Data Science at U. of Michigan

Atul Prakash

Professor and Associate Chair, CSE Division

(Also led the design of the undergraduate data science programs at U. of Michigan)

Data Science Educational Activities at Michigan

- MIDAS: Michigan Institute for Data Science (since 2014 with 400+ affiliate faculty members)

- Undergraduate Programs in Data Science (since 2015)

- M.S. Program in Data Science (since ~2017)

- CS undergrad and grad programs – many CS majors take electives in AI, databases, ML, NLP, computer vision, etc.

MIDAS

- University-wide with 400+ faculty affiliates.
- **Mission:** Research-focused on transformative use of data science in a wide range of research disciplines to achieve lasting societal impact.
- **Education to support research:**
  - Organize seminars, workshops, and bootcamps
  - Pilot research funding and some postdoc support
  - Connect students with faculty
  - Manage a university-wide Graduate Data Science Certificate program of about 12 credits, including practical experience

Undergrad Data Science Programs

- **Two degrees:** DS-Eng and DS-LSA – largely identical
- **Managing Units:** CSE and Statistics. A small joint Program Committee (PC)
- **Got buy-in from college deans at design time:**
  - Treat students from both degrees the same
- **Advising:** Split between CSE/Stats by college
- **Management:** Program designed to keep management simple. E.g., Joint PC authorized to approve updates to elective courses – pointers help!
- **7-year experience:** The program has been running remarkably well for a joint undergraduate program

Comparison with the CS Major

- Shared core with CS, leading up to data structures.
- DS and CS have high overlap in that CS students can choose electives to be effectively data scientists
- All DS students do course work that a CS minor would do
- DS students do not take architecture and theoretical CS. Instead, they take more statistics and their electives are both broader (from other units) and narrower (within CS).
- In the end, the case for a separate DS major is similar to that of a CE major

DS-Eng Requirements

	Total
Subjects Required by all Programs (55 credits)	
Mathematics 115, 116, and (214 or 217)	12
Mathematics 215	4
Engineering 100, Introduction to Engineering	4
Engineering 101, Introduction to Computers	4
Chemistry 125/126 and 130, or Chemistry 210 and 211	5
Physics 140 and Lab 141	5
Physics 240 and Lab 241	5
Intellectual Breadth	16
Program Core (30 credits)	
Discrete Mathematics: EECS 203 or MATH 465	4
EECS 280, Programming and Elementary Data Structures	4
EECS 281, Data Structures and Algorithms	4
STATS 412, Introduction to Probability & Statistics	3
STATS 413, Applied Regression Analysis	4
Databases and Applications: EECS 484 or EECS 485	4
Machine Learning/Data Mining: EECS 445 or STATS 415	4
Data Science Applications elective (see online list)	3
Advanced Technical Electives and Capstone (12 credits)	
Advanced Technical Electives in Data Science. 300-level or higher from online list of approved courses, or with advisor approval prior to taking the course.	8
Capstone Experience Course	4
Other Requirements	
Flexible Technical Electives. 200-level or higher from a pre-approved list of courses, or with advisor approval prior to taking the courses.	11
TCHNCLCM 300	1
EECS 496 Major Design Experience Professionalism	2
TCHNCLCM 496, TCHNCLCM 497, TCHNCLCM 499, STATS 404, or STATS 485	2
General Electives (15 credits) – See note above	15
Total	128

Size of the Programs

- CS-Eng: 1602
- CS-LSA: 1051
- CE: 325
- DS-LSA: 285
- DS-Eng: 107
- CS Minor: 420

DS cohort is now larger than the undergraduate CE Program. CS remains the largest program by far.

Student-reported base salaries after graduation (2018-19)

SALARIES BY MAJOR[3]	Respondents[4]	Base Salary Information		
		Median	Average	Range
Aerospace Engineering	21	$74,500	$76,348	$62,000 - $112,000
Biomedical Engineering	5	$71,000	$80,300	$63,500 - $130,000
Chemical Engineering	33	$74,000	$73,664	$55,000 - $101,000
Civil Engineering	12	$62,500	$60,904	$48,850 - $70,000
Computer Engineering	24	$80,500	$88,396	$70,000 - $120,000
Computer Science	182	$101,000	$99,248	$52,000 - $170,000
Data Science	22	$96,000	$91,582	$65,000 - $110,000
Electrical Engineering	32	$75,500	$79,436	$57,000 - $120,000

Student-reported Internship Salaries (2018-19)

BACHELOR'S INTERNSHIP SALARIES REPORTED

Major[1]	Reported[2]	Median Monthly Salary	Average Monthly Salary	Range
Aerospace Engineering	42	$3,900	$3,739	$1,638 - $5,200
Biomedical Engineering	25	$3,293	$3,214	$1,387 - $5,547
Chemical Engineering	35	$3,640	$3,857	$2,167 - $6,933
Civil Engineering	26	$2,908	$3,074	$2,080 - $7,284
Computer Engineering	31	$4,160	$4,864	$2,253 - $8,667
Computer Science	316	$4,853	$5,275	$1,647 - $10,123
Data Science	24	$5,633	$5,753	$2,080 - $9,533
Electrical Engineering	43	$3,640	$3,653	$1,733 - $9,187

Summary

- If students coming in from multiple colleges, it is important to treat them the same. We got college buy-in when planning the joint program
- We went with common core with CS.
- We paid attention to management challenges