DAKOTA STATE UNIVERSITY

GRADUATE PROGRAMS

2022 | A YEAR IN REVIEW

GRADUATE PROGRAMS

ANNUAL
NEWSLETTER

YEAR IN REVIEW

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INSIDE

DAKOTA STATE
UNIVERSITY

GREETINGS FROM GRADUATE PROGRAMS

A Message from the Dean

When you hear that Dakota State is rising, know that the Graduate Studies program is an important part of that, not only in 2022, but over the last 10 years.

Our student numbers were up 7.4% over this past fall, but over the previous 10 years, we've increased enrollment from 238 students in 2012 to 484 this fall. Program offerings have increased in number, too, from seven programs and certificates in 2012, to 21 in 2022. A new certificate in esports is in process.

Last fall, we reached a new application record for Spring 2023, with 293 applications received for our seven master's programs alone. This trend will likely continue, because we will be part of the Cyber 27 marketing campaign to bring awareness to Dakota State's quality programs.

Our graduate students are already having an impact worldwide. In 2018, the Karl Mundt Library started an institutional repository, Beadle Scholar, to collect and share the scholarly work of Dakota State University. Since then, all master's theses and doctoral dissertations have been added to the site. These items are now available electronically, through services such as Google Scholar. Currently, there are 385 theses and dissertations in Beadle Scholar, which combined have been downloaded over 45,235 times! Readership comes from around the world, from those in industry, education, government, and military organizations.

This global reach promises to grow as our students collaborate with other colleges and programs, including international research opportunities through a new consortium with AI Sweden.

After serving as Graduate Dean and Interim Dean of Education last year, I am happy to return all my attention to Graduate Studies. But no matter my role, I never tire of hearing about the amazing things you do in your communities and workplace. We are very proud to call you alumni.

Mark

Dr. Mark Hawkes
Dean, Graduate Studies and Director,
Center for Teaching and Learning

Student News

DSU on the cutting-edge of Edge Learning

"Cutting-edge" is a term often used to describe Dakota State.

Through a new consortium with AI Sweden, Dakota State is now on the cutting edge with a new area of Artificial intelligence (AI) called edge learning.

Edge devices include smart watches, self-driving cars, or home appliances that connect to the internet. They create huge datasets which can pose collection, storage, and processing challenges. Edge learning will address some of these issues by keeping data at or near the source device, "on the edge," instead of sending it back to a central processor.

As part of a pilot program, five graduate students worked on these issues this summer, three students from Sweden and two from Dakota State. They have been working on an edge learning concept called Federated Learning, which eliminates the need to transfer data by training individual components called edge nodes.

"Federated learning is a method to use information from separate devices to build an AI model," explained Dr. Austin O'Brien, one of the DSU faculty mentors. "With that, the project tries to see how to approach it from a security angle, how can we detect when people may be trying to disrupt the model."

Faculty mentor Dr. Mark Spanier explained that while these projects are theoretical in nature, "they have the potential to have applications in various other sectors."

Along with technology, there is also cultural learning taking place. DSU doctoral student Jason Mixon and master's student Charles Novak spent June in Gothenburg, Sweden.

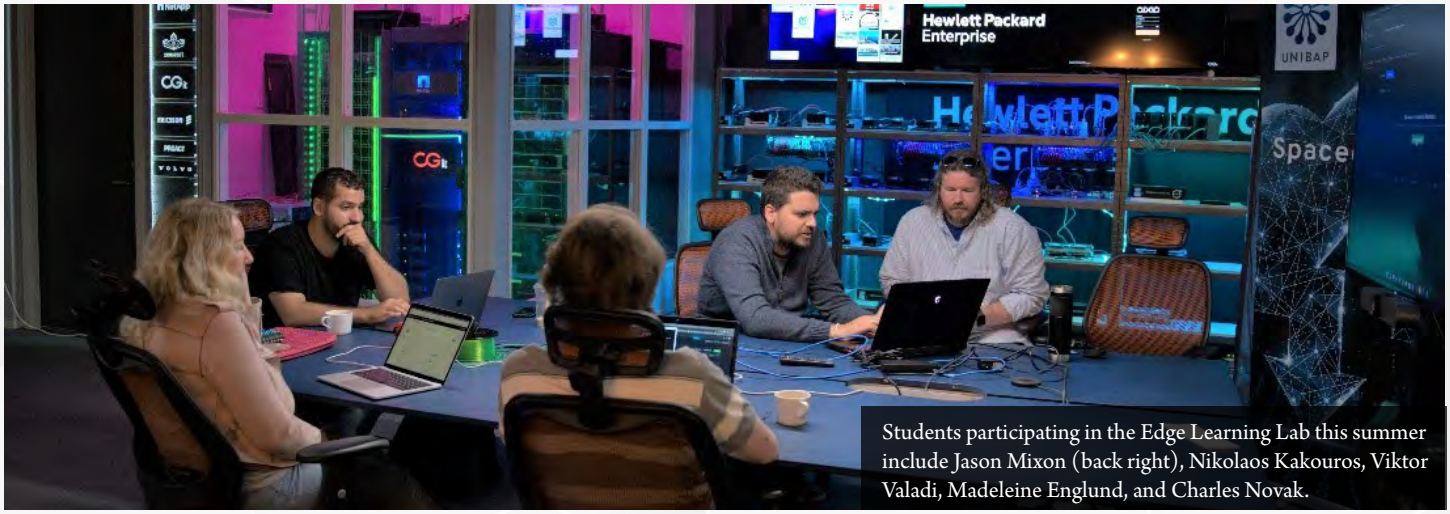
"We had a blast, and met a lot of great people," Mixon said. "They have a great facility at AI Sweden, and there is a ton of history and things to do in Gothenburg." The three Swedish students spent July in Madison and appreciated seeing life in small-town America.

The professional collaboration has also been very good for all involved. Nikolas Kakouros, originally from Athens, Greece, said research often includes speaking at conferences, "so it's good to be part of an international group where you can learn to communicate and express yourself." Groups like this all start with a concept, but people shouldn't feel like you are being ignored or dismissed. Instead, they should define the goals clearly and work as a team, he said.

The team's efforts will also have value for their graduate projects. Novak values the new, real-world industry tools he has learned, such as the automation tool (Ansible) that Kakourous taught him. Mixon said he will definitely take things from this experience and apply it to other research. "It's been a great learning experience."

O'Brien said the group plans to publish an article on this summer's work, and work will continue with AI Sweden in the future.

"This is the first step. We want to cement this and make this exchange ongoing and get more students involved."



Students participating in the Edge Learning Lab this summer include Jason Mixon (back right), Nikolaos Kakouros, Viktor Valadi, Madeleine Englund, and Charles Novak.

Tarek Abdelmotaleb Ahmed is one of several students who learns valuable skills through conference presentations.

Conference presentations are invaluable experiences

Dakota State University students gain valuable knowledge in class, but through research and conference presentations they learn to apply that knowledge and adapt them into career-ready skills.

Instructor Rob Richardson said, "attending and presenting at conferences is important to students' growth and development, especially if they wish to pursue a career involving research."

"Preparing and delivering a presentation to a professional audience is something that will be important throughout our students' careers," he stated.

But even if a student simply attends a conference, these opportunities broaden a student's horizons, and are "perhaps the best way to stay current on emerging trends, threats and research," Richardson said.

Several students have had the opportunity to attend and present about their research efforts in the last few months, including Tarek Abdelmotaleb Ahmed, a master's degree student in Computer Science, with a specialization in Cyber Operations, presented about his shellcode research at DEF CON in August.

DEF CON is one of the oldest and largest continuously running hacker conventions. It is attended by computer security professionals, as well as students, journalists, and researchers.

This was Ahmed's first-time attending DEFCON, and he said it provided practical experience and was a way to demonstrate his work with recruiters, and a way to network with people in the field from around the world. The research presentation, about shellcode, was well-received, he stated, adding that a White Paper about this research on DEFCON's website.

Ahmed came to Dakota State because it is well known in the cyber security field, and it was a good decision. He graduated in December and planned to work for the biotechnology company 23andMe. He had an internship with the company last year and was offered a position with the company.

"They have a big security team to protect the data," he said, "because there's no point if you can't protect the personal data."

Grad students win federal scholarships

Three Dakota State students are now part of the Department of Defense Cyber Scholarship Program (DoD CySP), including graduate student Gillian Morris.

This scholarship for service program is an effort by the DoD to protect critical services by creating a knowledgeable and skilled DoD cyberspace workforce, individuals who will defend the country's network, information systems, and data.

The students receive paid tuition and fees, a computer and book allowance, internships, and a stipend ($27,000 for undergraduates, $33,000 for graduate students). A major advantage to this scholarship is that students receive a full-time job offer as civilian employees with a DoD Agency upon graduation.

"It's nice to have a job right out of college," said Morris, a Cyber Defense master's degree student from Estelline, S.D.

Gillian Morris (right) is one of the three DSU students to be awarded a CySP scholarship this academic year.

The 2022-2023 CyberCorps Cohort includes Max Davis (back left), Daniel Eager; Isabelle Bakker (middle left), Abby Baker, Hannah Droge; Michael Fahnlander (front left), Tyler Thomas. Not pictured are Jackson Heiberger and Jacob Davie.

CyberCorps

Nine students have been named to the Dakota State CyberCorps program for 2022-2023, including two graduate students, Max Davis, Cyber Defense master's degree student from Watertown, S.D. and Michael Fahnlander, a Cyber Defense master's degree student from Plymouth, Minn.

A national scholarship for service program through the National Security Agency (NSA), the CyberCorps program has grown steadily on campus since first being offered in 2010. With 25 active members on campus this year, and 122 students who have come through the program over the last 12 years, it is listed as the largest program in the nation.

The DSU CyberCorps students have 100% placement in internships and full-time work with government agencies such as the NSA, U.S. Air Force, and national labs around the country.

"We're one of few schools with that good of a track record," said Dr. Michael Ham, Director of the DSU CyberCorps program. "The students are constantly pushing that bar, and that's encouraging to see."

CyberCorps was created under the Federal Cyber Service Training and Education Initiative, with the purpose of giving government agencies an advantage in recruiting and training cybersecurity professionals, closing the workforce shortage, and competing with similar positions in the private sector.

The program covers 100% of tuition and fees for the students, provides a stipend ($25,000 for undergraduates and $34,000 for graduate students), and support for professional development and books. The scholarship recipients also have paid summer internships and are guaranteed security jobs following graduation in federal, state, local or tribal government. Students may renew this scholarship for up to three years.

Faculty News

Professional development updates

Earlier this year, several Dakota State University faculty and graduate students shared research at South Dakota State University's Data Science Symposium (DSS).

DSS is a premier conference with presenters and attendees from across the nation, said Dr. Dorine Bennett, Dean of the College of Business and Information Systems (BIS). "It gives DSU the opportunity to showcase what we offer."

Faculty and students networked with others in the industry to develop their research agendas or career plans, Bennett said. "Several graduate students attended the conference to make presentations or share their research through posters, and this provided them experience in professional conferences that will serve them well in the future."

As an invited speaker at the symposium, Dr. David Zeng shared his research through externally funded grants he conducts as director of the Center for Business Analytics Research (CBAR) Lab.

In addition to speaking, Zeng also chaired a session on tools for data. "It feels great to have the opportunity to introduce my students and research assistants, and their expertise and research, to the data science community and region," he said.

"I also appreciate the opportunity to promote our data science related programs offered by the College of BIS, including a data analytics certificate, Bachelor of Science in Computer Information Systems, Master of Science in Analytics, and Ph.D. in Information Systems."

Graduate research works on or off campus

Working with a group can always have challenges, especially so when the group members are not in the same location.

Six Dakota State University graduate students – all in different physical locations around the world – learned to work through those challenges, and successfully collaborated on a research project in Spring 2022.

The students – and their faculty advisor Dr. Cody Welu – were spread out over the U.S. and Great Britain, so "finding times to meet with a geographically diverse group [was] difficult," Welu stated, but "the students are all great and seemed to work together very well."

While all the student researchers are studying cybersecurity in some way, they all brought a different background and different experiences to the table.

"Whenever a diverse group is brought together, there is much to be learned and much to be gained by all," Welu said. "The different skillsets the team brough to the table are vital for project success."

This project did require planning and communication, said Jacob Williams, a doctoral student in Cyber Operations. He is originally from Parker, S.D., now living in Columbia, Md.

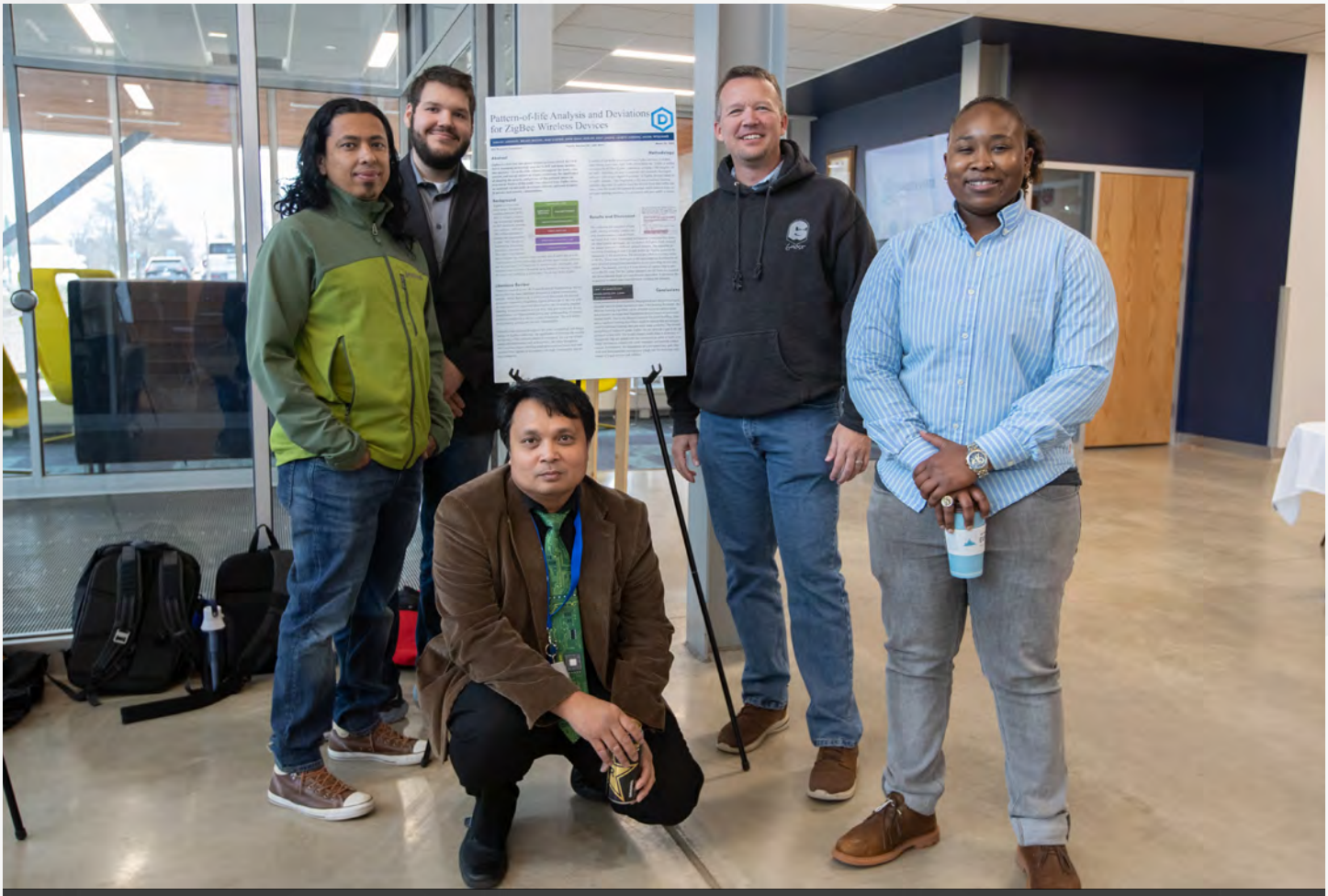
"Working professionally across almost every possible time zone in the continental U.S. required a lot of planning. Schedules were often tight and not everyone was able to make it to each meeting. Proper note-taking and asynchronous communication was a must. The ability to work independently was instrumental in keeping progress moving," Williams said.

The project, titled "Pattern-of-life Analysis and Deviations for ZigBee Wireless Devices," was one of the 2021-2022 Graduate Research Initiative grants awarded to students this academic year. It included a $500 stipend which was able to be used for collection, analysis, or results dissemination.

"I'm very grateful that Dakota State University places such a high importance on student research and provides the necessary support to be able to carry it out," Williams said.

Other 2021-2022 examples of GRI projects include:

» Giridhar Reddy Bojja researched CEO communications styles and their impact on organizational performance by mining psycholinguistic characteristics from social media. A Ph.D. in Information Systems major with an analytics specialization, Bojja chose management information systems research and was inspired to find gaps in communication styles research in the organizational science domain. Through his research, he found a gap in knowledge about how CEO communication styles on social media may impact their businesses.



This group of graduate students worked remotely on a research project. They met in person for the first-time during Research Week. Subash Adhikari (back left), Jacob Williams, Kurt Jarvis, Chinyere "Chin" Isaac Heslop; Mar Castro (front).

» Lisa McKee loves a good challenge and has never backed down from a problem throughout her IT career. After 20 years, she still is eager to take on industry-wide challenges, including her GRI work with privacy risk. She hopes to determine a new industry standard, working from the privacy assessment side to create a new model and write standards for the American National Standards Institute (ANSI), and hopes that the International Organization for Standardization (ISO) will adopt this as the global standard.

Five GRI awards have been granted for 2022-2023:

» Kalee Crandall, Ph.D. in Information Systems (PhDIS), with Dr. Cherie Noteboom, Advisor. "Influencing Student's Career Choices: Parent's Perceptions of Information Systems."

» Benjamin Hou, PhDIS, with Dr. Omar El-Gayar, Advisor. "Designing Knowledge Management Information System Architecture to Support Knowledge Intensive Aerial Surveying Projects."

» Badr Harfoush, PhDIS, with Dr. Omar El-Gayar, Advisor. "A Qualitative Analysis of the Critical Success Factors Associated with Business Intelligence Systems Implementation and Delivery."

» Jonathan Lancelot, Ph.D. in Cyber Defense (PhDCD), with Dr. Kevin Streff, Advisor. "Tesla's Lane Assist and Physical Security and Safety Action Research Test."

» Ali Shaheen, PhDIS, with Dr. Omar El-Gayar, Advisor. "Deep learning in Agriculture at edge: An Exploration of Ensemble Models, Compression, and Hyper Parameter Tuning."

Alumna's research turns into provisional patent

Dr. Arica Kulm sees "endless possibilities" for students at Dakota State, including the opportunity to create patentable research on new technologies, as Kulm has done.

Her dissertation research resulted in a provisional patent on a unique model of a digital forensics tool that is currently being developed into a prototype.

Kulm started researching the technology behind the dark web in 2019, an assignment from her major professor, Dr. Ashley Podhradsky. She decided to study one aspect of the Dark web for her doctoral work. Her efforts resulted in creating a model tool to help law enforcement identify the different digital artifacts that can be found in the Dark web.

This fits in perfectly with her current position as Director of DigForCE, the Digital Forensics for Cyber Enforcement lab at Madison Cyber Labs.

While Kulm maintains that "I'm not unique in any way," Podhradsky is impressed by this accomplishment, because by operationalizing Kulm's unique model, it becomes a stand-alone tool or one that will integrate with others.

"This is novel and needed by law enforcement and for research," Podhradsky said. And because it would be a monetized version, that will add validity to the evidence it provides.

Kulm admits that she would not have pursued a patent on her own. "I wouldn't even know where to begin," she said, so appreciates the resources on campus through the Department of Economic Development, and the department's Director Katherine Cota.

This example, and the resources provided by the university, demonstrate the "endless possibilities" for students at Dakota State researching or developing new technologies.

Inspiring students through volunteer work

Technology can make communication seem effortless, but those connections don't just happen, said online doctoral student Tony Rizi, a Ph.D. student in Cyber Operations.

One example is ham radio, which uses high tech gear to make one-on-one connections between people all around the world. To help young students learn about this type of technology behind communications, he and fellow members of the Amateur Radio Club of Columbia County (ARCCC) have held outreach sessions at the Savannah River Academy, a preschool through 8th-grade non-sectarian private school in Grovetown, Ga.

"It is important for students to understand that communications do not happen by magic," he stated. "Antennas need to be a specific length, and someone needs to build the electronics."

Over several months, kindergarten through 6th-grade students at the Academy have been explored technology. They practiced Morse code, learned ham radio fundamentals, and even launched a weather balloon with a radio system that allowed them to track the balloon's path.

Tony Rizi, a Ph.D. student in Cyber Operations

Tony Rizi with a radio system

These events were strategically planned to lead up to one big communication event – a talk with an astronaut on the International Space Station (ISS). ARCCC coordinated with the Amateur Radio International Space Station (ARISS) and NASA to develop and implement these learning experiences to prepare the students for the December 10, 2021 event. ARISS is the group that facilitates special amateur radio contacts between students around the globe and crew members with ham radio licenses on the ISS.

Rizi said the lessons allowed students to see the reality of technology and get hands-on experience. "It helps make it more concrete for them and can inspire them," said Rizi. "Hopefully we'll get some future astronauts out of the group."

> ***"Hopefully we'll get some future astronauts out of the group."***

By the Numbers

484
total enrollment

18.6% of university enrollment

22 SD counties
29 countries
46 states

6
student athletes in 7 sports

GRADUATE PROGRAMS

100%
placement rate

$8.9M
in FY22 for research expenditures from sponsored grants and contracts

17
Ongoing research programs in 17 MadLabs® and Applied Research Lab

Majors/Programs

Graduate Certificates

- Advanced Mathematics Graduate Certificate
- Banking Security Graduate Certificate
- Business Analytics Graduate Certificate
- Cyber Security Graduate Certificate
- Data Privacy Graduate Certificate
- Ethical Hacking Graduate Certificate
- Healthcare Data Analytics Graduate Certificate
- Information Technology Graduate Certificate
- Mathematics Graduate Certificate
- Supply Chain Management Graduate Certificate

Master's Degrees

- Health Informatics and Information Management (MS)
- Master of Business Administration (MBA)
- Master of Science in Analytics (MSA)
- Master of Science in Computer Science (MSCS)
- Master of Science in Cyber Defense (MSCD)
- Master of Science in Educational Technology (MSET)
- Master of Science in Information Systems (MSIS)

Doctoral Degrees

- Doctor of Philosophy in Computer Science (PHDCS)
- Doctor of Philosophy in Cyber Defense (PhDCD)
- Doctor of Philosophy in Cyber Operations
- Doctor of Philosophy in Information Systems

Accreditation Information

Dakota State University is accredited by the Higher Learning Commission (HLC), founded in 1895, and is one of several institutional accreditors in the United States. HLC accreditation indicates that DSU has the standards, processes, and assurance that it delivers quality educational experiences. DSU must meet 18 core components within the five HLC Criteria for Accreditation. Several programs also have professional accreditations, such as the cyber program's accreditation from the National Security Agency. DSU's undergraduate and graduate Cyber programs are accredited by the National Security Agency (NSA). NSA leads the U.S. Government in cryptology that encompasses signals intelligence (SIGINT) insights and cybersecurity products and services and enables computer network operations to gain a decisive advantage for the nation and our allies. DSU is designated as the Center of Academic Excellence in Cyber Operations (CAE-CO), Center of Academic Excellence in Research (CAE-R), and Center of Excellence in Cyber Defense (CAE-CD). Universities designated as National Centers of Academic Excellence are eligible to apply for scholarships and grants through the Federal and Department of Defense Information Assurance Scholarship Programs.

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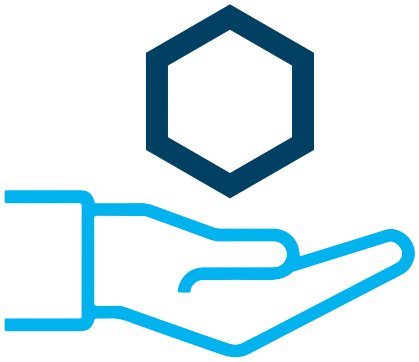
DAKOTA STATE
GRADUATE STUDIES



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