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Your guide to bridging the analytics skills gap

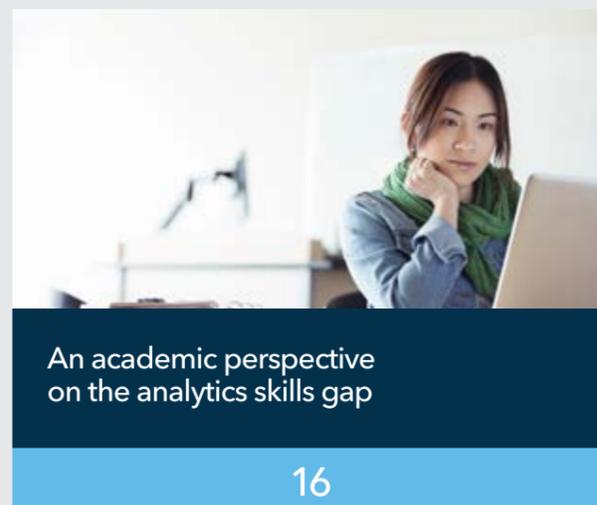
Developing tomorrow's data scientists to fill today's industry needs

sas
THE POWER TO KNOW.

A persistent skills gap plagues employers in all major industries, spurring SAS to provide additional resources that support the next generation of analytical talent. But we know the skills gap can mean different things to different people.

This e-book features interviews with those who employ, possess, and educate analytics talent. Keep reading to learn how employers, educators and students are working to fill the analytics skills gap.

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Analytics inside a state agency



Why would a state wildlife department need analytics? To analyze customer interactions, help serve constituents and generate revenue for funding recreational opportunities, all while conserving the state's natural resources.

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We asked John Taylor, a data analyst for the Inland Fisheries Division of the Texas Parks and Wildlife Department, to tell us more about the analytics skills gaps he sees at the state and local government level - and how government agencies can be more analytical.

Taylor earned the TPWD's Employee Recognition Award for Innovation for his efforts to advance the use of predictive analytics, location analytics, data integration, and data quality methodologies at the agency.

What does the analytics skills gap mean to you?

John Taylor: As a natural resources agency, we have two different cultures when it comes to analytics. Most of our biologists have a fair amount of analytical skills and considerable experience in thinking analytically. These biologists collect vast amounts of data and routinely use analytical techniques to drive their decision making on biological issues; most of our biologists have even had graduate-level training in statistics.

However, the business and administrative side of the agency has had less experience with analytical techniques and less access to data. With less of a culture of data-driven decision making in those functions, some decisions have had to be made based on subjective beliefs and best guesses. It's often worked out well enough, but over the course of time, we've determined that some decisions achieved suboptimal results.

We've been working to close the gap by providing easier data access with data integration tools and thoughtful construction of data marts, as well as by providing staff with easy-to-use analytical tools and training. This has boosted confidence and trust in the decisions being made and has inspired a great deal of innovation among our staff to look at issues from unique perspectives in order to improve business processes. Our top leadership encouraged and empowered staff who already had those analytics skills to share their knowledge, and that investment in time and effort has helped close the gap.

What can government agencies do to attract, retain, or foster more analytics talent?

Taylor: In discussing this issue with my colleagues who do analytics for government agencies, many of them were attracted to state agencies because they sincerely felt a call to public service, identified with the agency's mission, and gained a sense of satisfaction and self-worth from supporting that mission. Some also perceive agencies as more stable and secure work environments than many private corporations, and those considerations outweighed the promise of higher salaries. We stress these aspects in recruiting all of our employees, not just the ones involved in analytics.

Agencies can gain some advantage in recruiting analytics professionals by making concentrated efforts to share information on their progressive analytics initiatives in public forums such as professional meetings and industry media outlets. Many private organizations are reluctant to share the "secret sauce recipe" details about their initiatives, but public agencies are mandated by open government legislation to share information about their activities. Agencies can leverage that openness to offer dynamic learning environments for potential employees who want to grow in their skills.

So the message boils down to: Help us make a difference in people's lives and for the environment by applying interesting and innovative analytics.

What role do you think analytics companies should play in helping to close the gap?

Taylor: They can help close the gap in three ways: by developing tools that are easy to use and have a short learning curve, providing broad support for user communities that help professionals further develop their skills, and supporting educational institutions in their efforts to teach these skills to students.

New analytics tools that eliminate the need for programming and BI tools that simplify data access have allowed our users to enjoy a much shorter and less steep learning curve than with previous tools. Implementing these intuitive tools has narrowed the gap in our agency considerably. We also have relied heavily on resources available to the SAS user community to help our staff members develop their analytical skills. We've found the paper proceedings published by regional SAS user groups and at SAS Global Forum to be especially useful.

I'm excited to see that SAS now offers a free version, SAS University Edition. I hope that more professors will add SAS University Edition to their analytics curricula, because I think students will experience an easier analytics learning curve as compared to only learning analytics via R programming. That will give them more time to concentrate on tool-independent skills related to problem framing, interpretation, and so on.

What advice would you give students or adult learners interested in pursuing an analytics career?

Taylor: Don't be intimidated by the complexity of everything there is to learn as an analytics professional; your learning will continue for your entire career.

Share your knowledge and absorb what others are willing to share with you. Spend at least as much time learning about the business processes that generate the data as you do the skills to analyze the data, because some of the most valuable insight comes from being able to identify how



“Strive for simplicity over complexity in communicating your findings; you can always provide more detail later as long as you hook your audience with the simplicity of your message first.”



John Taylor,
Data Analyst, Inland Fisheries Division,
Texas Parks and Wildlife Department

those processes influence the data that gets recorded and how those processes may be changed to make data more accurate and useful.

Visualize the data and think about what the picture is telling you before running any analyses. A wise statistics professor once told me that the PLOT procedure is the most powerful procedure ever programmed.

Strive for simplicity over complexity in communicating your findings; you can always provide more detail later as long as you hook your audience with the simplicity of your message first.

What's the coolest or most important thing you've done or seen done using analytics?

Taylor: Recently we've been considering a change to our fishing license product offering that may have a negative impact on revenues that support the vast majority our conservation efforts. When the change was initially proposed, it was assumed any resulting impacts on revenue would be minor. Using analytics, however, we were able to model the license renewal behavior of license buyers of different license products and make predictive estimates

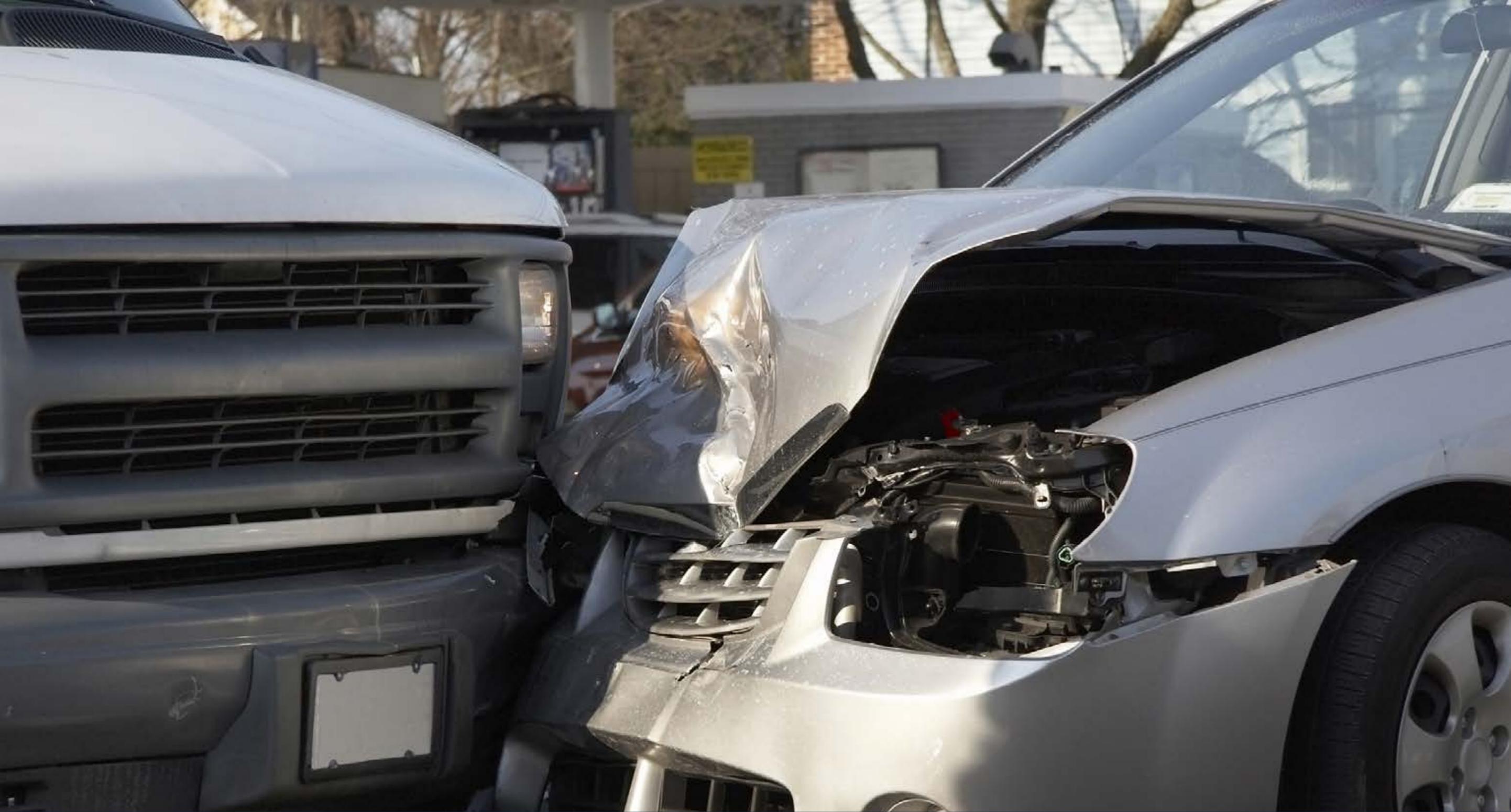
that the considered change may result in a double-digit decrease in available funding.

This information has encouraged the use of data to drive the decision-making processes and for forethought to be given to how the agency might adjust to predicted decreases in funding and minimize negative impacts to our conservation efforts.

Your interests include kayaking, camping, snorkeling, and fishing. How does that passion extend to your work with analytics?

Taylor: I have a perspective on what's important to our customers that's informed by on my own strong interests in outdoor activities. Feeling that I'm doing something that has value to outdoor-loving Texans like me gives me added motivation to find ways we can better serve our constituents. I'm driven to explore innovative ways that make what we do relevant to Texans who may not take advantage of recreational opportunities we offer but will still support our mission to manage and conserve the natural and cultural resources of Texas.





How to keep your analytics team from crashing

Tips from XL Insurance for finding and keeping good people for your analytics staff



Kimberly Holmes is a Senior Vice President of Strategic Analytics at XL Group, a global insurance company offering property, casualty, professional and specialty insurance products. She is responsible for the development of leading-edge analytical tools across the organization.

Find out how Holmes entices analytics experts, what she considers the essential skills, and why it is good to contradict conventional wisdom (like she did when she named her dog)!

What does the analytics skills gap mean to you and XL Group?

Whenever you are on the forefront of innovation in your space there are very few people who have the exact experience and skill set you need. We do two things. First, we identify what types of experience and skills are transferable, and second, we hire people that have them and invest in their professional development.

What can organizations do to attract, retain, or foster more analytics talent? What is your “pitch” when hiring new analysts for XL Group?

We have found that three factors are key to enticing top analytics talent to join an insurance company like XL. First, there is a real opportunity to make a difference. We haven't even seen the “tip of the iceberg” of how analytics can impact our business, especially the commercial insurance business. Second, the work that we are doing is creative and innovative. New risks are emerging all the time, along with more and more information to work with.

And lastly, we have executive support for the analytics team. Supportive leadership validates the value analytics brings to the table. XL Group checks all three of these boxes. In addition, we have a team of people who are

enthusiastic and know how to have fun with their work. That's a big selling point to potential candidates. Who wouldn't want to be part of that kind of team?

What role do you think analytics companies should play in helping to close the gap?

Through internships, training opportunities and programs like SAS Analytics U, we as an industry can develop new talent and create career opportunities in analytics.

What advice would you give students or adult learners interested in pursuing an analytics career?

My main advice for anyone wanting to pursue a career in analytics is to not forget the soft skills, or what I call essential skills. The technical skills are necessary but what will differentiate you and make you more effective are communication skills, a focus on business problems, and an ability to build trusting relationships with business partners. Technical skills are useless to a company unless you can translate them into business value.

How should organizations keep analysts challenged and engaged?

Analysts are creative and want to be challenged. The keys to keeping them engaged are to give them a variety of interesting work that pushes their skills, and to provide them opportunities to work with business leaders. Working with business leaders will make analysts more effective through better understanding of what business problems they are trying to solve. It also gives them the ability to influence how their solutions will create business value.

What's the coolest or most important thing you've done or seen done, using analytics?

The coolest thing about using analytics is seeing people's minds open up about what is possible. The surprise and excitement of seeing how new data and new analytical methods help businesses is exhilarating for both the business and analytics teams. For instance, when we identify a new risk factor for one of our underwriting businesses it means that the underwriters are more effective at risk selection than they were before. This improved segmentation of risks also means that pricing for insureds is fairer. It's great to be constantly and pleasantly surprised.

What cultural changes are essential for analytics thinking to take hold in an organization?

Cultural change has to start with the CEO and top executives. Decisions need to be made based on what we know, not what we think, so executives need to ask colleagues for data to back up opinions. Analytics also has to be a part of the everyday conversations as it won't be successful if it is done "on the side."

You have a Yorkshire terrier named Tyrannosaurus Rex, which is awesome, and ironic. Can you think of a time where analytics results surprised you, contradicting what was accepted to be true?

There have been quite a few times when analytics results have contradicted common wisdom. I call this the holy grail of analytics because these findings are the ones that will give us the most competitive advantage.



"The coolest thing about using analytics is seeing people's minds open up about what is possible. For instance, when we identify a new risk factor for one of our underwriting businesses it means that the underwriters are more effective at risk selection than they were before."



Kimberly Holmes,
Senior Vice President,
Strategic Analytics at XL Group



Data-driven journalism and analytics skills



Data science has established its place in the field of journalism. Newspapers, broadcast media, and Internet news sites are relying on teams of journalists who understand data, and on data professionals who want to be part of a news team.

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Steve Doig teaches database reporting at the Cronkite School of Journalism of Arizona State University. Before joining ASU in 1996, he was research editor of The Miami Herald in Florida. Investigative projects on which he worked at The Herald and at ASU have won the Pulitzer Prize for Public Service, the Investigative Reporters and Editors Award, the Goldsmith Prize for Investigative Reporting, and the George Polk Award for Medical Reporting. In this interview, Doig shares his thoughts about what it takes to be a data-driven journalist.

As more and more media outlets jump on board the big data bandwagon, they must battle for analytics talent. What does that analytics skills gap mean to you as someone who teaches those skills?

Steve Doig: I'm happy that some of our smartest journalism students get excited about learning and using the power of data analysis for investigative reporting. But too many journalism students are math-phobic: "I'm a word person, not a numbers person" is their mantra. So I've come to believe that journalism needs to attract students from disciplines where such analytical skills are the core of the curriculum: data science, computer engineering, statistics, etc. Some journalism schools are exploring cross-campus partnerships with their university's computer science program as a way to proselytize the idea of journalism as an exciting career choice.

What can news organizations do to attract, retain or foster more analytics talent?

Doig: Unlike most other industries, news organizations have been famously reluctant to spend serious money on research and development and training. That was true even during the days when newspapers and TV news were cash machines, an era that now is long gone thanks to the disruptions of the Internet on the traditional news business models. Some foundations with interest in the civic role of journalism, like Knight, Carnegie, and a few others, have stepped up with funding for training programs and support for news startups, but much more of that is needed. I think it would be very wise for news organizations to create scholarships for students who are interested in news-focused analytics. I'd also recommend an aggressive recruiting program, with ads and brochures and speakers, aimed at showing students in those analytical disciplines that using those skills in a newsroom might be even more interesting than working in a more traditional tech environment.

What role do you think analytics companies should play in helping to close the gap?

Doig: Some analytics companies already are doing a lot. Google, for instance, joined with the Knight Foundation to fund the annual Data Journalism Awards that are announced at meetings of the Global Editors Network each June. Google also has given support money for data journalism conferences in various places around the world. (I spoke at Datafest 2014 in Buenos Aires in October and was pleased to see that SAS had joined Google and Knight as a supporter of that conference.) Other companies offer support and access to software for data journalists who are members of Investigative Reporters & Editors.

This model is one I would recommend to analytics companies. Offering free software and training for newsrooms that otherwise couldn't afford it is a smart business decision, I think. The resulting use of their analytical output and interactive graphics on news websites is great free publicity.

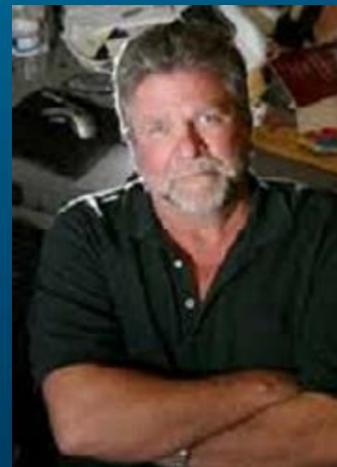
What advice would you give students or adult learners interested in pursuing an analytics career in the news industry, or in general?

Doig: First, I would tell them about the demand for people with those skills. As a journalism educator best known for working with data, I get calls weekly from editors who want to hire students who can analyze data and create interactive web applications and data visualizations.

I'd also tell them that they will have to learn to be journalists as well as coders. The best news application developers have a strong news sense and understand that their work must tell a compelling story just the same as the work of the reporter who is typing in words or doing a TV standup. They also need to understand that news has a more urgent time dynamic than does traditional software development. Having it be as good as possible by deadline is far more important than having something better when the news peg has come and gone.

However, I'd also assure them that it's easier to learn the basics of journalism than it is to understand statistics and write JavaScript apps and Python web scrapers. A journalism degree absolutely is valuable education for students who are seeking to get the experience and clips necessary to get hired as reporters, but it isn't required. One study found that about a third of Pulitzer winners—including myself—didn't attend journalism school.

I'd also add that newsroom data analytics is a field where women with those tech skills are welcome. Many of the very best data journalists I know are women who are running or are key members of data teams at the biggest news organizations in the country.



“The key to getting hired in data journalism is to show that you can do the job. Editors will want to see apps you have created, data visualizations you have done, data sets you have created by scraping websites. They won't care much about credentials or courses you have taken; you need to show them your work.”



Steve Doig, Database Reporting Instructor,
Cronkite School of Journalism
of Arizona State University

You've won a Pulitzer with the help of analytics, so this might be an obvious answer, but what's the coolest or most important thing you've done or seen done, using analytics?

Doig: It's hard to name any one project as best. Most important, I'd say, would be the large category of watchdog investigative projects that have exposed crime, corruption, societal failures, and the like: banks that refuse home loans for minorities, mortgage fraud rings, bad cops, substandard building codes, educators who cheat to get bonuses, factories that pollute the air and water, politicians who misuse taxpayer money, unsafe products that kill people, hospitals that pad their bills to Medicare, and so much more. All those stories became possible only because journalists were able to analyze data, going beyond anecdotes to finding evidence.

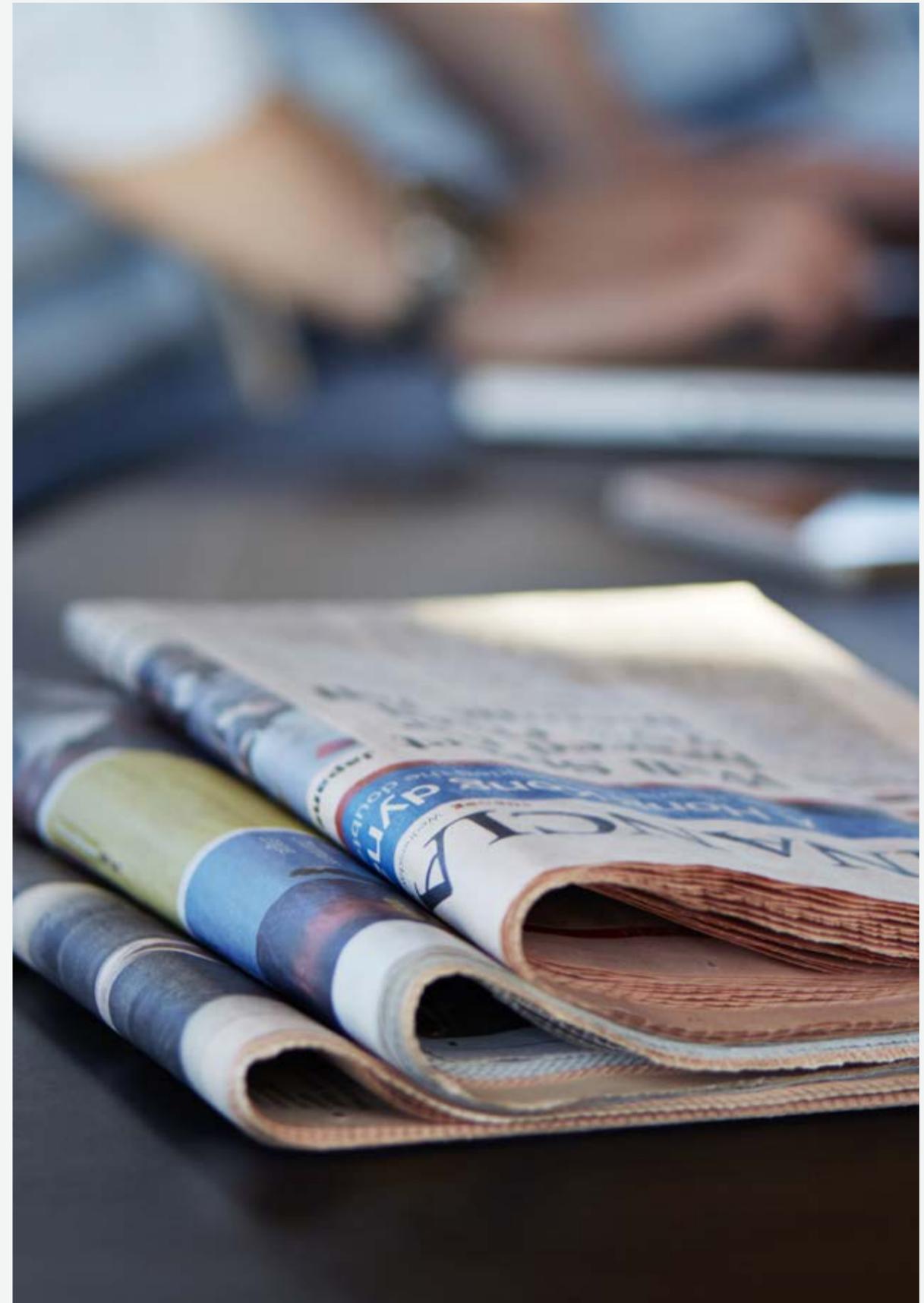
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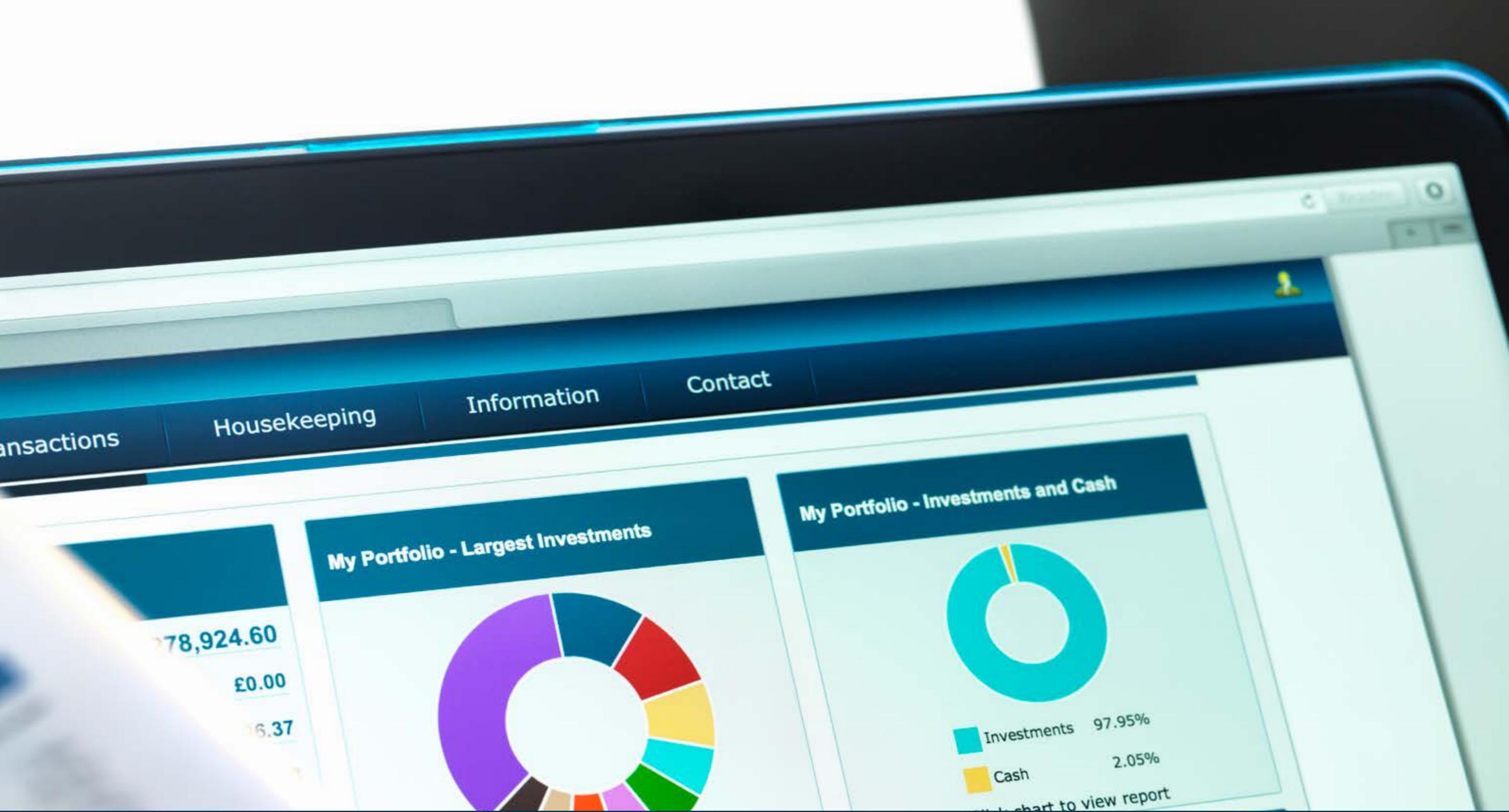
Doig: For a long time, analytics in a newsroom was sort of a “nerd in the corner” thing; the data journalist might as well be wearing a wizard’s cape for all anyone understood about what he or she was doing. However, I think we’ve reached the tipping point. It’s no longer necessary to sell editors on the need for having analytics skills in the newsroom; they’re desperately trying to find and hire those skills. I’ll add that every reporter doesn’t need to be a data analyst. A newsroom filled with reporters like me wouldn’t be very functional, but most editors realize they need at least a few like me.

Where are the greatest opportunities for data journalists? How can they get their feet wet with easily available data?

Doig: The good thing is that today there is a ton of journalistically interesting data available to anyone. Census.gov is a trove of data sets that can be explored with the click of a download button. The Federal Elections Commission site (fec.gov) has detailed tables of data on the lifeblood of politics, campaign donations and expenditures. Many local police departments will let you download crime report data. And so on.

The key to getting hired in data journalism is to show that you can do the job. Editors will want to see apps you have created, data visualizations you have done, data sets you have created by scraping websites. They won’t care much about credentials or courses you have taken; you need to show them your work.





Adding analytics expertise to your business skill set



Involved in predictive analytics and data mining for two decades, Dudley Gwaltney is the manager of the predictive analytics team in the Marketing Information Group of SunTrust Bank, a top 15 financial institution headquartered in Atlanta.

With a background on both the consulting and client side, Gwaltney has extensive experience in a wide array of data mining areas, including predictive modeling, segmentation, implementation and maintenance of data repositories, and program analysis.

Gwaltney works with SunTrust's marketing and product management departments to improve overall performance to enhance existing direct targeting programs and creating new ones. Currently his team is implementing a real-time data repository of all client interactions with SunTrust. These include online, mobile and tablet banking, branch, integrated voice response (IVR), call center, clickstream data from SunTrust.com, and outbound direct marketing. This data will be used for real-time predictive analytics, understanding client preferences, and omnichannel analytics, to mention a few.

You have degrees in business management and economics, but "just" a minor in computer science. How has that background led to a career where analytics is central to your role?

Gwaltney: After graduating from NC State in 1983 with degrees in business management and economics, I returned to school in the early 1990s and completed NC State's two-year computer science certificate program. The program consisted of over 30 hours of coursework and was closer to a minor in computer science than a full major. Shortly after completing the program, I joined a small, startup consulting firm that specialized in applying data mining and predictive analytics with marketing.

The certificate and the knowledge it gave me have proven invaluable in my career. I realized pretty quickly that the ability to manage data and understanding how data is processed was crucial to data mining. At the consulting firm, we were receiving data sets of over a million records, which at the time was almost unheard of.

Having an understanding of computer science and data management is even more crucial today than it was when I started 20 years ago. We are dealing with data sets in the billions. The environment for storing data has evolved from basic databases to database appliances and non-structured data on Hadoop. Data miners no longer access well-established data systems but are creating their own environments for managing data and performing analytics.

What advice would you give to high school or college students who are considering an analytics career?

Gwaltney: There is a misconception that a degree in statistics is the basis for a career in analytics. Today's advanced analytics requires a combination of statistics, data management, and an understanding of business. The best schools for advanced analytics focus on all those areas, not just statistics. In my opinion, the No. 1 skill for any analyst is what I call "intellectual curiosity." Good analysts want to find the answer and will acquire the skills and tools necessary to do so. Unfortunately it is hard to quantify intellectual curiosity. I have seen people with great resumes and backgrounds who are very poor analysts because they don't have intellectual curiosity. On the other hand, I know several great analysts who did not have a great resume but have a strong intellectual curiosity.

Additionally, a great skill to hone is the ability to communicate technical information to the non-technical. Most leaders of organizations do not want to know the details of the analysis, but how the analysis will solve the problems they are facing. Those who can communicate the value of analytics are the ones who provide the most value to their organizations.

What role do you think analytics companies should play in helping to close the analytics skills gap?

Gwaltney: SunTrust, like many companies, is partnering with local universities to support their advanced analytics programs. As recently as 10 years ago, there were only a handful of universities that had programs specializing in advanced analytics, including my alma mater NC State. Now, more and more universities have or are planning to start advanced analytics programs.

These programs actively look to partner with local businesses with large analytics organizations. Not only do the universities want to expose their students to career opportunities, but, more importantly, they want to make sure they are preparing their students for businesses' fast-changing analytics needs.

Also, companies should look internally for team members who have the desire to get involved in analytics. These employees know the business and with training, education and encouragement can become valuable analytical assets.

How should organizations keep analysts challenged and engaged?

Gwaltney: As I said before, the No. 1 characteristic of a good analyst is intellectual curiosity. Good analysts are always looking for new problems to solve and new ways to solve them. Analysts want opportunities to learn and utilize new methods. Good analysts flock to organizations that provide those opportunities, and leave those that don't.

Secondly, analytics is not reporting. Reporting is showing how many widgets were sold. Analytics is understanding who bought the widgets, why they bought the widgets, who is most likely to buy another widget and when, which channels do customers prefer to buy the widgets, will they buy something other than a widget, and many more questions.



"Companies should look internally for team members who have the desire to get involved in analytics. These employees know the business and with training, education and encouragement can become valuable analytical assets."



Dudley Gwaltney,
Manager of Predictive Analytics,
SunTrust Bank

Finally, good analysts want to be involved in the organization's decision making process. They want to know that their input is valuable and their work crucial to the direction of the organization. They don't want to produce an analysis that leadership will use to make decisions; they want to be at the leadership table explaining the findings of the analysis and working with leadership on how best to act on these findings.

What's the coolest or most important thing you've done or seen done, using analytics?

Gwaltney: Several years ago, I built a group of models predicting deposit balance augmentation and diminishment to help our branches better manage deposit clients. The program was extremely successful, and within a few years the incremental lift associated with the models topped \$1 billion. It's not often you get to put a billion of anything on your list of accomplishments.



An academic perspective on the analytics skills gap



From training students to partnering with businesses, universities have an important role to play in helping to fill the analytics skills gap. Here, Allison Jones-Farmer, a professor at Miami University, in Oxford, OH, offers advice to students and hiring managers – including how to move analysts from the backroom to the boardroom.

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Jones-Farmer is a past recipient of the Colonial Company Teaching Excellence Award, the MBA Teacher of the Year Award, and the Outstanding Teacher in the Department of Aviation and Supply Chain Management at Auburn University.

She's an active researcher, developing practical methods for analyzing data in industrial and business settings. Besides holding the Van Andel Endowed Professorship in Business Analytics at Miami, Jones-Farmer is an active researcher, developing practical methods for analyzing data in industrial and business settings. She also serves on the editorial board of Journal of Quality Technology, and is a past associate editor for Technometrics.

What does the analytics skills gap mean to you?

Allison Jones-Farmer: It means that I have the opportunity to share the field that I love with an increasing number of engaged students. It means that well-respected professionals who work for cutting-edge companies will call this a "sexy profession" in The New York Times. It means that bright, mathematically inclined students will have another recognized field to pursue that has real value in the marketplace.

And, it means that technical faculty in higher education (statisticians, mathematicians, operations researchers, computer scientists, engineers, faculty in information systems, etc.) have a huge responsibility to define

and shape the future of analytics education for both technically and managerially inclined students.

What role do you think analytics companies should play in helping to close the gap?

Jones-Farmer: Simply stated, more technically and mathematically inclined students need to be aware that analytics is a valuable career option. They need to be introduced to analytics early, and see what analytics professionals do. By the time the students get to college, it may be too late.

While there are many opportunities for national funding to attract students into the STEM fields of science, technology, engineering, and mathematics, these agencies do not, in general, fund these efforts through colleges and schools of business. Thus academia, particularly colleges and schools of business, needs the help of corporations to support efforts to educate students about analytical professions. Companies come to us demanding diverse, technically capable students.

Yet, in higher education, we have few resources that we can use to attract such students into our programs. One of my goals for Miami University is to establish corporate partnerships to attract more women and minorities into the analytics profession.

What advice would you give students or adult learners interested in pursuing an analytics career?

Jones-Farmer: My advice is for students to learn as much as they can about the field and the day-to-day life in the profession. There are many resources that give information on careers in analytics, including INFORMS and the American Statistical Association.

The field of analytics is not for everyone; thus I recommend taking some higher-level classes, particularly applied data analysis classes, to make sure

students are suited in personality and capability for the work. In my experience, for every story of analytical glory (like *Moneyball*), there are many gritty backstories of tediously slogging through data, failed analyses, and political obstacles. It's definitely a profession for persistent, independent learners.

If they're still interested after all of this advice, I'd recommend they roll up their sleeves and analyze data. While reading and studying will get you to a certain point, the only way to learn to analyze data is to actually analyze data!

What's the coolest or most important thing you've done or seen done using analytics? Perhaps an example you use in your class?

Jones-Farmer: [Mathematician] John Tukey once stated, "The best thing about being a statistician is that you get to play in everyone else's backyard." And because I've been in academia for much of my career, I've played in many backyards, including disciplines like psychology, health care, engineering, business management, transportation, and others. But the most important thing I witness is students as they transform from knowing next to nothing about data or how to analyze it into professionals who I would trust to send out into industry to apply analytical methods to real problems. This transformation is so rapid, usually over the course of two years or less. It's amazing to watch.

How should analysts communicate results in a way that inspires change?

Jones-Farmer: Good analysts need to be good storytellers. This is, perhaps, the most difficult skill for analysts to learn. I recently conducted a study with a colleague to determine the most critical knowledge, skills, and abilities for entry-level analytics professionals. One of the most frequently mentioned skills by industry was the ability to clearly articulate the results of an analysis. My advice is to focus on the purpose of the analysis and to use well-designed visualization tools whenever possible.



"More technically and mathematically inclined students need to be aware that analytics is a valuable career option. They need to be introduced to analytics early, and see what analytics professionals do. By the time the students get to college, it may be too late."



Allison Jones-Farmer,
a professor at Miami University,
in Oxford, OH

As a mother of four kids, what sort of analytics opportunities do you think they'll have 10 to 20 years down the road? Or what will organizations be doing with data that they aren't now?

Jones-Farmer: My husband, who is also in a technical profession, and I joke that our children should be analytically inclined since they all listened to me deliver advanced statistics lectures in the womb. If my children do choose a technical path, the door is wide open. We encourage them to excel in math, and we have a goal that each of them will learn to code. A foundational understanding of these skills, in my opinion, will be critical to many occupations of the future, either technical or managerial.

In the future, companies will no longer use data to gain a competitive advantage, but data-driven decision making will be required for survival. Our ability to efficiently acquire, manage, and access data will continue to grow, and research will provide us with new ways to turn this data into information and eventually knowledge.



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