Genentech	<u>Data Scientist, Imaging, Personalized Healthcare (PHC)</u>
	Blue Cross Blue Shield of Arizona	<u>Analyst - Analytics and Data Science (healthcare analytics, healthcare analyst)</u>

Curriculum

REQUIREMENT	#COURSES	CONTENTS	CREDITS
Core Courses	7	Biostatistics, Computing/Programming, Health Data Analytics	24
Elective Courses	7	Biostatistics, Computing/Programming, Epidemiology, Public Health, Open Electives	21
Capstone Course	1	Capstone projects in health big data analysis	3
TOTAL	15		48

Required Courses

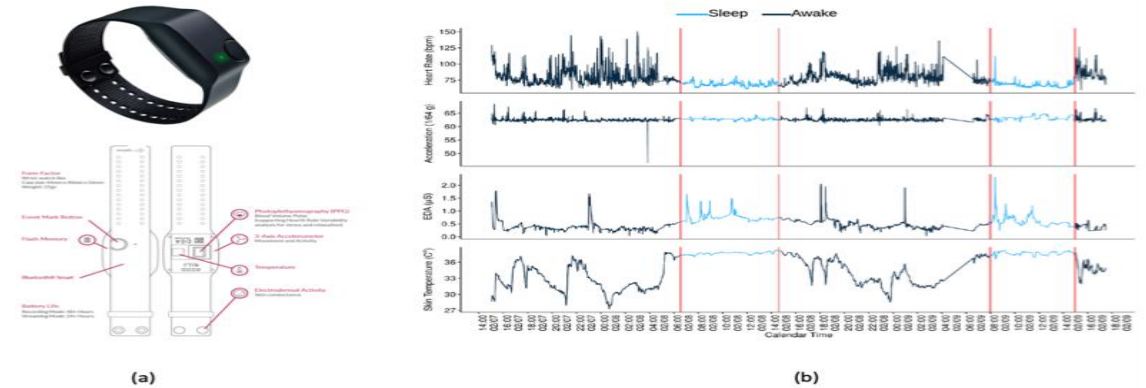
AREA	COURSE	CREDITS	TITLE	TERM
Biostatistics	BIOSTAT 601	4	Probability and Distribution Theory	Fall, Year 1
	BIOSTAT 650	4	Applied Statistics I: Linear Regression	Fall, Year 1
	BIOSTAT 602	4	Biostatistical Inference	Winter, Year 1
	BIOSTAT 651	3	Applied Statistics II: Generalized Linear Models	Winter, Year 1
Computing / Programming	BIOSTAT 625	3	Computing with Big Data	Fall, Year 1 or 2
	BIOSTAT 626	3	Machine Learning for Health Sciences	Winter, Year 2
Health Data Analytics	BIOSTAT 620	3	Introduction to Health Data Science	Winter, Year 1
Capstone	BIOSTAT 629	3	Case Studies in Health Big Data	Winter, Year 2

Sample HDS courses

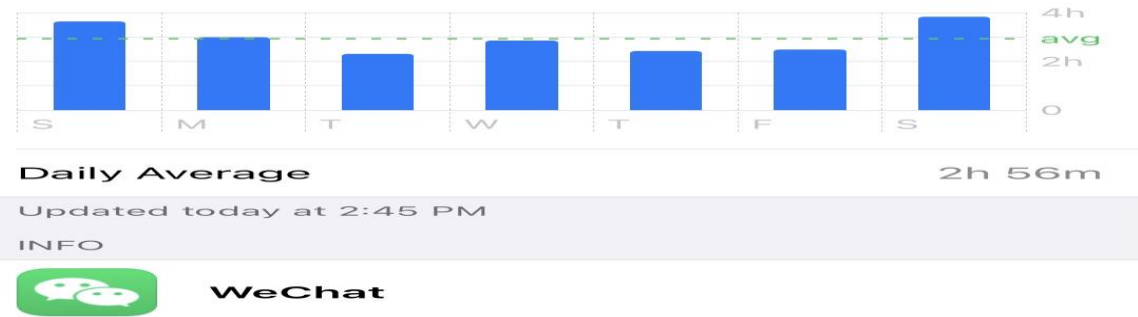
Biostat 620 – Introduction to Health Data Science

- Students are expected to learn a practical understanding of important statistical issues for health big data analysis in different areas, with extensive hands-on experiences
 - Data collection
 - Data cleaning
 - Data visualization
 - Exploratory data analysis
 - Observational data analysis
 - Reporting results
 - Team projects
 - Presentation/publication

W2020 Semester: Empatica E4 Wearable Device Data for Sleep Pattern Classification



W2021 Semester: Behavioral intervention on Mobile Social APP Use and Activity



Biostat 625 – Computing with Big Data

- Computer basics
- Unix/Linux, common line tools, scripting
- Introduction to programming, R, C++
- Data processing
- Debugging, unit testing
- Profiling, benchmarking, optimization
- Version control, Git, GitHub
- Software development, R package
- Interfacing with databases, SQL, noSQL, dplyr
- Interfacing between programming languages, Rcpp
- Data visualization, Shiny, R Markdown
- High performance and cloud computing, parallel computing, Hadoop, MapReduce, Spark

Elective Courses

REQUIREMENT	#COURSES	CONTENTS	CREDITS
Biostatistics Elective	1	Advanced biostatistics topics: sample design, clinical trials, longitudinal, survival and categorical data analysis	3
Computing/Programming Elective	1	R/Python/C++ programming, statistical computing	3
Epidemiology	0-2	Epidemiology exemption exam or course(s)	0-6
Public Health	0	Online course: foundations of Public Health	0
Open Elective	3-5	Courses in biostatistics, statistics, computing, public health or related topics	9-15

HDS Featured Elective Courses

COURSE	CREDITS	TITLE
BIOSTAT 607	3	Basic Computing for Data Analytics
BIOSTAT 615	3	Statistical Computing
BIOSTAT 617	3	Methods and Theory of Sample Design
BIOSTAT 619	3	Clinical Trials
BIOSTAT 653	3	Longitudinal Data Analysis
BIOSTAT 675	3	Survival Time Analysis
BIOSTAT 696	3	Analysis of Categorical Data

MS in Biostat vs MS in HDS

REQUIREMENT	MS IN BIOSTAT	MS IN HDS
Core courses	18 credits	24 credits
Capstone course	4 credits	3 credits
Epidemiology req.	0-6 credits	0-6 credits
BIOS elective	12 credits (any BIOS 600+ course)	6 credits (limited choices)
Open elective	8-14 credits	9-15 credits
Total credits	48	48

MS in Biostat vs MS in HDS

COURSE	CREDITS	TITLE	MS IN BIOSTAT	MS IN HDS
BIOSTAT 601	4	Probability and Distribution Theory	req	req
BIOSTAT 602	4	Biostatistical Inference	req	req
BIOSTAT 650	4	Applied Statistics I: Linear Regression	req	req
BIOSTAT 651	3	Applied Statistics II: Generalized Linear Models	req	req
BIOSTAT 653*	3	Longitudinal Data Analysis	req	elective
BIOSTAT 699	4	Analysis of Biostatistical Investigations	req	(open) elective
BIOSTAT 620	3	Introduction to Health Data Science	(open) elective	req
BIOSTAT 625	3	Computing with Big Data	(open) elective	req
BIOSTAT 626	3	Machine Learning for Health Sciences	(open) elective	req
BIOSTAT 629	3	Case Studies in Health Big Data	(open) elective	req

* Required for Biostatistics PhD admission

Applying to the MS program in HDS

- The new MS program in HDS will launch in Fall 2023, with applications begin in Fall 2022.
- Candidates should apply through the Rackham Graduate School, application link on the Biostatistics website.
- Prerequisites include 3 semesters of calculus, matrix or linear algebra, and introductory statistics or biostatistics. (Students may be conditionally admitted and required to complete prerequisite courses prior to arriving.)
- Other application materials include academic transcripts, statement of purpose, personal statement, resume, 3 letters of recommendation, and (if application) TOEFL scores.
- No GRE required.

- More information can be found at <https://sph.umich.edu/biostat/programs/>. (New webpage for the HDS MS program currently under construction and will be launched in Fall 2022).
- For further questions, contact one of our graduate program coordinators: Fatma Nedjari (fned@umich.edu) or Nicole Fenech (fenechn@umich.edu).