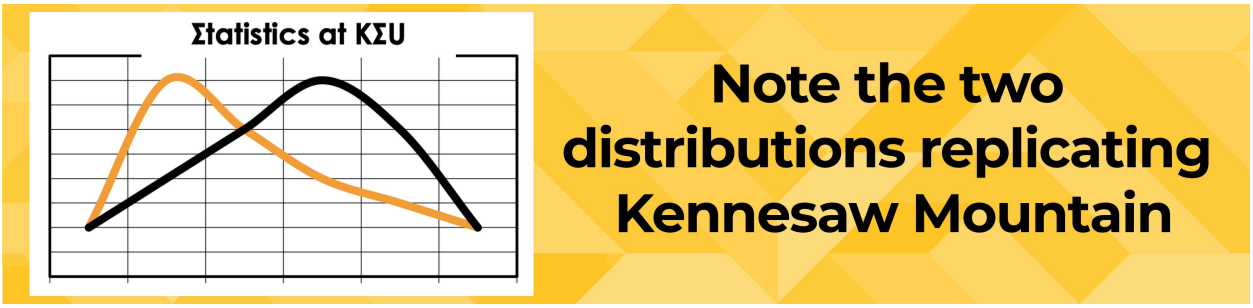
Minor in Applied Statistics and Data Analysis

In 2005 – 2006, this group of faculty, which included Lewis VanBrackle, Marla Bell, Vic Kane, Jennifer Priestley, Louise Lawson, and Daniel Yanosky, developed and proposed the Minor in Applied Statistics and Data Analysis (yes, "Data Analysis" was part of the original proposal in 2005) and the Masters in Applied Statistics. In an effort to recognize the uniqueness of the programs – the faculty developed an initial logo for the programs.



The undergraduate and graduate programs in Applied Statistics were unique and transformational for KSU – this was true for three reasons:

1. T**he curricula were a response to the needs of the business community**. In 2005, the faculty met with members of the local business community to better understand what they needed from entry level talent - we literally laid out their job ads on a table to find the key words. While the faculty understood that companies were looking for people who could translate data into information – what specific skills were they looking for? That meeting took place in room 1005 of the Clendenin building and included analytics managers from The Home Depot, Equifax, AT&T, Delta, Cox Automotive, and The Southern Company. We filled up multiple white boards with topics and terms, including "Extract-Transport-Load", Imputation, Descriptive Statistics, Supervised Modeling, Linear and Non-Linear Modeling, Time Series, Experimental Design, Visualization and Communication. And…programming.

2. **These were cutting edge Data Science programs**. Although we did not know this term "data science" in 2005, the MS in Applied Statistics integrated mathematics (students were required to have completed Calculus 1 and 2, with some Discrete Mathematics preferred), programming (SAS and SQL), and Statistical Theory. Following the lead of the business managers (this would eventually evolve into the Analytics Advisory Board), all courses at the undergraduate and

graduate levels integrated theory and application – with "real" data used in almost every course. Ensuring that students had deep and broad experiences with real data – rather than with textbook or simulated data – quickly became a point of differentiation of the program.

A brief story *– shortly after we launched the undergraduate minor program, we were approached by a local sub-prime lender who had hired several of our graduates. Over coffee, the Chief Risk Officer of this company said "I have typically hired from X university (well-known, highly ranked local institution). While those graduates are really smart, they actually don't know how to 'do anything' and I have to spend six weeks training them before they can add any value. The students that we are hiring out of your program know how to work with data and they can add value day one – which is why we now hire out of KSU. I would like to give back something to the program – other than money." Our response was easy – we need data. We need big, complicated, messy data that we can use in the classroom. That company went on to provide data that formed the basis of the STAT4330 and STAT8330 courses. In 2015, Equifax "upgraded" the data for STAT8330 – which has lead to more published papers and dissertations than any other course at KSU.*

3. The undergraduate Minor was the most successful Minor in the history of the university. The Minor was originally architected as an interdisciplinary undergraduate curriculum with the intent of helping students across KSU become more competitive in the job market. From the beginning, the faculty emphasized that the Minor was NOT developed with the intention of training undergraduate students to become Statisticians, but rather to help students learn how to effectively and correctly work with data in their discipline.

From the original proposal in 2005:

II. Identify the existing KSU major programs that have agreed to endorse/sponsor the program and will promote its completion by their students. (Collaborate with these departments and colleges on program development and send a final copy of the proposal to the unit heads.)

Statistics and Data Analysis is inherently interdisciplinary. For this reason, the Department of Mathematics sought input regarding the content and execution of this Minor from a cross-section of departments, including: Psychology, Marketing, Nursing, Political Science, Economics, Information Systems, Biology and Chemistry. Faculty and Department Chairs from all of these constituent areas expressed support for the Minor.

VIII. Explain how completion of this program will benefit students.

"Statistical thinking will one day be as necessary for efficient citizenship as the ability to read and write."- H.G. Wells. All professional disciplines encounter data in different forms. This Minor will train students to utilize data correctly to enhance decision making in their discipline. A Minor in Applied Statistics and Data Analysis combined with the completion of the student's undergraduate degree in their discipline will help differentiate the student from others with the same degree when competing for positions after graduation – this Minor is intended to enhance the value of a student's degree from any department within Kennesaw State University, whether a student chooses to enter private industry or graduate school (in any discipline). Should a student pursue admission into a graduate program, a Minor in Applied Statistics and Data Analysis would no doubt enhance the likelihood of admission. Since most graduate programs require statistics courses, this Minor would represent an important part of the preparation process.

Since its inception, students from every college and almost every department have pursued an undergraduate Minor in Applied Statistics and Data Analysis. The Minor has been one of the few instances in higher education (not just at KSU) where students majoring in highly diverse fields (e.g., Nursing, Psychology, Finance, Engineering, Mathematics, etc) will take the same classes and work on the same projects – thereby learning critical latent skills related to working in teams, and collaborating with people who have studied different disciplines.

One of the more unique tangible representations of the undergraduate Minor has been the development of the "Reference Manual". This has become a "living" e-textbook that was originally written by Jennifer Priestley and Marla Bell in 2005 to support STAT3010 – Computer Applications of Statistics. The Reference Manual: A Gentle Overview was developed to teach undergraduate students (and occasionally faculty) the basics of analytical computing. The original version of this manual included modules in Excel, SPSS, Minitab, and SAS. The Manual eventually integrated SQL, R, and Python. The manual is still in use and undergraduates since 2005 will likely smile if you reference the "WidgeOne" dataset – which famously became the basis for the manual and for many exercises throughout the first course in the Minor. A small sample of the data:

EmpID	Plant	Gender	POSITION	JOBGRADE	PRDCTY	SOCREL	YRONJOB	JOBSAT
100	D	M	HRLY	9.00	85.98	5.00	11.10	6.50
61	N	M	MGT	6.00	80.18	0.00	11.00	7.30
89	D	M	MGT	8.00	90.42	5.00	7.10	8.00
24	D	F	HRLY	7.00	91.81	6.00	10.10	6.50
16	D	F	MGT	9.00	91.81	5.00	0.10	8.50

Masters in Applied Statistics

The MS in Applied Statistics had a similar history of interdisciplinarity. From the original proposal that went to the Georgia Board of Regents in 2005, the MSAS stated as its educational mission:

The Masters of Applied Statistics Program at Kennesaw State University is a professional degree program which seeks to prepare a diverse student body to utilize cutting edge applied computational methods to enable correct, meaningful inferences from data obtained from business, industry, government and health services. The use of a variety of commercial software will be emphasized to ensure graduates can effectively analyze real-world data.

Like the undergraduate Minor program, the MSAS program attracted (and continues to attract) students with backgrounds in Business, Engineering, Healthcare, and Mathematics. Shortly after it was launched, graduates of the MSAS program were receiving 2-3 job offers per student. The program maintains an almost 100% placement rate.

In 2006, the Department hired two faculty who would eventually go on to make lasting impacts on the programs and on KSU - Dr. Sherry Ni (who would go on to become the Director of the MS in Applied Statistics, the Chair of the Department and then the Associate Director of the School) and Michael Frankel (who would go on to become the coordinator of the undergraduate curriculum as well as the coordinator of the online certificate programs).

SAS Day

We would frequently hear from companies that they were challenged to find strong, applied analytical talent who also knew SAS. We had a group of strong, applied analytically talented students who knew SAS. We just had to find a way to connect the two groups. In 2007, we hosted our first “SAS Day at KSU”. This first SAS Day event was held in Clendenin 1009. At that first event, it was clear that the 35 attendees were substantively less interested in talking to the faculty than they were in learning about what the students were doing – about their projects, their skills, their questions, and what they wanted to do after graduation. This really became the theme of everything the faculty did moving forward – it’s all about the students. SAS Day evolved into our flagship event. The event grew from 35 people in 2007 to over 250 attendees and over 100 students presenting posters in the KSU Center in 2019.

Along the way, we were honored to have speakers ranging from University President Dan Papp, Provost Kat Schwaig, Science and Mathematics Dean

Mark Anderson to Arby's President and CEO Paul Brown, former Revenue Commissioner for the State of Georgia Doug Macginnitie, President of Equifax, Trey Loughran, SVP for Innovation at SAS, Radikha Kulkarni, and former CAO of Teradata (and future Director of the KSU Center for Statistics and Analytical Research), Bill Franks. We were also proud to host analytical faculty and program directors from Emory, Georgia Tech, University of Georgia, University of West Georgia, Georgia Southern University, and Georgia State University. The best part of SAS Day was the number of students who would come up to the faculty after the event excited about the job interviews (in some cases actual job offers) as a result of their poster or presentation.

A brief story – In 2012 Brandi Werbalowsky was an undergraduate Major in Psychology and a Minor in Applied Statistics. She was two semesters away from graduating. She had a 4.0 GPA. At SAS Day, she won the top student prize (sponsored by The Southern Company) for her poster - $1500. When the prize was announced, an external visitor to the event – Frank Payne – unexpectedly stood up in front of the entire audience of 200+ people and announced that her work was so good he was going to match the prize – giving Brandi $3,000. The next day, we learned that Brandi had been in danger of having to drop out of school because her funding had run out. This money allowed her to complete her final semester. Brandi went on to hold successful positions at Cardlytics and Truist Bank.

The Department of Statistics and Analytical Sciences and CSAR

In 2008, Lewis VanBrackle lead the academic equivalent of a "velvet revolution". In that year, the group of faculty that architected and launched the undergraduate and graduate programs in applied statistics and data analysis left the Department of Mathematics and established the Department of Statistics and Analytical Sciences. Lewis was appropriately our first Department Chair.

By 2010, the interdisciplinarity of the Department of Statistics and Analytical Sciences was increasingly being manifested through requests for analytical support for research, publications, and grant applications. In response, Jennifer Priestley proposed a formal Center for analytical support. The Center for Statistics and Analytical Services was officially chartered in 2010. An excerpt from an early brochure to the internal faculty community:

Kennesaw State University

Center for Statistics and Analytical Services

Services for the KSU Community

The Center for Statistics and Analytical Services engages the Department of Statistics and Analytical Sciences as well as the Ph.D. in Analytics and Data Science to provide support for the KSU Community in a variety of ways.

Research Design The best time to seek help with a research initiative or analytical project is BEFORE the data is collected. In the early stages of your research we can help you to determine the optimal design of your project (e.g., sample size, statistical power, data collection strategies, variable determination, assistance with survey development) to help increase the likelihood of a successful publication/study.

Project/Scholarship/Grant Support Once data has been collected, the Center is available to provide assistance with statistical analysis and interpretation of results. The Center can also be written into grants as an "external evaluator" or as a "statistical expert".

Programming/Software Support Frequently, faculty and graduate students will have some training in an analytical package (e.g., SAS, SPSS, R, Matlab, etc.) but may not recall how to execute specific types of analysis. We provide support in all major analytical packages and programming languages.

By 2014, CSAS was generating over $100,000 in its own external funding through analytical work with regional companies. These projects became a particularly strong "training ground" for masters students (and eventually for doctoral students). With the launch of the PhD program in 2015, CSAS transitioned to becoming CSAR, with an increased emphasis on Research rather than on service. Today, CSAR has engaged a portfolio of research labs with sponsors including Equifax, BlueCross BlueShield of TN, The Georgia Department of Juvenile Justice, Travelers, GE Power, Alcon, The Office of Naval Research, and others. CSAR continues to provide opportunities for graduate (and some brave undergraduate) students in the area of practical analytical and computational research. Since 2015, CSAR has generated three patents, dozens of peer-reviewed publications, over $2 million of external research funding, and engaged faculty from six different colleges.

In 2011, the Department hired Drs. Gene Ray and Nicole Ferguson. Ironically, both were graduates of the Biostatistics doctoral program at the University of Louisville but did not know that each was interviewing for tenure track faculty positions. We were excited to have both join.

The year 2015 brought sadness and joy.

Dr. Anda Gadidov passed away on March 23, 2015. Dr. Gadidov was a foundational part of the analytics curriculum. Although she stayed with the Math Department after the "velvet revolution", she was universally appreciated by both the Statistics faculty and the Mathematics faculty as the "Statistician's Mathematician". She could answer any question that anyone had related to the mathematics of statistics. Anda is still greatly missed by those who worked closely with her.

The First PhD in Analytics and Data Science in the US

On February 13, 2015, the Georgia Board of Regents approved the first PhD in Analytics and Data Science in the United States. The proposal for this program actually started in 2014. President Dan Papp asked Lewis VanBrackle and Jennifer Priestley to develop a proposal for a PhD program in Statistics that leveraged the successes of the undergraduate and graduate programs in Applied Statistics and Data Analysis. After taking a look at the great work at UGA, Georgia Tech and GSU, Lewis and Jennifer determined that it would be difficult to develop a doctoral program in Statistics that would be competitive with the existing programs in the state. President Papp – in his very distinctive tone – asked us to reconsider. We recognized that whatever we developed was going to have to be distinctive and uniquely KSU – the intent was not to compete with UGA, Georgia Tech and GSU, but to lead them.
As we considered the success of the MS in Applied Statistics, we recognized that if we could have reinvented the program, we would have integrated more computing and more programming. This logic ultimately informed the proposal for the nation's first PhD in Data Science, which combined the talents of faculty from Mathematics, Statistics and Computer Science. Dr. Charlie Amlaner, VP of Research and Dean of The Graduate College at the time, was instrumental in helping to develop the financials for the program and ensure a sound research emphasis.

The first cohort of 6 from a pool of 35 applicants joined in Fall of 2015. From this group, the program is proud to have graduated the nations first formal Ph.D. in Data Science:

- **Dr. Linh Le**
- **Dr. Jie Hao - The nation's first woman Ph.D. in Data Science**
- **Dr. Edwin Baidoo - The nation's first African American Ph.D. in Data Science**

At the time of the proposal of the PhD program in 2014, a proposal for a "School of Computational Science" within the College of Science and Mathematics was developed. In this proposal, the departments of Computer Science and Statistics would have been brought together into a single school, with the Ph.D. program, and CSAR. The proposal was developed just as consolidation between KSU and Southern Polytechnic State University was announced, so the School of Computational Science was put on hold.

The Analytics and Data Science Institute

In 2017, CSAR and the PhD Program were brought together into a unique interdisciplinary research unit – The Analytics and Data Science Institute – housed in The Graduate College, under the strong leadership of Dean Mike Dishman. Jennifer Priestley, Associate Dean, was the Executive Director of the Institute, Dr. Gene Ray was invited to be the Director of CSAR, Dr. Sherrill Hayes was invited to be the Director of the Ph.D. Program and Cara Reeve was brought in to ensure operational efficiency. This move into "academic Switzerland" allowed the Institute to become a truly interdisciplinary research unit. The PhD program maintained an incredible 10% (or lower) acceptance rate and the external research funding generated through CSAR more than doubled to over $500,000 per year. In addition, the Institute continued to broaden the depth and breadth of impact across KSU, engaging faculty from almost every college in research, grant support, and publication.

Like 2015, the year 2020 was a year of joy and sadness.

On April 16, 2020, Dr. Louise Lawson passed away. Louise was a founding faculty member of the undergraduate Minor in Applied Statistics and Data Analysis. Specifically, her commitment to helping students understand the design of human studies and the role of epidemiology propelled the careers of dozens of students through the years. After years of commitment to studying infant growth curves, her work was formally recognized through a

large research grant from Gerber. Her influences on the program and on the students continue to this day.

The School of Data Science and Analytics

In 2020, with an established, externally funded interdisciplinary research portfolio, the Institute was moved into the College of Computing and Software Engineering. In addition, there was recognition that the Institute needed to transition into an academic unit to achieve synergies across the undergraduate, masters and doctoral programs in Applied Statistics, Analytics and Data Science. The solution was to “get the band back together” - and the School of Data Science and Analytics was launched, with Dr. Sherrill Hayes taking the helm as the Executive Director.

In 2023, we changed the names of our Graduate Degrees to Master of Science in Data Science and Analytics and Ph.D. in Data Science and Analytics to align with the name of the new school. That Fall, we launched our new Bachelor of Science in Data Science and Analytics, which completes our full stack of programs.