NEXUS
A Magazine by NSPARC at Mississippi State University

SPRING 2020

INVESTING IN THE FUTURE
Study reveals economic impact of Mississippi community colleges

MISSISSIPPI AID APPLICATION
Improving user experience to help students secure funding

HELP IS ON THE WAY
CYBERCRIME SUPPORT THROUGH 211 FOR MILLIONS OF VICTIMS ACROSS THE U.S.

MISSISSIPPI STATE UNIVERSITY™
NATIONAL STRATEGIC PLANNING & ANALYSIS RESEARCH CENTER
MESSAGE FROM NSPARC INTERIM EXECUTIVE DIRECTOR

I am humbled to be taking on the role of interim executive director for Mississippi State University’s National Strategic Planning and Analysis Research Center (NSPARC). It is a joy to collaborate each day with more than 70 talented professionals on our NSPARC team.

At NSPARC, we partner with great organizations across the state and country to create data innovations in areas such as economic development, workforce development, education, and the delivery of human services at all levels of government. From helping to improve early childhood care and education to developing digital solutions for government agencies to providing research to businesses interested in bringing jobs to the state, people are truly at the heart of what we do.

Moving forward, we plan on keeping up the momentum in providing quality work that improves quality of life and sharing our stories with you through Nexus magazine.

Steven M. Grice, Ph.D.
Interim Executive Director, NSPARC

Help is on the Way
Providing Cybercrime Support through 211

Athlete Engineering Student Pipeline
Bridging the Gap between Human Factors and Performance Technology

Harvard Competition
Places National Spotlight on Early Child Care and Learning in Mississippi

Assessing Hydrological Resources
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Nexus Q&A
with Hal Bullock
Bringing Home the Benjamins

Report Reveals Economic Impact of Community Colleges in Mississippi

by Laura McPhail

Benjamin Franklin—renowned statesman, economist, scientist, philosopher, and face of the $100 bill—had a lot to say about investing. Pithy quotes like “A penny saved is a penny earned,” “Time is money,” and “An investment in knowledge pays the best interest” are just as true today as they were when Franklin was alive in the late 18th century. In fact, the last of these was recently put to the test when the Mississippi Association of Community and Junior Colleges (MACJC) contracted the National Strategic Planning and Analysis Research Center (NSPARC) to determine the economic impact that community colleges have on Mississippi.

Residents of Mississippi’s 15 community colleges commissioned a study that they hoped would reveal how the community college system makes significant contributions to the state’s economy. The study had three primary objectives: (1) to examine who is served by the statewide network of community colleges, (2) to determine education and labor market-related outcomes of those served, and (3) to estimate the overall economic impact of community colleges in the state.

The results of the study were stunning. It is estimated that community colleges directly and indirectly generate $2.1 billion in wages and salaries each year, which then results in an estimated $277 million in state and local tax revenue and an estimated $3.9 billion in state gross domestic product (GDP) annually. The Mississippi Community Colleges Serve, Prepare, and Support Mississippians report was released in January 2020 and provided proof that community colleges have huge effects on the Mississippi economy and the people they serve.

Investing in Knowledge

In June 2016, Mississippi Speaker of the House Philip Gunn met with the community college presidents for a work session and asked a very direct question: Did they have enough money to accomplish their mission?

Knowing the answer was no, the presidents decided to evaluate. The new question became “Is it right to invest in community colleges in Mississippi?” Seeking an independent and objective answer, MACJC turned to NSPARC.

“This report is important because taxpayers are becoming increasingly interested in the details of how their taxes are spent, and this research explains how their hard-earned tax dollars are returned, many times over, as income and jobs that benefit their neighbors, families, and communities,” said Michael Spanbauer, a research project manager at NSPARC.

At a press conference in January, Jesse Smith, president of Jones College and MACJC Legislative Chair, stated that it had been historically challenging to understand the value of public higher education and workforce training until now. He revealed MACJC’s intentions behind the economic report.

“We intended to show legislators, county officials, and the citizens of Mississippi how crucial community colleges are for the successful future of the state of Mississippi. Specifically, we can make a reasonable assumption on the return on investment to the state of Mississippi and the potential for increased earnings for the student who earns a community college degree,” Smith said.

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“All photos provided by several Mississippi community colleges.”
The financial return to the state in tax dollars and GDP is impressive, but the impact on Mississippians who benefit from the community college system is even more remarkable. Approximately 100,000 full- and part-time students enroll in one of 250 academic or for-credit career technical programs each year.

The report shows that three out of four students who graduate from a Mississippi community college choose to live and work in Mississippi after graduation. The community college presidents see this as proof that brain drain is not relevant in the community college system. This relatively high workforce participation rate of Mississippi community college graduates ensures that the majority of the benefits generated by these graduates stays in the state.

Mary Graham, president of Mississippi Gulf Coast Community College, says the report provides a “proof of quality” to state leadership.

“Community college can benefit anyone, and we have a great product,” Graham said. “Community colleges offer education to anyone in any location in our state—all 82 counties are represented. It is the great equalizer.”

An attractive factor for students who attend community colleges is accessibility. Ninety-five percent of community college students in Mississippi are state residents, and approximately three out of four students attend the community college in their home district. Unlike many universities, Mississippi community colleges—with 15 main campuses and 500 total locations—offer convenience to home.

Smith is right. NSPARC researchers were able to quantify the value of a single credit hour as an additional $224 added to a student’s annual earnings. Given that a typical associate degree requires an average of 60 semester hours, this translates to an additional $13,440 per year—every year—of the degree-holder’s working life.

“[Within five years of graduation] the average salary for graduates with an Associate of Applied Science degree is above $40,000, which is equivalent to most university grads with a bachelor’s degree,” Smith said.

Success of Mississippi community college students who transferred to a university and earned a bachelor’s degree is notable. The report shows that community college students transferring to public universities are almost 1.5 times more likely to graduate from a university than their counterparts who enroll as first-time, full-time freshmen.

“[Our] college serves a population of students who might not even embark upon a college career if not for the opportunities afforded to them by having the convenience of three MDCC campus locations,” said Tyrone Jackson, president of Mississippi Delta Community College. “A large section of the student population has no access to transportation for long distance commutes.”

An additional attraction for students who attend community colleges is affordability. With student loan debt at an all-time high, affordability and earlier entry into the workforce are other attractions for prospective students.

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Training events throughout a given academic year. Of these people, 80,000 enroll in substantive training areas that are aligned with Mississippi’s labor market demand. The top five substantive areas are: (1) medical/healthcare, (2) banking skills, (3) Smart Start skills training, (4) industrial production, and (5) welding/soldering.

“A highly-skilled workforce is critical to company productivity, generating tax revenues, and improving the quality of life in Mississippi,” said Mississippi Community College Board Executive Director Andrea Mayfield.

Workforce training programs at community colleges provide opportunities for those already in the labor market to increase and improve their skills, perhaps earning certifications in some job areas. The time those students invest in workforce training programs then leads to an average increase in earnings of more than $2,390, raising their average annual salary to $42,922.

“The community colleges do not receive state appropriated dollars to conduct non-credit workforce training for business and industry employees, yet the report clearly illustrates the value of such training to the individual, the company, and our state,” Mayfield said.

Community colleges also train about 22,000 people in safety-based training every year.

“It’s hard to quantify the saving of a life. Saving one life is worth it. But we were able to forecast just a little bit, and it [safety training] does reduce workplace accidents and hopefully it would prevent someone from losing a life or being injured enough where they can’t work,” Smith said.

A symbiotic relationship has developed over the years between Mississippi community colleges and the businesses and industries in the communities they share because of the workforce training programs. President of Northwest Mississippi Community College Michael J. Heindl credits these relationships as a significant contributor to his college’s success.

“We have a whole department that is dedicated to workforce training. Either our trainers or our administrative leaders have strong partnerships with economic developers in the eleven counties we serve. They truly know they can come to Northwest with training needs they might have,” Heindl said. “We are proud of the fact that we have such strong, long-term relationships with business and industry partners.”

This sentiment was echoed by the other MACJC members, and the relationships with businesses benefits those already in the labor market taking non-credit workforce training courses as well as degree-seeking students.

“We’re all looking to make some significant strides of tying our local business and industry into directly connecting to that student. It’s what the parents want, it’s what the kids want, and it’s also what the employers want,” Smith said.

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The Bottom Line
Community college presidents all agree that the economic impact report provides a good data-based foundation for creating the narrative for future funding requests.

Each year, community college students spend close to $650 million, and community colleges spend more than $600 million on operational expenditures and salaries of more than 8,100 employees. These direct jobs support an additional 16,200 jobs in the state. As labor market demands continue to evolve, it sometimes becomes challenging for community colleges to keep up with those demands.

“Community colleges are good stewards of the taxpayer’s money,” Jackson said. “Outcomes such as mid-level funding for the Mississippi community college system is paramount. The colleges consistently graduate more students and train the workforce with less funds practically each and every year.”

Graham agrees that greater support by legislators is needed and hopes they see the fact-based information presented in the report as proof of the strength community colleges bring to Mississippi.

“The economic impact of community colleges across the state to build and expand on the foundation that was established by this initial report.”

The community college presidents all agree that drilling down to each local area will help them understand their communities better and design programs that fit their service regions better, ultimately making a stronger and more competitive Mississippi.

“NSPARC knows that this research provides critical information for students, taxpayers, and policymakers alike, and we know that these reports ultimately benefit our fellow Mississippians,” Spanbauer said. “As a result, we are excited to continue partnering with the leaders of community colleges across the state to build and expand on the foundation that was established by this initial report.”

To view the full report, Mississippi Community Colleges Serve, Prepare, and Support Mississippians, visit https://bit.ly/3aPngJJ.
Eager to share the report’s results, MACJC held a press conference at the capitol shortly after the Mississippi Community Colleges Serve, Prepare, and Support Mississippians report was released in January 2020. The report told a factual, data-based positive story about the significant impact community colleges have on the state’s economy and within the communities they serve. However, the report was not able to quantify this impact beyond dollars and cents.

“The economic impact of a graduate’s earning power has now been revealed, but the emotional impact to the student and his/her family is immeasurable,” said Tyrone Jackson, president of Mississippi Delta Community College.

To explore this emotional aspect, I didn’t have to look any further than my own family to find several relatives who are currently taking advantage of the benefits of attending community college. I spoke with my cousin, Savanna McPhail, who is a first-time freshman pursuing an Associate of Applied Science degree at Hinds Community College. She wants to transfer to a university after earning her associate degree so she can become a registered nurse.

“I’m glad I’m going [to community college] because ultimately I want to provide for my future family,” Savanna McPhail said.

Savanna believes that by starting at a community college, she avoided the probability of becoming totally overwhelmed at a university where the classes are larger and less personal. She also gets to commute from her family’s home every day instead of living on campus, and staying with her family helped get her through the first semester. She believes the gradual change in environment will help her be more successful when she transfers to a university.

Savanna’s father, Danny McPhail, appreciates having her close to home as Savanna ventures into adulthood.

“[Going to community college] provides a slower transition into a truly independent life, which keeps her more grounded and closer to the root values she was raised with,” Danny said.

He cited the ability to greatly increase her earning potential and having a better chance of finishing a higher degree as other reasons why he finds value in her attending community college.

When asked how the information in the report made him feel about paying for Savanna’s community college education, Danny felt a sense of reassurance.

“It makes me feel like it was the right decision,” Danny said.
MAAPP: Improving User Experience with New Student Financial Aid Application

As students prepare to enter college or a career training program, finding the funding to foot the bill can be difficult for families or individual students. These students apply for federal aid with the Free Application for Federal Student Aid (FAFSA) to help cover the costs of tuition and other fees. In addition to the federal government providing aid, state governments also offer student financial aid in the form of scholarships, grants, loans, and other types of funding, which differs state by state.

The state of Mississippi offers its residents millions of dollars in state aid to help pay for schooling within the state. Based on eligibility, students can apply for more than 20 programs online through the Mississippi Office of Student Financial Aid (SFA). Each aid year, beginning October 1 through September 15 the following year, SFA typically receives 60,000 to 70,000 applications.

To improve Mississippi applicants’ online experience, SFA, in partnership with the National Strategic Planning and Analysis Research Center (NSPARC), recently launched the new Mississippi Aid Application (MAAPP) system. MAAPP serves as a single application for all state student financial aid programs and as a student information or account system. The system provides a portal for students, administrators, high schools, and institutions to manage state aid applications.

“The new system is much more user-friendly and more intuitive in terms of how people use the internet and apps today.”

-Jennifer Rogers

Mississippi’s first online state aid application was developed and hosted by the Mississippi Department of Information Technology Services (ITS) in 2003. Though the application had been periodically updated for the past 15 years, the application still functioned with its original 2003 infrastructure.

After ITS informed SFA that they would no longer be able to host the application, Rogers and her team saw this as the perfect opportunity to renew the aging infrastructure to ensure the safety and privacy of SFA’s users and they soon began their search for a new host. After weighing their options, SFA determined...
NSPARC would be a great fit as SFA had already been working with the research center on an effectiveness study.

“I met with the NSPARC executive team, and they said, ‘we can handle this for you,’” Rogers said. “We spent the first year moving the existing application from ITS to NSPARC. They hosted our old app for a year while we were building MAAPP with the NSPARC software development team. We started from scratch and created a completely new platform.”

“It was a huge overhaul that needed to happen years ago,” Rogers continued.

**MAAPP’s Development**
Prior to MAAPP’s development, SFA asked the NSPARC software development team to maintain the old app until MAAPP was launched as its replacement. Software Project Manager and scrum master for NSPARC Clint Hester explained that since the old app was previously hosted by ITS, his team faced some challenges with investigating issues and deploying changes to keep the old app up to date.

“One of our first tasks with SFA was to update the branding of the old app. This was challenging as the old app used technologies that we don’t normally use at NSPARC, but we found a way,” Hester said. “The process is much easier now that we completely host the new MAAPP system.”

MAAPP’s official development began on January 14, 2019 when the NSPARC team and SFA conducted their first meeting and discussed the system and the addition of features. MAAPP officially went live on October 1, 2019 and has received 37,232 applicants as of March 2020.

This is approximately 223 submissions via MAAPP per day.

MAAPP users can visit [maapp.msfinancialaid.org](http://maapp.msfinancialaid.org) and register by filling out a short list of questions.

**The Roles in MAAPP**
With the new MAAPP system, users can easily navigate the site due to its enhanced functionality.

MAAPP allows users to distinguish themselves with four different roles: students, high school users (superintendents, headmasters, district counselors, and school counselors), institutional users (financial aid directors and financial aid administrators), and administrators. MAAPP’s functionality varies from user to user because it adapts to each user’s role and provides a different view of the dashboard depending on the role selected.

MAAPP walks student users through a step-by-step process in completing applications for programs. They can also view award information, access a message center linked directly to SFA, and view milestones that show a student user’s progress through the financial aid process.

High school users can view their students’ financial aid applications, status of awards, and submit grade information. They can also check to see if students are missing documents or have incomplete applications, generate reports based on MAAPP or FAFSA completion dates, and more.

Institutional users have the same privileges as high school users, but they can also manage a user’s access to student information in their institution.

Administrators can manage any of the MAAPP users’ accounts and adjust dates such as the SFA application and availability, deadlines, and renewals. Admins can also send messages to other users, view user activity for any role listed above, and view student applications and award statuses.

**Improved User Experience**
According to Rogers, 337 active high school counselors, as well as financial aid directors and administrators from the state’s 30 public and private colleges and universities, are using the MAAPP system. Jessica Hubbard, secondary counselor at Starkville Academy, shared her experience with the system.

“I found MAAPP to be easy and user-friendly. It did not take long to fill out the application.”

-Kimberly Jackson

“I like it as a counselor because I can check my students’ status more easily. I’ve got the app saved on my desktop, and I can tell students what they’re lacking,” Hubbard said.

Kimberly Jackson has been a school counselor for more than 15 years, providing services to elementary, junior high, and high school students. Having helped students apply for financial aid under the MAAPP system, she has witnessed the system’s impact on students and their families.

CAMPAIGN

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hundreds of Mississippi students over the years, Jackson did not hesitate when her friend asked for assistance in helping her son to apply for state financial aid.

"Even though I do not use MAAPP as an elementary school counselor, any school counselor can view student accounts and make adjustments, which is helpful especially for the students and parents who don’t have internet access," Jackson said. “When we used MAAPP to help my godson apply for student financial aid, I found MAAPP to be easy and user-friendly. It did not take long to fill out the application.”

MAAPP allows students more control over their application than the previous system. Students can see more information pertaining to the application, and they can update their application information more easily. Information updates are also reflected in real time with no worrisome delays.

MAAPP ultimately improves communication with the applicants.

By partnering together, SFA and NSPARC have created an intuitive and user-friendly MAAPP system to help Mississippi students apply for state financial aid with ease. SFA and NSPARC will continue to improve the user experience with periodic updates.

MAAPP can be accessed by users via desktop or mobile device web browser. To learn more about SFA and MAAPP or to apply for state financial aid, visit msfinancialaid.org.

Visit maapp.msfinancialaid.org to complete a single application for more than 20* state aid programs available in Mississippi.

*Based on program qualifications.
MSU Students Improve Lives of Children and Adults with Innovative, Award-Winning Projects

by Tori Boatner

Innovative thinking, cutting-edge research, and a passion for data were on full display by student researchers at the fourth annual Data Summit. Mississippi State University’s National Strategic Planning and Analysis Research Center (NSPARC) introduced its first juried poster symposium at Data Summit 2019 as another way to support and promote academic research at the university. It also gave MSU students an opportunity to share their pioneering ideas, receive valuable feedback, and gain visibility for their work.

A native of Saint Clair, Missouri, Kruse is currently a junior pursuing a bachelor’s degree in computer science. His winning poster was titled, “Anomaly Detection of Security, Privacy Attacks Disrupting Users’ Immersive Experience in Virtual Reality Learning Environments.” Kruse’s research highlighted recognizing potential cybersecurity threats in virtual reality learning environments designed to teach children with autism and learning deficiencies about social cues and responses.

Kruse’s interest in this research topic bolstered when he participated in a summer research program for undergraduate students at the University of Missouri (Mizzou). Funded by the National Science Foundation (NSF), this program focused on several technology-driven areas like graphics, virtual reality, space, and cybersecurity. Through his research, Kruse began to develop an interest in human-computer interaction. “Now I think I’ve found what I really want to do which is augmented reality, virtual reality, cybersecurity, and real-world application,” Kruse said.

“We decided to feature a poster symposium at Data Summit to showcase the hard work and research rigor of the next generation of scientists,” said Shane Warren, NSPARC research project manager and chair of the poster symposium committee. “If you’re doing research, you want people to see it. The research that I had the pleasure of reviewing at this event was very impressive.”}

The posters were judged by an evaluation panel, which included Warren and other MSU faculty and staff members. Brady Kruse and Samaneh Davarzani, both students in MSU’s Bagley College of Engineering, were named the undergraduate and graduate winners, respectively, taking home the “Research in Action” awards for their faculty-led research.

“Now I think I’ve found what I really want to do which is augmented reality, virtual reality, cybersecurity, and real-world application.”

-Brady Kruse
The MSU Provost Scholar spent 10 weeks at Mizzou, studying how to make virtual reality headsets more secure and less susceptible to cyberattacks.

“Unauthorized access to these connected devices can cause SP [security, privacy] attacks that can negatively affect the educational user experience and disrupt the delivery of data,” Kruse said. “This is why it was vital to investigate any SP issues that may affect the usability of VR applications and develop ways to detect attacks prior to disruption.”

Kruse and his team at Mizzou developed and used the virtual reality system, vSocial (based on Mizzou’s social competence curriculum), as a case study for their research. vSocial was established as a social competence intervention method to teach children with learning deficiencies about social responses and cues. When gathering cybersecurity research, Kruse asserted that there was not much research on cybersecurity threats within the virtual reality realm. As a result, Kruse and his team began to investigate how they could make virtual reality headset usage more secure by developing a system that detects potential SP attacks.

“Since this development is very new, we had to look into cybersecurity threats and network requirements,” Kruse said.

Because virtual reality requires the use of headsets, multiple vulnerabilities exist that could potentially hurt a user by instructing them to move or turn in a manner that could cause cyber sickness—when a VR user begins to feel disoriented or experiences cognitive displacement.

“We have these amazing machines that can do things that humans never could, and I think it’s really important that we apply it in a way that’s beneficial,” Kruse said.

Kruse’s research at Mizzou provided a framework for cybersecurity and virtual reality systems. This framework and algorithm can be used to detect network attacks on virtual reality environments. Kruse values knowing that his research will potentially help children and users remain safe while learning social skills. He says interconnecting cybersecurity and virtual reality to improve the educational learning experiences for children with autism and learning deficiencies was an insightful and humbling experience.

“This experience definitely opened my eyes up to the power that cybersecurity has to influence an individual’s life,” Kruse said. “It’s motivating and [I feel] a certain pride in saying, ‘I did that.’”

Anastasia D. Elder, interim associate dean for undergraduate research at the Judy and Bobby Shackouls Honors College and a Provost Scholars program mentor at MSU, played a key role in guiding Kruse throughout the research process. Kruse credits her for encouraging him to showcase his research at Data Summit 2019 as this opportunity granted him a plethora of exposure and feedback on his research.

“I thought it was a great gesture to involve students in a competition where they could highlight and showcase their use of data in different fields,” Elder said.

Because of Kruse’s curiosity and his ability to think deeply about topics, Elder was certain his research would be very competitive.

After winning the ‘Research in Action’ award at Data Summit 2019, Kruse submitted a scholarly paper about his research to a peer-reviewed journal; it is currently under review. He is now participating in augmented reality research at MSU.

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Anastasia D. Elder

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Graduate winner Samaneh Davarzani is working toward a Ph.D. in industrial and systems engineering at MSU. Her winning poster was titled, “Supervised and Unsupervised Machine Learning Techniques in Heart Disease Prediction.” A native of Iran, Davarzani presented her findings on machine learning techniques that could increase the accuracy of the prediction and treatment of heart disease. According to the Centers for Disease Control and Prevention (CDC), heart disease is the leading cause of death for both men and women in the United States. As a result of the growing demand for research, Davarzani was inspired to implement data mining to improve the overall quality of healthcare by seeking to decrease the amount of diagnostic errors.

“This framework is very beneficial and helps society to live better and longer,” Davarzani said. “Quality healthcare contributes to humans’ happiness and wellbeing, and I am passionate about improving people’s lives.”

Having experienced the effects firsthand through her mother’s own struggle with heart issues, Davarzani was determined to continue her research in finding ways to early detect issues of the heart. As a result of her research and experiments employing different unsupervised and supervised algorithms, she provided a model for prediction of coronary heart disease with high accuracy.

For researchers like Davarzani, this research is only a step in achieving early heart disease detection. Davarzani says tools like data mining will be instrumental in developing a collection of procedures that help investigate and analyze data. This will allow researchers to obtain valuable information that will help practitioners in diagnosing and treating patients.

“There is great potential to adopt data mining algorithms and integrate them into the healthcare systems’ workflow to provide better care for the patients,” Davarzani said. “Therefore, it is beneficial to design procedures intended for mining cardiovascular data for the prevention, prediction, and treatment of heart disease.”

Davarzani says knowing that she is making a difference makes her research worthwhile. Her research in machine learning has contributed to her success in healthcare and beyond. Data mining is not only used for disease prediction, but this tool can be implemented for treatment recommendation and streamlining administrative processes in hospitals.

Davarzani credits her advisor Brian K. Smith for believing in her abilities and encouraging her to participate in NSPARC’s juried poster symposium. Smith, who serves as professor of industrial and systems engineering in the Bagley College of Engineering at MSU, explained that Davarzani has had an incredible work ethic from the beginning.

“She’s really interested in using her skillset in engineering and data analysis to try to improve healthcare,” Smith said. “The opportunity to work with someone that has demonstrated an ability to work independently on their own development idea and see it through is rare.”

According to Smith, this leading research was not only competitive during the symposium, but is also crucial to the betterment of healthcare and society.

“Working on these big problems and huge challenges that could impact people’s quality of life is very rewarding and fulfilling,” Smith said of their team’s research. “Davarzani’s passion to discover tools to assist in the early detection of blockage in the heart was so apparent, and her unyielding drive has contributed to her success thus far.”
When you’re a leader, people watch to see what you’ll do next. Nobody knows that better than Mississippi State University. For years we’ve been leaders in the world of aerospace engineering. MSU now serves as the national lead university for the Federal Aviation Administration’s Center of Excellence of Unmanned Aircraft Systems, putting us on the cutting edge of this new era of research, development and integration into the nation’s airspace. We’re driven to lead the way. Keep watching as we soar to new heights. RESEARCH.MSSTATE.EDU

IMAGINE THE FUTURE OF AEROSPACE. WE ARE.
On Valentine’s Day, February 14, 2020, CNN reported that an 80-year-old widower from Oregon lost $200,000 in an online romance scam. The victim befriended a scammer through an online dating service and was coaxed to send money. And he is not alone, about one-third of Americans are victims of some form of cybercrime or online fraud each year. According to CSN, cybercrime and online fraud are illegal activities on the internet (websites, email, social media, etc.) that involve communicating a false or dishonest representation to people or businesses.

Although there are several federal reporting systems available, cybercrime and online fraud are often underreported. Approximately only 15 percent of victims report these crimes to the Federal Bureau of Investigation’s (FBI) Internet Crime Complaint Center (IC3), which is the main federal reporting mechanism for internet crimes in the U.S. Underreporting is often due to a lack of awareness of these resources. Many of these victims naturally turn to 911 for help. However, after speaking with operators that specialize in handling only health and public safety emergencies, they are often left underserved and are victimized again.
So, where can people go for help after becoming a victim of cybercrime?

This is the question that CEO and President of CSN Kristin Judge was motivated to solve. During her time as a county commissioner in Michigan, one of her constituents asked her to point them in the right direction after a family member was scammed on Facebook. She told them she didn’t know, but she would find out. In 2017, Judge established CSN, a public-private nonprofit collaboration that serves as the voice of cybercrime victims, and began conducting research on how to best serve these victims.

“The problem we’re trying to solve is if a consumer or a small business is a victim of cybercrime, they don’t know the first place to go to get help. There are law enforcement agencies as well as 18 different hotlines that you can get different kinds of help,” Judge said. “Most of these places don’t have a trained staff to provide cybercrime support, so there has been this gaping hole in the services and the connection to services for cybercrime victims, and we realized we needed one simple number for people to call.”

During her time as a legislator, Judge worked closely with United Way and saw value in the 211 program. Led and supported by United Way in many communities, 211 is a text/call/chat helpline that connects people with resources for mental health, food, shelter, clothing, water crises, COVID-19/coronavirus recovery, and disaster relief. In the U.S., there are more than 200 agencies that provide 211 services with trained specialists that handle more than 12 million requests for help by phone, text, and web chat annually.

“Kristin and I began talking about a real partnership about three years ago when she was first launching CSN. 211 already had the infrastructure and an easy-to-remember number, so why not become the clearinghouse for a complex issue like cybercrime,” said Rachel Krausman, senior director at 211 United Way Worldwide. “The partnership has provided many 211s with additional resources, training, and capabilities to serve cybercrime victims and provide communities with an easy place to go for help... Our mission is really to shorten the distance between a person in need of help, and the cybercrime hotlines launched through 211 really epitomize that.”

Securing Funding for Cybercrime Victim Support

Prior to the 211 launch, CSN sought multiple funding opportunities to help move forward with its Cybercrime Victim Support Initiative. The U.S. Department of Homeland Security (DHS) Cybersecurity Infrastructure Security Agency (CISA) awarded CSN with a $1 million cooperative agreement to create a state, local, tribal and territorial (SLTT) reporting and threat information sharing pilot to address threats to consumers and small and medium-sized businesses. With this funding, CSN is working with partners to develop a standardized reporting platform to capture more cybercrime victim complaints and deliver the data to SLTT and federal agencies that have the authority to handle said complaints.

The U.S. Department of Justice (DOJ) Victims of Crime Act (VOCA) awarded federal funding for CSN, 211 centers, and law enforcement partners to launch the first pilot program in Rhode Island. The DOJ Office for Victims of Crime also awarded funding to launch pilots in Central Florida and Western Michigan. These pilots have given CSN and United Way the opportunity to train 211 referral specialists to help victims and 911 dispatchers to pinpoint a cybercrime and refer victims to 211, law enforcement, or other relevant resources.

“We believe we are going to decrease the number of repeat victims, which will decrease the amount of overall victimization,” Judge said.

In accordance with fraudsupport.org and cybercrime support through 211, CSN created a step-by-step process for victims. Judge says the first step is to visit fraudsupport.org, which provides assistance to both individuals and small businesses. If 211 is live in the state, a popup will let the user know they can call 211 to speak with a trained specialist. If 211 is not live, the users can utilize the site to learn how to (1) report the issue, (2) recover from the issue, and (3) reinforce their security so they can be safer.

Since the website’s launch, more than 480,000 cybercrime victims have been served with immediate access to resources.

“After someone calls 211 to get help, we do an evaluation two weeks later, and they are reporting to us that they don’t feel they will become a victim again,” Judge said. “Ninety percent of the people surveyed are rating that they leave satisfied or very satisfied with the service received.”

Serving as a Tool for Law Enforcement

According to CSN, cybercrime support is not only a source for cybercrime victims, but also one more tool for law enforcement to utilize.

“Now, law enforcement can provide us [CSN/211] as a...”
resource to people who have been victimized. There are a lot of crimes that are being reported to law enforcement right now, some of which are not appropriate to give to them or tie up 911 lines,” said Program Managing Director of Victim Services at CSN Mark Batchelor. “They work on what they can for victims, but sometimes it’s not feasible to send out a deputy to take a report on something like a phishing scam from out of the country.”

Batchelor manages the pilot programs in Western Michigan and Central Florida. Through the pilot programs, law enforcement has been able to focus more on investigating criminal activity while the call center specialists provide information and resources to help people who are victims of cybercrime and online fraud.

“I often tell people the single most important thing to remember about fraud is it’s a crime of deception. The bad actor [criminal] is trying to convince you of a false reality whether it’s done on a computer, phone, or in person,” Sergeant Robert Bell said.

Bell supervises the Economic Crimes Squad at the Orange County Sheriff’s Office in Orlando, Florida. Bell and his team have been working closely with CSN and the Heart of Florida United Way 211. He says his unit typically receives a heavy volume of calls each day, and the 211 call center has been helping to assist many of these callers.

“The operators at the center have been specially trained in educating the public on how these crimes work and then how to respond,” Bell said. “In fact, they have time to walk victims through the IC3 website. Then, of course, here in Orange County, we ask the call center to refer them back to us to see if there is anything we can do locally to help that victim in terms of coordinating with the bank or the like.”

Bell asserts that though law enforcement and the 211 referral specialists do all they can for cybercrime victims, the victims have to be actively involved in their own recovery for crimes like identity theft. While law enforcement investigates the criminal activity, the victim is placed in the position to reach out to retailers where their information may have been used or submit reports to financial institutions to get reimbursed for any losses. Thanks to fraudsupport.org and the 211 call center specialists, these victims are armed with resources to complete each of these actions on their path to recovery.

“The more we expose members of the public to the kinds of schemes these criminals engage in and how to recover from that, the less likely they are to be victimized,” Bell said.

Developing a Partnership with NSPARC

In September 2019, CSN developed a partnership with NSPARC for the Cyber Reporting and Information Sharing System (CRISS), which will provide cybercrime victims with an easy-to-use reporting form to report their losses directly to the respective law enforcement agency. The goal of this effort is to equip law enforcement and government agencies with real-time cybercrime data that will, in turn, help in locating cybercriminals quicker and more efficiently.

NSPARC has been tasked with creating the standardized reporting form that will capture the information provided by cybercrime victims from across the county.

“When the NSPARC development team first met with CSN, we demonstrated a similar product that we developed and shared some of the lessons we learned along the way,” said Clint Hester, software project manager for NSPARC. “They were impressed with our work, and we began working with CSN to develop the reporting form.”

According to NSPARC’s Manager of Security and Compliance Craig Shorter, the partnership with CSN and the Center for Internet Security (CIS) in building CRISS will support the CIS’s continued efforts in protecting the nation’s critical infrastructure.

Expanding the 211 Program

In October 2019, CSN received VOCA funding to expand the Cybercrime Victim Support Initiative to North Carolina, New Jersey, and Mississippi. Additional states are in the process of being added to the expansion.

For the Mississippi program, CSN has partnered with the United Way of the Capital Area to provide 211 cybercrime support for Mississippi residents. NSPARC will be responsible for evaluating the success of the Mississippi program.

“The goal is to learn about the program that we’re building for 211 in Mississippi,” Judge said. “NSPARC will serve as our evaluator to make sure we are doing a good job at helping people in the state.”

Increasing Awareness in Mississippi

According to Mississippi Program Director of Victim Services at CSN Heather Bradley, one of the biggest challenges that CSN as a whole has been working to overcome is spreading awareness of 211 and fraudsupport.org resources. In her role, Bradley is taking a boots-on-the-ground approach to build...
relationships and inform the public about the resources available to them.

“I am typically out making contact with local law enforcement, associations, and local nonprofit organizations and establishing contacts in the community,” Bradley said. “From there, we’re going to start offering classes and helping with senior citizen education, which is one of our targeted demographics.”

In her outreach, Bradley has been working with the National Guard to share information about the initiative with military personnel and their families. She also met with the Mississippi Library Commission about distributing CSN’s printed material, such as rack cards and posters, in libraries across the state. As CSN continues to expand its outreach, Bradley is looking forward to the growth of the Mississippi program in the coming months.

“I am proud that Mississippi is the second state to go live statewide with this program. I feel that it’s very progressive of our state leadership to see value in this program.”

Seeking a Nationwide Solution for the Future

By developing fraudsupport.org and working with United Way and 211 agencies, CSN’s Cybercrime Victim Support Initiative is helping to bridge the gap in services for cybercrime victims. It is Judge’s goal to offer cybercrime support through 211 to all 50 states in the near future. Judge and her team will continue to build and maintain partnerships that help to minimize re-victimization and ensure individuals have access to the help they need.

Representatives from CSN and NSPARC recently traveled to Washington D.C. for a meeting with CISA at DHS to discuss the progress of the cooperative agreement to create a uniform cyber reporting structure.

“I am proud that Mississippi is the second state to go live statewide with this program. I feel that it’s very progressive of our state leadership to see value in this program,” Bradley said, “And since the program is funded by VOCA dollars, the taxpayers don’t pay a dime.”

“Everyone agrees that it takes collaboration to ultimately create a single pipeline for reporting. It is unrealistic to think that just one federal agency can handle all the online crime, but it has to be a partnership among every level of government,” Bell said. “And, then bringing in these community resources to help raise awareness and educate the public on cybercrime and the support that is available to them.”


FraudSupport.org is here to help.
A first of its kind resource database to provide you with guidance on how to report, recover, and reinforce after a cybercrime, giving you a place to turn for the simple answers you need.

In addition to providing resources for individuals and small businesses, fraudsupport.org has expanded its recovery resource database to include targeted resources for senior citizens, caregivers, teens, and children. For more information on CSN, visit cybercrimesupport.org. To learn more about United Way or 211, visit unitedway.org or 211.org.
With the rise of wearable technology, the sports industry has adapted to this cultural change by introducing data scientists into teams’ organizational environments. In their search for talent to fill these relatively new roles, professional organizations such as the National Basketball Association (NBA), National Football League (NFL), and Major League Baseball (MLB) are recognizing a shortage of engineering graduates who have preexisting, hands-on experience both collecting and interpreting human performance data in a real-world environment.

To meet the growing demand for these specialized professionals, Mississippi State University has developed the athlete engineering student pipeline, providing a new educational avenue to bridge the gap between engineering and human performance in the sports industry. Students are learning to make data-driven, strategic decisions that will influence athletes’ training, performance, and recovery programs.

Athlete engineering at MSU is a multidisciplinary research collaboration between MSU’s academic and athletics departments using both laboratory equipment and sport-specific wearable technology to explore human performance and movement baselining. Funding and mentorship are provided via MSU’s Bagley College of Engineering (BCoE), Center for Advanced Vehicular Systems (CAVS), and National Strategic Planning and Analysis Research Center (NSPARC). The mission of this initiative is to bring together researchers from all engineering disciplines, as well as kinesiology, sociology, and psychology researchers, with athletic practitioners such as strength and conditioning coaches (S&CC), athletic trainers (AT), and nutritionists, to enhance the student athletes’ safety and link human factors and performance technology.
**Birth of Athlete Engineering**

When Burch taught the introduction to industrial engineering course during his first year as a professor at MSU, two of his students asked him how they could work for a sports team as engineers.

“They asked me, ‘Is that even a real job and how could I get hired?’” Burch said. “That’s when I remembered Steve Weinman’s story, and I told them I would figure it out.”

Burch admired Weinman’s rise from intern to analytics professional in pro sports. Eleven years ago, Weinman secured an internship in the NBA league office while studying at the University of Missouri. He worked there for two seasons. During this time, there was not much data available in the NBA. During meetings, he would always pose a question to leadership about analytics.

According to NFL Sports Science Consultant Ted Lambrinides, it is important for teams to utilize sports analytics for both safety advantage and competitive advantage. He asserts that having data from wearables give coaches objective numbers, instead of just guessing. Thus, analytics help coaches and their athletes gain more confidence in the process.

Weinman’s hard work and inquisitiveness in analytics led him to holding a myriad of responsibilities within NBA league operations, one of which was serving as basketball analytics liaison to team personnel. He is now assistant general manager of the Chicago Bulls. For Burch, Weinman’s story was proof that unique careers in the sports industry was viable.

“I was able to get the two students a job later that semester assisting the strength and conditioning coaches for men’s and women’s basketball, and that’s how athlete engineering was officially born at MSU,” Burch continued. “Students had questions about their career choices, and I did my job as a professor and figured it out.”

In January 2017, athlete engineering at MSU began as a working group at BCoE with 15 academic and athletic personnel, all interested in discovering how to grow a research partnership. Now, just over three years later, athlete engineering has grown to about 90 people, depending on the semester. Athlete engineering at MSU has also received more than $1.5 million in funding, with six awards (nearly $1 million) coming from the National Science Foundation (NSF), toward building MSU’s own wearable technology.

“We complete anywhere from 12 to 15 projects or data assistance-based efforts every year,” Burch said. “We have published 10 articles based on our athlete engineering research with many more on the way and in review so others in academics and athletics can see what we’re doing and potentially partner with us.”

**Bridging the Gap**

One of the goals of the athlete engineering student pipeline is to keep one or more graduate or undergraduate students partnered with each strength and conditioning team in MSU athletics to (1) run their technology, (2) generate data reports for the coaching staffs, and (3) lead research experiments with oversight from both research faculty and athletic practitioners.
Zach Shelly, an industrial engineering graduate student at MSU, is exploring the space between data and athletics. As an athlete engineering graduate assistant, Shelly works with the university’s football team to analyze athletic data collected by sensors worn by players during practices.

“I’ve been helping the Mississippi State football team for the last two years,” Shelly said. “I do most of my work directly through the strength and conditioning team, and Catapult [GPS performance tracking system] monitoring is one of the main things we do with wearable tech. I go in and just run that system for them and then generate reports, and they use the reports to influence their decisions and also present to head coaches.” Preston Robertson, a junior industrial engineering student at MSU, works with strength and conditioning coach Collin Crane for the MSU men’s basketball team. Robertson has worked with Crane since his freshman year, analyzing data gathered from the sensors worn by athletes during their basketball practices. He then helps Crane provide adequate, specific workout plans that benefit the athletes’ personal needs.

“After analyzing a practice, Preston and I talk about the stress that the athletes are under,” Crane said. “We talk about our future game schedule and where we’re at from a conditioning standpoint and a stress management perspective. We look to see if we are pushing too hard, going hard enough, and things like that. Then, we decide what we are going to communicate to the coaching staff.”

Communication is a large part of bridging the gap in human factors and performance technology. Open communication between the data analyst and the coaching staff is vital to success in these athletic programs.

“One of the common themes I’ve seen across multiple collegiate settings is ensuring that communication channels are set up in a way that if we’re collecting information from multiple technology programs, we know who is analyzing and delivering this information to the sport coach, with that coach then being able to use that information to drive decision-making in planning practices,” said Stephanie Mock, director of Olympic Sports strength & conditioning at MSU.

“Our biggest goal is to make the communication of information clear and concise.”

Two athletic engineering interns have been placed under Mock’s guidance during the spring semester.

“I think teaching them how to speak the language with the sports coaches and understanding the sport [is vital],” Mock says.

“After analyzing a practice, Preston and I talk about the stress that the athletes are under,” Crane said. “We talk about our future game schedule and where we’re at from a conditioning standpoint and a stress management perspective. We look to see if we are pushing too hard, going hard enough, and things like that. Then, we decide what we are going to communicate to the coaching staff.”

Building relationships is also another important element in bridging the gap. Crane says that Robertson’s involvement and the relationships that Robertson has been able to cultivate with the players and coaching staff has benefited everyone in the program. Through working together, Crane and Robertson have been able to progress the men’s basketball preseason conditioning program over the years by better managing student athletes’ stress.

Since Robertson has exceeded in his position, Crane explains that finding undergraduate students to train under Robertson would help MSU keep the athlete engineering student pipeline strong and successful.

New to the athlete engineering student pipeline is industrial engineering graduate student Sam Osborne. He says he is eager to join Shelly as an athlete engineering graduate assistant and gain hands-on experience with the MSU football team.

“I think teaching them how to speak the language with the sports coaches and understanding the sport [is vital].”

– Stephanie Mock
“I am looking forward to learning from any and all of the experiences and relationships that come my way,” Osborne said. “I can learn so much from the groups that I will be working with, whether it is data collection methods and skills, research methods and skills, project work, sports culture analysis, sports performance analysis, or really anything else. I hope to utilize what I learn through this opportunity to find a career in a sports performance-related field.”

Weinman says the more bright, passionate, hard-working people in the industry, the better.

“Dr. Burch and his staff appear to be doing a superb job of identifying talented people and providing a forum for them to develop their skills and display their work in a way that will help create opportunities for them within the sports industry,” Weinman said. “Combine smart, driven people with advancing technology, and the possibilities are limitless.”

Pipeline Produces Future Talent in Sports Industry
MSU’s athlete engineering student pipeline is making strides in producing talented data scientists and engineers to meet the growing demand in the sports industry.

Athlete Engineering Summit
For those interested in learning more about sports technology and the integration of engineering into the sports environment, plans are underway for the inaugural Athlete Engineering Summit. The date of the event is to be determined. Hosted by four units at MSU—NSPARC, CAVS, Bagley College of Engineering, and the MSU Athletics Department—this two-day summit will focus on the “Secret Sauce” to improving the human athlete and bring together researchers from various educational backgrounds and athletic practitioners to share ideas that further enhance athletes’ safety.

For more information as it becomes available, visit athleteengineeringsummit.com.
At any given time at any child care facility in America, the children who are on the floor tinkering with an abacus or stacking blocks are the faces of the future...future teachers, scientists, engineers, and more. At this early stage of development, it’s important for states across the U.S. to take the steps necessary to ensure these little humans have the best opportunity to learn and build skills needed for lifelong success.

The state of Mississippi has gained national attention for its efforts in improving early care and learning for approximately 16,400 children and their families in the state. Out of 160 applicants, Mississippi was among 15 finalists selected to pitch its idea at the Saul Zaentz Early Education Innovation Challenge at the Harvard Graduate School of Education. The Zaentz Early Education Innovation Challenge provides funding to recognize new ideas, programs, or projects that work toward positive experiences in early care and education (home, classroom, program and networks, and/or policy).

Mississippi’s winning idea was “Connected for Success: A Family-Based Unified and Integrated Early Childhood System,” a multi-level, collaborative effort to create a unified statewide framework in the state and improve quality of child care and services for children and their families across the state’s mixed-delivery system.

“The primary goal for submitting to the Challenge was to share the work we were doing in the state and to gain feedback on what other states were doing and how that could inform our work,” said Micca Knox, assistant executive director for the Early Childhood Academy (ECA). “To me, our accomplishment in this challenge means that we finally have the right people in the right place working together to do what’s right for families and children.”

Under the State Early Childhood Advisory Council (SECAC), different agencies across the state formed a partnership and began working together to build...
this system from the ground up. These agencies include, but are not limited to, the Mississippi Department of Human Services (MDHS), Mississippi Department of Education (MDE), the Mississippi Office of the Attorney General, Mississippi Board of Education, Mississippi Community College Board (MCCB), Mississippi Head Start Association, Mississippi Department of Mental Health, Mississippi Division of Medicaid, ECA, and the National Strategic Planning and Analysis Research Center (NSPARC). According to NSPARC Research Associate Katerina Sergi, the first step in building the system was to discover the specific issues to address. The state conducted a statewide needs assessment in 2014, which analyzed the past and current problems in the early education and care system. Issues boiled down to a lack of qualified and trained early learning workforce, a flawed quality care rating system, a lack of state funding for preschool, and fragmented early service delivery. These issues stemmed from small unaddressed problems inside all child-centered agencies across the state. The resulting goal was to build an efficient system that was well-coordinated and connected each of the agencies together.

“The foundational work for ‘Connected for Success’ began in 2016 from the hard work of SECAC. My work began in 2017 with the development of the state’s ECAs with MCCB,” Knox said. “In my role, I provide direct oversight to the ECAs. We are responsible for serving as the primary support mechanism for child care providers in the state who participate in the child care payment program.”

According to SECAC’s website (secac.ms.gov), funding for “Connected for Success” was provided through the Preschool Development Grant Birth through Five (PDG B-5), a $10.62 million grant awarded by the United States Department of Health and the United States Department of Education to MCCB. This funding has helped improve coordination, quality, and transition within Mississippi’s early childhood system.

Over the past year, the state has sought to build on the foundation of Mississippi’s initial accomplishments by achieving two main goals: (1) expand the state’s integrated and coordinated quality framework statewide to the entire mixed-delivery system, including family-based care, and (2) bring child development resources and services directly to families in early learning environments to ensure that children can access the developmental services they need to succeed in their efforts to learn.

When the Saul Zaentz Early Education Initiative at Harvard Graduate School of Education welcomed submissions for the Zaentz Early Education Innovation Challenge, the partners agreed that Mississippi’s project would be a great fit. As collaboration is the key to Mississippi’s continued
success, designated team members worked together to complete the proposal.

Mississippi’s proposal was submitted in the Scaling Track (for initiatives that have already been launched). In the proposal, the state described its effort for reimagining early childhood education and care. It detailed the quality framework of Standard and Comprehensive designations for early learning and care centers, the establishment and role of ECAs, and some of the activities realized through PDG B-5, including the individualized service plan for child and families, the electronic scorecard for child transitions, and the expansion of the quality framework.

Proposals were judged based on three criteria: quality, relevance, and design. Mississippi and fourteen other finalists were selected to travel to Harvard and give a three-minute pitch, followed by a three-minute Q&A session. Final pitches included the problem, solution, future of the proposal, and a reflection of the five values of the Saul Zaentz Early Education Initiative—aspiration, equity, scientific integrity, connectivity, and communication.

Representing the state of Mississippi at the event were Knox and Sergi as well as Jim Miller, alignment specialist for PDG B-5, and Yumeka Rushing, independent consultant to PDG B-5. Knox and Sergi presented “Connected for Success” onstage to a live audience and a panel of expert judges. Knox found the most difficult part of the final pitch to be the time limit.

“One of the biggest challenges, for me personally, was figuring out how to condense years of amazing work down to a three-minute presentation,” Knox said. “It was very important for us to highlight the accomplishments thus far without leaving out any pertinent details.”

After each pitch, the event’s judges had the opportunity to provide feedback and ask questions.

“The judges were very complimentary of the work and spoke positively about the system’s building and alignment we are working to achieve in the state,” Knox said.

At the event, Mississippi racked up a number of accolades: the state placed third in the Scaling Track, earned the Audience Choice award, and received a $5,000 cash prize. This recognition for the state of Mississippi brings awareness and prestige to the state’s efforts to improve the early childhood system and aids in funding the continued development of programs to benefit Mississippi families.

Knox marked Mississippi’s participation in the Zaentz Early Education Innovation Challenge as another step in the right direction for the state.

“Mississippi is on an upward trajectory of success and being selected for this competition and placing proves that,” Knox said. “It shows that regardless of a family’s circumstances, they are able to receive support that will place them on the path of being self-sufficient, and they can trust that their children are growing, learning, and being nurtured in high-quality learning environments because Mississippi has made the necessary investments to ensure it.”

Attendees will learn how the human element will continue to be vital as the data economy expands and technology advances.

For details, visit datasummit.info
Assessing Hydrological Resources

Vital to Mississippi’s Agriculture

by Jan Woody, Ph.D.

Understanding the risks and rewards linked to the state’s agricultural resources requires understanding the associated environmental processes. In particular, the state’s hydrological resources merit close consideration. Rainfall in Mississippi is often evenly distributed across the calendar year (unlike monsoonal conditions in some more tropical climates), with some drier conditions typically in the fall. However, atypical drought and flood conditions certainly impact agricultural and even recreational interests.

Flooding is frequently associated with local extreme rainfall events. Therefore, it is critical to understand the statistical distribution of high precipitation events. This will allow agricultural interests to better understand how frequently flood and drought events may be expected.

The Next Generation Weather Radar (NEXRAD) system is among the most trusted sources for observing and estimating precipitation. Scores of studies have used NEXRAD data to estimate, and in turn, predict precipitation accumulation. While considered among the best methods for estimating precipitation amounts, the overall coverage for this ground-based methodology is limited, depending on the location of radar stations. Many such stations are frequently located near population centers and therefore, underrepresented in more rural locations with agriculturally-based economies.

In contrast to the ground-based NEXRAD precipitation estimates, the Climate Prediction Center Morphing (CMORPH) method is a satellite-based technology. The CMORPH method analyzes cloud cover formations to estimate precipitation.

Since the technique is satellite-based, the method has working functionality on a global basis.

Statisticians at Mississippi State University’s National Strategic Planning and Analysis Research Center (NSPARC) have developed methodology to statistically tune the upper quantiles of the most extreme precipitation estimates of CMORPH to those of NEXRAD, therefore providing enhanced estimation and prediction capability for more rural and agricultural areas.

The tuning methods are significant, requiring an understanding of the extreme value theory (EVT), a mathematically rigorous area of probability theory. The notion of statistical extremes relates to the very largest and very smallest observations of a random process. For example, EVT may be used to quantify the distribution of the world’s fastest one-mile run (minimum) or the longest standing broad jump (maximum). Likewise, one may be able to quantify the distribution of maximum stock returns, maximum pumpkin weight, maximum baby weight, or even maximum precipitation events. Statistically speaking, these extremes all follow the same rules of probability.
However, if the underlying measurements of all the precipitation events are biased (especially the very largest or smallest), then the estimates of statistical extremes may not be useful. This was the case with the CMORPH-based estimates. With the probability theory for tuning CMORPH to match NEXRAD extreme precipitation estimates constructed, a more complete description of high precipitation events in the region is now available.

Securing a better understanding of local hydrological resources requires more than just monitoring local water tables. While monitoring and predicting local precipitation is an important consideration for predicting flood conditions (especially flash flooding), there are certainly other hydrological considerations that must be monitored.

Snow comprises a critical component for hydrological considerations of the state. Spring 2011 experienced near record levels of snowfall across the portions of the mountain west. Across the northern and central Rockies, snowpack values were more than 180 percent of their typical values in many locations.

After experiencing extreme rainfall in late spring, a rapid melt-off flooded the Yellowstone River, the longest un-dammed river in the contiguous United States.

While the Missouri River’s tributaries and the river itself were already swollen due to melt-off, the southeastern United States experienced two record-breaking bouts of severe weather. The April 14-16 and the catastrophic April 25-28 severe weather outbreaks inundated Mississippi River’s tributaries throughout the South.

The overlapping of these and other events led to a once-in–500-years flood of the Mississippi River in May 2011. Parts of downtown were flooded from Bay St. Louis in south Mississippi through Vicksburg and beyond for towns bordering the Mississippi River shoreline.

Scientists at NSPARC have adopted storage model approaches to modeling the hydrological resources stored in the mountain snowpack. These storage models are state-of-the-art statistical methods that may be adapted to assess departures from normal during any season. Trends in mountain snowpack may also be assessed.

In order to optimize the state’s environmental and agricultural resources, hydrological concerns are among the most critical components to be considered. Holistic insight of these local resources requires understanding snowfall in the mountains in western U.S. to measurements provided by space-based satellite systems. All of these resources may be assessed to provide a better understanding of the hydrological resources that are vital to the state’s agricultural interests.

Snow depth prediction graph
Annie: Can you tell me about your team’s role in becoming FedRAMP compliant?

Hal: It is very challenging to meet the federal standards and be certified, but once we do, NSPARC will be able to handle the most sensitive data in an environment sanctioned by the U.S. Federal Government. NSPARC’s IT team, in close collaboration with the NSPARC security and compliance team, is currently defining a special suite of hardware and software that we can “lock down” and provide FedRAMP cloud services as an Infrastructure as a Service (IAAS) to customers who require a federally-certified platform.

Annie: How did this upgrade come about?

Hal: NSPARC started down this path because many federal and state agencies require a FedRAMP-certified platform to be allowed to host their systems. A majority of state governments also require hosts, like NSPARC, to meet almost identical standards. We could see that the future will require such a controlled, secure platform before we could host systems for our new and even existing customers. This upgrade will also allow many other potential providers to partner with NSPARC and host their work here.

Annie: How does the FedRAMP upgrade distinguish NSPARC from other university or business data centers in the state and the Southeast?

Hal: Once we are certified this year, NSPARC will be one of six or seven universities in the U.S. that is certified as FedRAMP compliant, and one of less than 50 such hosts of any type in the country. We are also on the path to potentially becoming the first FedRAMP facility in Mississippi.

Annie: How will FedRAMP benefit NSPARC, Mississippi State University, and Mississippi as a whole?

Hal: NSPARC’s FedRAMP-certified cloud hosting facility will provide a secure platform to process and store the most sensitive data in a safe, secure federally-certified manner. It will not only benefit NSPARC and Mississippi State University, but also provide others in the state and region the opportunity to leverage our FedRAMP facility to provide such services to their own customers.

Annie: How long will this upgrade take and when is it expected to be completed?

Hal: We have already been working on the specifications and compliance requirements for more than six months. It is not a quick, easy, or inexpensive process. We will continue to work toward our certification and expect to be complete later this year.
ABOUT NSPARC

NSPARC overcomes workforce, education, and economic development policy challenges through research-based data and technology solutions. A nationally-recognized research center, NSPARC innovates in areas such as data analytics, predictive analytics, machine learning, data governance, and cybersecurity to improve the human condition.

NSPARC has extensive experience in the application of data science in every major area of enterprise software development, data security, and IT infrastructure, including:

- Case Management System Design and Coding
- Mobile Development
- Reporting and Regulatory Requirements Gathering
- User Experience/User Interface Design
- Electronic and Digitized Paper Record Handling
- Real-Time Consumption of Third-Party Sources of Information
- Interagency Coordination Systems
- Data Security and Monitoring

OUR EXPERTISE

Known primarily for our work in support of smart government, NSPARC has achieved national prominence with its use of data science (the field of study that examines new methods for the use of data) in economic development, workforce development, education, and delivery of human services at all levels of government.

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OUR VISION & MISSION

Our vision is to become among the best in the data science field by using the smart-city concept as an intellectual framework.

Our mission is simple: to advance the use of data science to drive human progress.

We seek to lead a data revolution for the betterment of our global society.

Imagine a world where sustainable energy powers our daily commute and where our nation is safe from cyber-attacks. Imagine a world where food shortages are replaced with food abundance and where the flu is something our children will read about in history books. Imagine a world where the spark of an idea can grow into a solution that molds the future. Imagine a world where inspiration gives birth to innovation. We are, at Mississippi State University, where we ring true. MSSTATE.EDU