Graduate Council Four-Year Review of the
Master of Information and Data Science (MIDS) 2018[1]
UC Berkeley School of Information

CORE QUESTIONS

1. Has the degree met its academic objectives as laid out in the initial proposal?

We designed the Master of Information and Data Science (MIDS) from the ground up in 2014 as a multidisciplinary and holistic data science degree for professionals. At the time, most data science programs offered a menu of existing statistics and computer science courses; we sought to expose students to the entire life cycle of data (from collection and organizing through analysis and communication of results) and to integrate relevant insights from the social sciences, law, policy, and management into the curriculum. In the degree proposal we described our objectives as:

> to address the practical challenges facing managers and other professionals working with large, messy, often incomplete datasets; to prepare working professionals to analyze the floods of new data to solve problems and to achieve organizational and societal goals; to provide hands-on practice working with complex, unstructured and user-generated data to identify new ways to inform decision-making; to integrate insights from social science and policy research, as well as statistics, computer science, and engineering, in an authentically multidisciplinary program; and to set the benchmark for high quality, online professional education of data scientists.

We believe that we have succeeded in achieving these objectives. In our high-touch delivery model, students are required to attend weekly live (synchronous) 15-person sections of their classes with an instructor, as well as viewing asynchronous videos, and doing reading and exercises. The courses are designed to integrate conceptual and theoretical knowledge with practical, hands-on examples, and a majority of the courses in the degree are project-based. Students gain hands on experience with the basic and advanced statistical and computational tools of data science along with basics of research design, the ethical and legal aspects of data analytics, and the professional skills associated with communicating the findings from complex data analysis in an organizational context.[2] The program targets working professionals who want to advance within their organization or to make a career switch.

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[1] We have not repeated all of the data provided in the 3 prior Graduate Council Annual Reviews of MIDS. Please refer to those documents for details on the evolution of the program from 2014-2017.

[2] The program includes 5 core courses, 7 advanced courses, and the required synthetic capstone. Students are required to take (or place out of) Python for Data Science; Research Design and Applications for Data Analysis; Statistics for Data Science; Fundamentals of Data Engineering; and Applied Machine Learning. Students also take 2 or 3 advanced courses from the following list: Experiments and Causality; Behind the Data: Humans and Values; Scaling Up: Really Big Data; Statistical Methods for Discrete Response, Time Series, and Panel Data; Machine Learning at Scale; Natural Language Processing with Deep Learning; and Data Visualization.

We have met our goal of increasing access to data science education for working professionals in California and beyond. To date 400 students have earned a MIDS degree; and there are now well over 500 students registered in the program. A majority of the students in the program are working part or full time. MIDS students come overwhelmingly from the US, with about 30 percent of the total from California. We also enrolled students from 14 other countries around the world, including India, China, Australia, Korea, Taiwan, Spain, Germany, New Zealand, Hong Kong, and Brazil. Our students and alumni are excited to be part of a growing network of data science professionals around the world.

The following quotes suggest that graduates value the MIDS academic program. Ehrin Boehner, who relocated to Africa after graduation to work for Fenix International, where she uses data to inform strategies to bring solar power to rural Uganda says:

> I rely heavily on the knowledge and confidence that I gained from the MIDS curriculum as I approach open-ended data science problems to inform company strategy at Fenix. As the sole data scientist in the company, I am often approached with questions that have no clear answer; my professors at UC Berkeley, however, have provided me with a strong basis in structured problem solving and critical thinking as a data scientist.

Milad Davaloo, who formerly worked at Adobe and is now a Senior Data Science and Business Analytics Associate at LinkedIn has shared that:

> Data science problems are often viewed as purely technical challenges that can be solved with applying some fancy algorithms and the latest technology available. But I learned [in MIDS] that it is important to pause and really consider the problem, the approach, the legal and ethical considerations, the organizational impact, and communication during the various stages of a project.

Davaloo goes on to say that “I should also mention that although the MIDS program is a relatively young program, it has already provided me with a lot of exposure, as several top companies I have interacted with over the past year are aware of and think very highly of the program and its graduates.”

Kelsey Clubb, who worked as an astronomy research associate at Berkeley throughout the program, got a job following graduation as a Data Scientist at Fitbit says:

> Before enrolling, I had no industry experience and I was concerned that I would have a hard time getting a job as a data scientist, let alone at my dream company. The courses provided me with a solid foundation of a broad set of both technical and less technical skills, as well as final projects to showcase and discuss in interviews. Enrolling in the MIDS program was certainly one of the best decisions I've made in my life!

The diversity of professional and educational backgrounds among the MIDS student body has been an unanticipated asset. The students are, on average, five years older than our residential master's students, and they have substantially more diverse work experience. They come from a wide range of industries (cosmetics, media, finance, engineering, energy, education, health care, urban planning, athletics, publishing, etc.) and different types of organization (established corps, tech companies, startups, non-profits, public sector, etc.) We have enrolled several students who already have PhD or MD degrees. One student remarked:

> I was surprised with how other students' attitudes and approach to data problems are different from my own. The diversity of professional and academic backgrounds inspires fresh thinking about your own challenges.

Another said, in a similar vein:

> I've seen people utilizing data in very creative ways, in fields that one doesn't always see a lot of data applications. People in the program come from very diverse fields, and they bring a lot of knowledge and experience that are just as valuable as the program curriculum itself.

Career placement results confirm that we have achieved our goals. Data from our career outcome surveys, which we conduct three times/year, show the median salary for all MIDS graduates at $120,000 and the median annual bonus as $15,000. This includes international graduates in countries like India where median salaries are lower ($91,000) as well as those in the Bay Area with higher medians ($130,000).

Sixty-eight percent of the MIDS graduates surveyed report a salary increase following graduation, fifty-five percent report taking a new job, and twenty-nine percent report receiving a promotion.

The top employers of MIDS graduates to date are: Google, Facebook, Amazon, Apple, Capital One, and Microsoft.

Their job titles include Data Scientist (Principal, Senior, Lead, Associate) 29 percent; Engineer/Architect/Developer (Data, Machine Learning, Business Intelligence, Software) 20 percent; Analyst (Data, Product, Business)- 8 percent; Director (Data Science, Analytics) - 8 percent. The remaining job titles (with 5 percent or less) include C-Level and VP-Level, Manager (Senior, Data, Analytics, Engineering), Consultant, Product/Program/Project Manager, Scientist/Researcher, Quant/Trader/Investment Management, Other Data/Analytics Related, Other Non-Data Related, and Unknown.

2. What is the quality of the admitted students (e.g., test scores, GPA) compared to on campus degrees offered by your unit, or peer programs at other institutions (if known). How does the diversity of your admitted students compare to similar on-campus and peer institution programs? What percentage of students are expected to graduate on time? What is the attrition rate?

The quality of students admitted to the MIDS program remained high in 2017. Admitted students had an average GPA of 3.49 and strong standardized test scores. The average admitted student test scores were the following: GRE Quant - 83rd percentile, GRE Verbal - 83 percentile.

We continue to focus on increasing the number of women in the field of data science. We are pleased to report our progress on this front. In 2017, 27% of admitted students were female, which represents a significant increase from the 2015 rate of 21%. We believe that this growth is largely due to our introduction of a one-semester Python for Data Science class, which especially serves women with limited programming experience but strong quantitative skills.

The program attracts students of all ages; in 2017 the average admitted student age was 33, while the youngest admitted student was 22 and the oldest was 64.

The quality of students admitted to MIDS compares favorably to those admitted to our on-campus Master of Information Management and Systems (MIMS) program. Average undergraduate CGPAs are similar: 3.49 MIDS v. 3.53 MIMS, as are GRE quant scores: 83% MIDS v. 81% MIMS and GRE verbal scores: 83% MIDS v. 85% MIMS.

It is worth noting that 11% (35) of admitted MIDS students were underrepresented minorities. This was substantially above the 5.6% (4) in the MIMS admitted student pool.

A full 90% of students graduated as expected in 2017. From inception to date, the program has had a 4.7% attrition rate.

MIDS 2017 admitted students (n=280)
Avg GRE verbal percentage: 83
Avg GRE quant percentage: 83
Avg domestic UG CGPA: 3.49
% women: 27
Countries represented: 15

MIMS 2018 admitted students to date (n=71)
Avg GRE verbal percentage: 85
Avg GRE quant percentage: 81
Avg domestic UG CGPA: 3.53
% women: 59
Countries represented: 11

Self-reported ethnicity for 2017 MIDS admits

Ethnicity	#	%
2 or more	23	6.34
Asian or Asian American	46	13.9
Black or African American	7	2.11
Chinese/Chinese-American	48	14.5
Hispanic or Latino	27	8.16
Other	7	2.12
Other Asian/Asian American	22	6.65
Unknown	34	10.27
White or Caucasian	119	35.95

3. What is the degree of student satisfaction in the advising and community-building aspects of the degree program? How do you assess and measure student satisfaction?
Our partner, 2U, evaluates student satisfaction using Net Promoter scores (NPS), an index that measures the willingness of students to recommend the program or specific aspects of the program to their peers. NPS is a very steep bar for measuring satisfaction. Scores range from -100 to +100. Anything above 0 is good and above 50 is world class.[3] In Sept 2017 the MIDS Academic Advising Team received an NPS of 53 and the MIDS Program received an NPS of 42.

There is ample evidence of students developing a community in the MIDS program. The online platform allows for students to form virtual groups. Students use this feature to launch groups related to both their academic/professional endeavors and social interests. The I School also provides all enrolled students with Slack accounts. The MIDS students, in particular, report that this real-time communication and collaboration tool has helped them build and maintain strong social connections across geographic distances. A 2017 program survey indicated that 53% of students agreed with the statement, “I feel like a member of my university community” and 69% of students agreed with the statement, “This program has helped me develop a network with fellow students.”

[3] The scores come from surveys that ask students whether they would recommend a program (or aspect of the program) to their colleagues on a scale of 1 to 10, with 10 being high. The NPS is calculated by taking the percent of Promoters (scores of 9 or 10) minus the percent of detractors (scores of 0-6). Scores of 7 and 8 are considered neutral and are only included in the denominator for the total response population. Leading global brands have NPS above 45, e.g. Apple (47) Microsoft (45)

The required immersion is an important element of community building in MIDS. It provides an opportunity for students to meet faculty and peers in person, as well as to spend time on the Berkeley campus. Offered three times a year, each four-day immersion is organized to provide additional learning from faculty and industry leaders, networking with industry professionals, and community building opportunities for students. Students are required to attend only once during the program, but many have elected to attend multiple times at their own expense.

We have also introduced MIDS meetups for prospective and current students, along with alumni, in areas where there is a strong geographic concentration of students. We have hosted events in New York, Boston, San Francisco, Washington D.C., and Seattle. These have been quite successful, so we plan to continue and expand this initiative. Students also report on self-organized meetups in their own locations.

4. What is the educational benefit of the capstone project or comprehensive exam?
The capstone project provides an opportunity for students to integrate and apply the skills and knowledge they have developed throughout the program. In small teams, students conceptualize, develop, and produce a full data science project using open source datasets. They gain the experience of running a project from start to finish, including defining a research question, finding relevant data, exploring the data, identifying the appropriate method and doing analysis, and producing a web-delivered demonstration of their work.

We assign two instructors to each 15-person section of the capstone course--one with technical expertise, and the other with business experience--in order to provide students with an authentic experience that parallels a real-world context, and to prepare them for professional success. The course is structured with sequenced milestones and deliverables where students both present their work and provide or receive feedback from their peers and from faculty. It requires students to collaborate and effectively navigate the dynamics of team-based project work. Students are also required to communicate their work in both written and oral form.

At least as important, the capstone project provides students with a high quality demonstration of their skills and capabilities that can serve as a portfolio. This is valuable in the job search and interview processes. One graduate, writing with advice to MIDS colleagues about the job search process, underscored the value of the capstone project in job interviews. He advised them to make a personal website and highlight their capstone project:

> I linked to Github and my project websites whenever possible. I made the first project on the page my capstone project. People responded well to my capstone, about machine learning in baseball. What I didn't realize is that people almost always only read the first project. So do your best to have one great project, put it first, expect people to read about it . . .this makes the capstone project even more important, since it's a natural choice for that first project.

Students present their completed projects in an online Capstone Project Showcase for the entire MIDS community held at the end of each of the three semesters. The Showcase has

become a regular and well attended I School community event (150+ attendees). The project presentations elicit outstanding questions and answers from the audience via chat. At that time we also select a winner of the Hal R. Varian Capstone Award for the best capstone project. The quality of these projects has been consistently high.

Students rankings for the Synthetic Capstone course in fall 2017 were 6.0 for instructor effectiveness and 5.6 for course effectiveness (on a 7-point scale with 1 as low.) This compares with program averages of 5.8 and 5.5 respectively. We believe that the course effectiveness will improve following current revisions of the asynchronous content. Student comments include:

> This was a great way to end an amazing MIDS program!
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> First and foremost, the course is designed (as it should be) to encompass all aspects of the MIDS program. It builds on all material and offers a major contribution to any graduate's work portfolio. Students have leeway and flexibility to work on projects that they find to be intellectually stimulating, which is usually half the battle in projects of this magnitude. Also, the course is designed around the major project, which helps students move in the right direction throughout the term.
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> Personally, I cannot thank both [of the Capstone instructors] enough for guiding us through a wonderful semester of learning. Thanks to the way you present the course, your constant encouragement and guidance and my two wonderful teammates, I truly enjoyed the course in the end. It may have concluded my formal education in MIDS, I believe I will benefit from this experience for years to come.

5. What is the workload for faculty teaching in the program? Has remuneration been evaluated and adjusted? Please document the lecturers, adjunct faculty, and ladder rank faculty participating in the online program and compare their contribution in the online program to comparable state-assisted graduate programs in the unit.
Each class in our MIDS program consists of an “asynchronous” portion, which is pre-recorded, and the required “synchronous” sections of 15 students that are taught by lecturers and other instructional faculty. The asynchronous content for each course, in the form of pre-recorded, customized, and professionally-produced videos, is developed by our ladder faculty and, in some cases, by industry professionals. These course leads are paid $50K to develop the asynchronous content, along with the assignments, exercises, and exams, for a new course and to teach at least two initial synchronous sections of the course to identify and address any bugs. The ladder faculty are compensated with summer salary or overload payments, while outside professionals are hired as contractors.

We believe that the participation of industry professionals in developing content for MIDS has been a valuable differentiator. For example, our Applied Machine Learning class was developed by a recent Berkeley PhD who works on the research team at Google. Students regularly comment on the value of his up-to-date knowledge of the technical developments in machine learning, and its applications in industry.

The synchronous sections of MIDS classes are taught by our lecturers (some of whom are postdocs with lecturer appointments) and adjunct/visiting faculty. The desirability of a postdoc position at Berkeley allows us to recruit top young scholars to teach in MIDS. The primary responsibilities for instructors teaching the synchronous sections include leading online classes that focus on active learning experiences such as discussion or collaborative coding exercises; evaluating and providing feedback on student work; offering online office hours for interactions with students outside of class time; participating in course-focused discussions on Slack; contributing to the ongoing improvement of course materials, labs and homework; and attending bi-weekly faculty meetings that focus on development of online instructional skills and strategies, and sharing knowledge about the program and data science education.

The workload for teaching a MIDS section is 17%. This is comparable to the workload for lecturers in our state-assisted programs, who receive 17% for one a unit class, 25% for two units, and 33% for three units. Adjunct faculty typically teach one or two sections per semester (three semesters per year), and lecturers teach up to three sections apiece per semester, although the average is two. Our lecturers start at Step 26, and they receive step adjustments according to regulations outlined in the Unit 18 agreement and the APM. Our ladder and adjunct faculty receive the normal merit increases as dictated by campus. We have recently reduced the workload for our section instructors by increasing our teaching assistant (TA) assignments. The ASEs assist with grading, feedback, and office hours.

The course leads (the ladder-rank faculty and professionals who develop the classes) are responsible for quality control in the synchronous sections of their courses. This includes regular meetings with the instructors to ensure consistency in content and delivery, as well as to flag common issues. They are compensated with overload payments that scale with the number of synchronous sections. We currently have 13 lead instructors, as well as 4 adjuncts/visiting professors and 51 lecturers teaching sections in MIDS. By comparison, our state-assisted programs have 13 ladder-rank FTE, 4 adjunct professors, and averages 7 lecturers teaching classes per semester. The state-assisted programs have 120 students enrolled, compared to over 500 in MIDS.

6. What is the impact of the online program on graduate student education (state-assisted and SSGPDP) in your unit? What is the impact on GSI opportunities? What specific training is provided to GSIs to meet the demands of online education?
As an online self-supporting graduate professional degree program (SSGPDP), MIDS has increased the opportunities for students all over the world to participate in a high-quality professional master's program without having to move to Berkeley for two years. The success of the MIDS program has raised the profile of the School of Information overall, and potential applicants who first learn about the MIDS program often also become aware of our state-assisted graduate degree programs, the Master of Information Management and Systems (MIMS) and our Ph.D. in Information Management and Systems. The MIDS program has therefore widened the pipeline for our state-assisted programs.

The most significant impact of MIDS has been to provide much needed revenue to subsidize our state-assisted programs (MIMS and Phd). We have used these revenues to invest in additional student services (including career services and advising), lecturers, and upgrades of the facilities in South Hall. In the 2018-19 academic year we are offering several of our most popular MIDS classes in a flipped classroom model for our residential students.

For the most part, the MIDS program does not hire GSIs. We hire one 50% GSI each semester to grade assignments and hold office hours for our self-paced "bridge courses" in Linear Algebra and Data Structures and Algorithms, which are offered free to all enrolled MIDS students. The MIDS program has therefore created one additional GSI opportunity, which has to date been filled by students from the state-assisted MIMS and PhD programs. The students hired as GSIs meet all the requirements for first-time GSIs: they take an on-campus pedagogy course in a relevant discipline, attend the one-day Teaching Conference held by the GSI Teaching & Resource Center, and complete the Online Professional Standards and Ethics Training.

In addition to this one GSI position, the MIDS program employs several Readers, and a few Tutors, each semester. In Summer 2018, for example, we hired 12 Readers and 2 Tutors to help support instructors. All academic student employees for the MIDS program, including GSIs, Readers, and Tutors, receive support and mentoring on workload and online pedagogy from MIDS faculty and from the MIDS program's Academic Director, Drew Paulin; supervision and training from the lead instructor for the course; and technical training and support from 2U's Faculty Support team.

7. What changes, if any, have been made in the delivery of the degree, either for individual courses or for integrating components of the degree (e.g., developing a community, the capstone project, advising)? What changes are anticipated in the next four years?

The program has seen numerous changes in its 4-year history that have focused on maintaining educational and programmatic excellence, keeping curriculum and academic technology up to date with the pace of evolution in both Data Science and online education, building community and improving communication.

Educational and programmatic excellence

In 2015 we created a new staff position, the MIDS Academic Director, and recruited a specialist in online learning, learning design, and learning analytics from the University of British Columbia. His responsibility is to oversee the curriculum (ensuring each course has learning objectives and goals, measuring relevant learning outcomes, strengthening connections between courses, eliminating overlap, etc.), to recruit and hire teaching faculty for MIDS, and to work with the adjuncts and lecturers who are responsible for teaching the 15-person synchronous sessions of the courses. The Academic Director holds bi-weekly meetings with the instructional faculty to discuss online pedagogy, running live sessions, developments in the field, and so forth. He also works instructors who are having difficulties with teaching, and with faculty who are refreshing a course or building a new one.

We have expanded support staff in several areas in response to the rapid growth of the MIDS program. This includes increasing the size of our Academic Advising and Student Support staff from 2 to 5, adding a full-time member to the Career Services team who works exclusively with MIDS students, and adding members to the team responsible for planning and delivering MIDS events such as Immersion. We expect that we will continue to add to the staff required to support a growing MIDS program and community.

Early on, we introduced 3 bridge courses that are available to students without cost: Python for Data Science; Linear Algebra; and Data Structures and Algorithms. The goal of our bridge courses is to make the program more accessible to students without advanced technical backgrounds—particularly to women who lack confidence or exposure to the skills. After seeing evidence that students who completed the Python bridge course fared much better in several of our technical courses than those who did not take it, we made Python for Data Science a required first-term course for incoming students who needed additional programming training.

We've added many co-curricular learning opportunities for students in the form of webinars. This includes, for example, a 2017 series on Deep Learning that featured experts in the field. We've also offered webinars with outside professionals whose work focuses on data science in specific domains or fields (ex: Healthcare, Education, Marketing, etc.). We also launched a "Women in Data Science" initiative that includes regular monthly discussion meetings for women in MIDS, webinars and presentations with prominent women working in data science industry and research, and as a basis for peer and alumni mentoring of MIDS students. The initiative has been led by postdocs and lecturers teaching in MIDS, and has been highly successful.

Our partner 2U has also added two programmatic elements that the MIDS students find valuable. A recent 2U partnership with WeWork allows our students to enroll for no cost in a program that provides 24/7 access to WeWork offices and coworking spaces around the world. The program was announced this summer and already more than two-thirds of MIDS students have enrolled.

Updates to curriculum and technology

Every course in the MIDS program has been refreshed or completed redeveloped since the program launch in 2014. The process for review and iteration of the asynchronous content involves the course lead who initially developed the courses, instructors who lead the weekly sessions, the academic director, and course development staff at our program partner, 2U. Most courses are updated at least once per year with minor changes to keep up both with the fast pace of the field and the wishes of our faculty to keep improving their courses. Ladder rank faculty are paid overload salary for the time they devote to updating or redeveloping courses.

We've completely rebuilt two courses, including the Storage and Retrieval course (and renamed it Fundamentals of Data Engineering), and the Data Visualization course. In these courses, the focus of redevelopment was to update the technologies used in the course to represent state of the art developments in their respective domains, to align and clarify the connection between

theory and practice, and to provide more opportunities to develop competencies and apply skills and knowledge in a hands-on manner in the course activities and assignments.

We have introduced three new advanced electives in recent years: Statistical Methods for Discrete Response, Time Series, and Panel Data; Machine Learning at Scale; and Natural Language Processing with Deep Learning. These additions represent new developments in data science, and our desire to provide more options for our students to study and develop highly marketable skills in a number of areas within the field. We plan to continue introducing new courses into the program. We are currently developing a course titled "End-to-End Deep Learning Applications" that will focus on developing applications relying on high-throughput data streaming prevalent in Internet of Things (IoT) devices and frameworks. This course will be introduced in 2019.

With the leadership of our program partner, 2U, we have upgraded the MIDS teaching technology in two important ways:

- We recently switched from Adobe Connect to Zoom as our online classroom platform. This has resulted in a reduction of technical issues and interruptions during class, and has been well-received by both students and faculty in the program.

- We are currently working with 2U to develop an updated LMS to replace the current ISVC (I School Virtual Campus). This new LMS focuses on improved tools for STEM education, including: a built-in Integrated Development Environment (IDE); support for integration of tools for coding and data infrastructure such as Jupyter notebooks, Docker, and Codepen; social components that will enable discussion around learning objects within course content; and access to git repositories and course authoring tools. We expect this will have a great benefit to the experiences of our students as course content will rely more heavily on hands-on, interactive components. Faculty will also benefit, as the process to update or include new material 'on-the-fly' will become much easier. We plan to roll out a pilot of the new LMS in January 2019 to 3 MIDS courses, with full implementation planned for Summer 2019.

In addition, the School now provides institutional subscriptions to *Slack* (a tool for real-time messaging, archiving, and search for teams) for all students, staff and faculty. This is used in almost all of our MIDS classes, with faculty communicating with students, as well as among subgroups of students, (e.g. those living in the same area, or interested in specific topics), as well as between the I School and the entire community. It has made a huge improvement in the sense of community among MIDS students, and between MIDS and MIMS students, as it has offered an informal space for conversation that is vital for an online program like MIDS. It has also become the primary discussion environment for MIDS courses, allowing for engagement and interaction between instructors and students outside of class-time, and a collaboration space for students working together in team-based projects.

Improving communication and building community

We established a MIDS Student Representative program to help us stay connected with the growing student body. The students select 1-2 representatives for each of the entering cohorts. These MIDS student reps meet regularly with our Student Affairs staff to provide student input and perspectives on issues related to the curriculum, the program, and community building. The students have, in turn, initiated a parallel program of MIDS Social Good Representatives from each cohort to build community around the commitment to using data for social good.

As our alumni pool grew, and they sought ways to stay connected with the, we launched the *MIDS for Life Program* which offers alumni lifelong access to the I School LMS, where they can retrieve all of their previously completed MIDS coursework, including the asynchronous content and the recorded synchronous sessions. Alumni can also view the most up-to-date asynchronous course content, including content for newly released courses, at no cost. Students say this is a major advantage of MIDS over face-to-face programs they considered.

We recently introduced a MIDS Curriculum Newsletter. The bi-annual newsletter provides updates and plans around curriculum development, and opens a dialogue between students and the academic director. It also provides visibility for students into how the feedback they've provided in the form of course evaluations, comments to staff, MIDS Student Representatives, and discussion with 2U Student Success staff translate into curriculum changes.

8. Have there been changes in the competitive environment (e.g., new programs at peer institutions) that have changed the landscape for this degree?
Masters programs focused on data science/analytics have continued to grow, both online and on campus, with several new programs launching in 2018 and 2019. (Please see earlier versions of this report for new program launches in 2014-2017.) Some notable new programs are listed below. In addition, we have seen new concentrations offered to data science students including Machine Learning, Business Analytics, and Cybersecurity. Industry thought leaders continue to further define data science and related fields away from broad "Big Data" terms and more specifically as a suite of skills and tools such as "Predictive Analytics", "Deep Learning" "Machine Learning" and "Natural Language Processing" or "R" and "Python."

We are delighted that in spite of the growing competition, a 2017 ranking placed Berkeley's MIDS among the top 6 data science Master's degrees in the US, along with Columbia, Carnegie Mellon, MIT-Sloan, Stanford, Northwestern, and New York University.

Notable new data science programs in 2018/19:

- The Master of Science in Data Science will launch in September 2018 at Harvard University. Developed by the Harvard computer science and statistics faculty with input from industry experts, the program offers preparation in statistical modeling, machine learning, optimization, management and analysis of massive data sets, and data acquisition. Program requirements include a technical core of four courses in data science, computer science, and statistics, as well as a capstone research project.

- The University of Michigan's School of Information will launch an online Master of Applied Data Science in partnership with Coursera in the Fall of 2019. The program will be designed to provide a project-based education for learners from a broad range of backgrounds including the sciences, social sciences, or professional schools.

Despite competitive programs entering the market, we continue to see record demand for MIDS. We have built competitive advantage in the landscape by designing a professional program with a focus on educating data science leaders via a multi-disciplinary curriculum that draws insights from the social sciences, computer science, statistics, management, and law.

9. Have any financial concerns emerged related to the development or delivery of the degree? Please provide financial statements as described on the attached page.
The financial situation for MIDS has been positive, as reflected in the attached financial statements. MIDS is by no means a gold mine, but it provides a steady flow of much-needed revenues to support the School of Information.

10. What are the plans for the future of MIDS?
Our goal has always been to scale MIDS only as long as we can maintain the high quality of the program. 2U continues to bring us large numbers of qualified applicants so we have maintained high admission standards. The constraint may be the supply of qualified instructors. We just admitted our largest cohort so far, and will enroll approximately 150 new students in fall 2018. Since class sections are 15 students we will need to staff 10 sections of our core courses. It is a challenge to find qualified instructors to teach the live sections of these classes, especially since there is competition for data science skills and our pay is not as high as the private sector. We have been able to recruit some instructors from outside of the Bay Area and will continue to expand our outreach for potential postdoctoral scholars/lecturers. Our short term goal is to enroll 150 students every semester (our spring and summer cohorts have historically been smaller than the fall cohort, and we would like to grow them to the same size) for a more stable intake of 450 students per year. We will then assess whether it makes sense to continue to grow the program. As always, maintaining the program's quality is our top priority.

ADDITIONAL QUESTIONS

1. The new campus policy on SSGPDPs is attached. Please speak to any changes you have made or anticipate making that pertain to the new policy. We recognize that the MIDS program was developed under a different set of guidelines, but it would be helpful to identify any significant deviations from the current policy.
We have not made, and do not intend to make, any changes in MIDS that pertain directly to the new SSGPDP policy. We are pleased that the new policy recognizes the important role of industry professionals in providing master's education, particularly in fast-moving domains such as data science. We believe that the participation of industry professionals in MIDS, alongside our ladder rank faculty, is a significant asset for the program.

2. Please elaborate on how the contract with 2U has impacted the program, especially regarding the I-School's autonomy in admissions and hiring, and 2U's willingness to innovate and improve its delivery platform.
Our contract with 2U states clearly that I School controls all admissions and instructional hiring in the MIDS program. We have complete autonomy in these decisions. 2U hires Admissions Counselors who work with prospective students, providing information and assistance with their applications, but admissions is a separate process controlled by Berkeley staff. 2U also helps to advertise our lecturer and postdoc positions, but the I School controls all instructional hiring.

As we detailed in Question 7, 2U has responded to our concerns about the inadequacies of their online technology, especially for a highly technical program like MIDS. They recently replaced Adobe Connect platform with Zoom for the live sessions of classes. We have seen a marked reduction of technical issues and interruptions during class, and it has been well-received by both students and faculty in the program.

Similarly, 2U acquired the LMS used by the Flatiron School, an online coding boot camp, that is far more appropriate for a program like MIDS. We are working closely with them to adapt the platform for use in the MIDS program. We will be pilot testing it in three classes in January 2019 and plan a program-wide rollout in May 2019.

3. Please comment on whether you were able to set aside funds for return-to-aid as expected.
Many MIDS students receive partial or full tuition support from their employers. Most also earn enough after graduation to be cover their investments in the degree, and all US citizens have access to the federally subsidized loans offered to Berkeley students. But there are other MIDS students who do not have access to employer funding, or who work, or intend to work, in jobs (e.g. non-profits) that don't pay as well as private sector data science positions. We have introduced three forms of financial aid for students in these categories, and hope to expand all three over time:

1. I School Graduate Opportunity Fellowships - Available to all I School students on an annual basis. Preference is given to students who have overcome significant challenges in pursuing higher education, who have shown leadership in the areas of diversity, equity, and inclusion, or whose research addresses social inequality.

2. MIDS Need-Based Scholarships - Available only to MIDS students, $10 awards available to admitted students who demonstrate financial need in their applications.

3. The Jack Larson Data for Good Scholarship - Available only to MIDS students, awarded every semester to a student who has demonstrated applications of data to address the social good.

4. Has a plan to support students in their job search been developed and implemented? Please provide any information about placement, any feedback from employers about the quality of graduates, and any feedback from graduates about how the degree has prepared them for current or future positions.

Our first investment with MIDS revenue was to hire a full-time Career Director to serve MIDS and our MIMS program. This is a good example of the way we've used revenues from MIDS to cross subsidize our "state-assisted" programs. Since that time we have hired another full-time employee to focus entirely on MIDS career placement. We believe that the placement data in Question 1 speak for themselves. In surveys of MIDS graduates we always ask what students have achieved in the program. The top three are:

1. Gained valuable knowledge and skills (97%),
2. Increased career opportunities and marketability (89%),
3. Achieved personal and professional growth (78%)

Here are some supporting statements from students about career placement and MIDS:

> Career services has been extremely helpful in my career advancement while in this program. My MIDS degree has allowed me to compete for jobs previously unavailable to me. The Berkeley brand has garnered respect with clients and potential employers, and most importantly I was able to back it up with what I learned.
>
> -Chandler McCann, Customer Facing Data Scientist at DataRobot

> I feel so grateful to have had the opportunity to complete the MIDS program. It accelerated my analytical skill acquisition and has allowed me to get 3 promotions and nearly double my salary upon completion. I have also interviewed at top companies (including Facebook). While I am ultimately choosing to stay working at my current company (flexible hours, WFH, competitive salary, etc), I feel confident in my newfound skill set and couldn't have done it without MIDS.
>
> -Lisa Barcelo, Business Intelligence Analytic Manager at Adventist Health

> Career services were invaluable for me in making this transition especially as a woman with a lot of uncertainty about the job market. In fact, access to career services and to a peer network of people working in tech are the two biggest factors that enabled my career advancement during MIDS.
>
> -Maya Miller-Vedam, Data Scientist at Microsoft

As part of the required Immersions, local companies host Tech Treks for MIDS students to meet with their data science teams. More than 180 students participate in these Tech Treks each year, and the companies they have visited include: Airbnb, Boston Consulting Group, Capital One, Dropbox, Autodesk, Uber, Yelp, Pandora, and Salesforce. After hosting 80 students in April 2018, the SAP data scientists expressed their appreciation, noting "Thank you for letting us be a part of it and introducing us to the amazing group of professionals that are in your program."