PREDICTING THE NFL’S FUTURE

ISE’s Will Burton travels to Super Bowl 50 to talk with a national audience about his statistical model that predicts NFL plays with shocking accuracy.
INDUSTRIAL AND SYSTEMS ENGINEERING PLANS TO MAKE ITS BIGGEST MOVE YET

Over its 85 year history, the Edward P. Fitts Department of Industrial and Systems Engineering (ISE) has had several homes on main campus. The following comes from the history of ISE authored by Distinguished Alumnus and Senior Lecturer Emeritus Clarence Smith.

The year was 1930. The Great Depression was in full swing, Britain’s Frank Whittle registered a patent for the jet engine and the curriculum of Industrial Engineering first appeared in the NC State catalog. The departmental classrooms and offices were in the Civil Engineering Building (which would later become the backside of Daniels Hall, opposite the Park Shops Building).

In 1940, the department moved to rooms 125 - 132 in the 1911 Building where it remained until the completion of the most modern facility on campus at that time, Riddick Engineering Laboratories in 1950. It would remain in Riddick Hall for the next 55 years. With growth, the department expanded the majority of its laboratories into Parks Shops.

In 2005, ISE moved back to where it all began in 1930, Daniels Hall. It was also the year that it became the first named department in the UNC system.

The large photo shows School of Engineering Dean John Lampe operating a steam shovel at the groundbreaking ceremony for Riddick Engineering Laboratories. The smaller photo shows the completed Riddick Hall in the early 1950’s. The department hopes to be moving to its new home, the Engineering Oval building on Centennial Campus in a few years. ISE will share the building with the Department of Civil, Construction, and Environmental Engineering (CCEE) and the dean’s administration office.

On page 14, learn more about the Engineering Oval building and how you can help to make it a reality for future ISE students.
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In November, ISE faculty and students joined over 5,000 of their colleagues in the City of Brotherly Love to present their solutions to some of the most challenging analytics issues in the industry.
FROM THE DEPARTMENT HEAD

Dear Alumni and Friends of ISE,

This academic year has been filled with an abundance of accomplishments from our students and faculty in the Edward P. Fitts Department of Industrial and Systems Engineering. Innovative research projects across all sectors have generated national and local media attention. This past semester also marked a record for the department with women representing 48 percent of students who matriculated in December 2015. Overall ISE’s undergraduate enrollment is over 37 percent.

Many awards received in the 2015-16 academic year include the INFORMS student organization receiving the Cum Laude Student Chapter Award at the national INFORMS conference. Also at INFORMS, ISE graduate student Shadi Hassani Goodarazi took third place in the Minority Issues Forum Student Poster Contest. Junior Ashley Williams earned awards for her academic and sports achievements with the College Sports Information Directors of America (CoSIDA) Academic All-District Honors and a spot on the All-ACC Women’s Basketball Academic Team. ISE faculty were recognized internationally for the lifetime achievements (Dr. Shu-Cherng Fang- Fellow of CIIE), outstanding research (Dr. Rohan Shirwaiker- SME Outstanding Young Manufacturing Engineer), and excellence in advising (Dr. Anita Vila-Parrish- George H. Blessis Award). To read more about these awards and several other achievements from the department, please see the Awards and Honors section on page 24.

Graduate student Will Burton was alongside celebrities and NFL legends at Super Bowl 50 sharing his statistical model that predicts NFL plays (more on page 18). Also, CNN’s Great Big Story visited the department this semester to include ISE in its Big Data series, featuring Dr. Ivy’s food bank research.

Funding for the Engineering Oval building, the future home for ISE, is moving full speed ahead with the passage of the Connect NC bond referendum. For more details on the project, see page 14.

Please enjoy reading more about the impressive accomplishments of our students, faculty and alumni in this edition of inGear.

Sincerely,

Paul H. Cohen, Ph.D.
ISE Department Head and Edgar S. Woolard Distinguished Professor

NEW LINKEDIN ALUMNI GROUP

Our alumni asked so we delivered. We have launched a NEW private LinkedIn ISE alumni group. This is an alumni-only private group that will allow you to network and communicate with fellow ISE alumni. It will also allow you to keep up with all that is going on in the department in one convenient place.

Getting access to the new group is simple. Search using the term “NCStateISE” or go to https://www.linkedin.com/grp/home?gid=8285397

Click the “JOIN” button in the upper right-hand corner of the page. That’s it! We look forward to connecting with you there.
5 Questions with ... JESSICA McCOY

Jessica McCoy brings a decade of experience in supply chain modeling to her current role leading inventory strategy and analytics for Nike’s replenishment business. In her prior roles at Nike, McCoy led projects including integrated marketplace analytics, retail planning optimization, NBA contract and portfolio simulation, and NFL playoff prediction modeling. Before joining Nike, Jessica received her BSIE from NC State in 2006 and her MSIE in 2007. She studied the last mile of humanitarian supply chains for her PhD at Stanford University.

What’s the single most important experience or understanding you gained in the ISE department?
I had the opportunity to pursue several research projects while in ISE. They really challenged me and served as fantastic learning experiences that sharpened critical transferrable skills: the ability to learn independently, solve problems creatively and be comfortable with failing fast on the path to innovation.

What’s the most pressing issue facing human society that engineers should be working harder to solve?
Our global society is shockingly unequal – depending on where you are born, the options available to you can be wildly different. Solutions are complicated, and engineers are involved in everything from improving infrastructure and the last mile in resource-limited nations, to supporting STEM education in Raleigh, NC. I believe inequality is the biggest problem facing our generation, and industrial engineers are well-positioned to address it.

What would you like to accomplish in your career? What are you most proud of so far?
I’m energized by helping organizations solve problems using data and analytics, and I look forward to a career of driving sustainable, fact-based change. In my current role, I get to live this dream as I lead the implementation of multi-echelon inventory optimization for Nike’s replenishment business. We will reduce our safety stock (and annual holding costs) significantly while still supporting aggressive service level targets – a win-win!

If you were not in the engineering field, what would you likely be doing?
I remember so clearly when I first learned about industrial engineering in E101, and recognized the profession that I’d read about in Cheaper by the Dozen as a kid. I was hooked! But if I hadn’t gone down the engineering path, my passion for solving problems with math would have likely led me into a career in statistics. Drawing conclusions from messy data is a powerful way to inform policy.

What advice do you have for current ISE students?
It’s important to be technically excellent and to stay current. Rock stars take this to the next level by also honing two key skills: the ability to deliver results and communicate effectively. Consistently producing at an above-average pace and being able to explain your methods to lay audiences will set you apart.
The morning began exploring how solar energy and smart grid technologies will shape the future for all North Carolinians. ISE welcomed two special guests to join the discussion with professor Binil Starly. The first was ISE alumnus Robert Koger, President of Advanced Energy Corporation and North Carolina GreenPower. He shared how North Carolina ranked third in the country behind only California and Arizona in adding new solar energy technologies. And, that the state has set a goal for 12 percent of its energy production to come from renewable energy sources by 2021.

Joining Koger on the panel was Gary Rackliffe, Vice President of Smart Grids at ABB. He shared how new, automated smart grid technologies can now reroute power around trouble spots to restore power to consumers faster. He also discussed how engineers are using advanced analytics to better predict storm damage so they can have resources ready to respond.
In front of a capacity crowd consisting of students, faculty, alumni, families and friends, the Department celebrated the life of ISE Distinguished Alumnus Fred Gant. Professor Stephen Roberts, former business partner Jim Davis and Gant Scholars Ruby Bombien and Paul Whitley all shared the positive change Fred and Beverly Gant had on their lives.

In 1997 Fred and Beverly met with then, department head Stephen Roberts, to discuss how they might support the department. “Fred began to think about the appreciation that he had for his education and the impact that it had on his career,” explained Dr. Roberts. “He felt that his degree in industrial engineering had laid the foundation for the success that he had experienced.”

In the end, Fred and Beverly created an endowment that supported five scholarships in industrial engineering. “Personally it has been a real pleasure to know the Gants,” shared Dr. Roberts. “Their kindness and generosity toward the department and toward me will be long remembered and their impact will be everlasting.”

To watch the ceremony for Fred Gant, go to go.ncsu.edu/CelebratingFredGant

ISE Distinguished Alumnus Allen “Fred” Gant and his wife Beverly

CELEBRATING FRED GANT

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ISE Distinguished Alumnus Allen “Fred” Gant and his wife Beverly
2015 DISTINGUISHED ALUMNUS AWARDS

The festivities concluded with the presentation of the 2015 ISE Distinguished Alumnus Awards. This year’s class included Timothy Berkey (1991) and F. Scott Moody (1980).

In 2006, the ISE Department began its Distinguished Alumnus Award Program by inducting an inaugural class of 12 (including Fred Gant). The Distinguished Alumnus Award is the highest honor the department presents any graduate. It is awarded to alumni whose contributions to their profession, community, the department, college and university, are notable and merit special recognition.

Surrounded by their families, friends and former professors, the inductees shared their perspective on life, careers and what it takes to pursue dreams and achieve success. Berkey encouraged others to seize every opportunity while appreciating the journey. “Be thankful for the journey you had;” reflected Berkey. “Be thankful for your parents and the other folks who supported you along the way.”

Moody shared a story about how his grandmother-in-law’s passing sparked his mission to lead an impactful, versus important life. “Mary was certainly not a wealthy woman,” explained Moody. “But seeing that packed church, I realized that she had, in reality, touched more people in her life than I ever could, no matter how wealthy or important I became. It profoundly changed me.”

Timothy Berkey
Timothy Berkey is a Vice President with Premier Healthcare Alliance in Charlotte, North Carolina. Tim received his Bachelor of Science in Industrial Engineering in 1991. At Premier, he serves as engagement executive for large-scale expense reduction engagements. In this capacity he provides strategic guidance to Premier’s project leaders and client executives to facilitate expense reduction.

During his tenure with Premier, Berkey has also served as the manager of Premier’s former process benchmarking unit, as a facilitator of multi-hospital “collaboratives”, and as a project consultant for hospital-specific labor productivity comparative analyses.

Berkey is a published author who speaks regularly to numerous professional groups, regionally and at national conferences.

F. Scott Moody
F. Scott Moody is the co-founder and CEO of K4Connect, a technology integration company focused on the emerging IoT market across several end markets. Moody received his Bachelor of Science in Industrial Engineering in 1980 and an executive MBA from the University of Florida. In addition to K4Connect, Moody is also an Entrepreneur-in-Residence for the Blackstone Network, an advisor to the National Science Foundation’s ASSIST program at North Carolina State University, and a regional board member for Hope International.

Previously, Moody was the co-founder, chairman and CEO of AuthenTec, the company that developed the technologies now at the foundation of the Touch ID in the Apple iOS products.

Moody began his career at Harris Semiconductor, now Intersil, in 1980 where he eventually became Division VP of a $200M division before co-founding AuthenTec.

2016 HOMECOMING EVENTS

We would like to invite all alumni and friends of the department to join us on October 28th to kick off the homecoming weekend. Get more information at:

www.ise.ncsu.edu/homecoming

To watch their speeches, go to go.ncsu.edu/BerkeySpeech and go.ncsu.edu/MoodySpeech
Discover how Dr. Yuan-Shin Lee uses industrial engineering, teamwork and opportunity to make the world a better place

Dr. Yuan-Shin Lee always had an interest for engineering. As a small child, it was not industrial, but locomotive engineering that captured his imagination. Dr. Lee recalled a family trip to the train station. “Locomotives have always been a fascination of mine,” he shared. “My parents tried to get us all aboard the commuter train, but I refused because I wanted to get on the locomotive.”

As he grew older, Dr. Lee realized it was other engineering disciplines like mechanical and industrial that were the backbone of a growing society. So, like many of the brightest young minds in Taiwan, he decided to pursue a career in mechanical engineering. After receiving his mechanical engineering degree from the National Taiwan University in 1984, Dr. Lee served his required two years of military service in the Marine Corps as a Second Lieutenant. It was there where he developed an appreciation for discipline, responsibility, and teamwork.

After his service, Dr. Lee took a full-time position as a teaching assistant and lab coordinator back at his alma mater. From this experience, he gained a strong understanding of how a university’s systems and culture work.

By 1990, Dr. Lee completed his master’s degree in Industrial Engineering at Purdue University. “My decision to study industrial engineering rather than mechanical was almost accidental, but a good one,” Dr. Lee explained.

This systems-based training gave Dr. Lee the ability to see things the traditional engineer does not. By combining his mechanical engineering knowledge of physics with this new perspective, Dr. Lee says he achieved a broader and more balanced view. “This combination of interdisciplinary training gives you two things,” he states. “One, it keeps you open-minded. Second, you are able to see things from different points of view. This gives you the confidence to try new things.”

Dr. Lee continued his education at Purdue and in 1993 received his Ph.D. in industrial engineering. He started his teaching career at Kansas State University as an assistant professor. After receiving a call from NC State and making a trip to Raleigh where he fell in love with the area, Dr. Lee joined the ISE faculty in 1995.

Today, engineering is evolving. To be ready for emerging opportunities in new fields, engineers must be able to combine various disciplines to solve new engineering problems. Dr. Lee is always searching for these connections, and dedicates himself to making opportunities available to the ISE Department.

Recently, along with Dr. Binil Starly and Dr. Paul Cohen, Dr. Lee introduced a new course, Digital and Smart Manufacturing to industrial and systems engineering. This course was just offered last fall and more than 20 graduate and undergraduate students have taken the course this spring. “Our department plays a key role in introducing smart manufacturing as a new disciplinary area to industrial and systems engineering. We have put NC State ISE on the map of new digital and smart manufacturing research in the nation. This helps the department move forward and distinguishes itself,” explains Dr. Lee.

Smart manufacturing is Dr. Lee’s current focus area, having recently returned from an international conference. Many other countries are already working on this new technology, so the federal government has been reaching out to engineers, such as those here at NC State, to spearhead further research. Dr. Lee says smart manufacturing is coming at society like a storm. It is coming, so we have to get ready for it. And, he wants NC State ISE to play a key role in this new opportunity.

As someone who believes that engineering represents the future of society, Dr. Lee is helping ISE students and graduates join new corporations and grasp trends in this exciting time.
Dr. Anthony Atala is the Director of the Wake Forest Institute for Regenerative Medicine and an ISE Advisory Board Member.

**ATALA TALKS PARTNERSHIP**

Dr. Anthony Atala talks about the benefits of the partnership between the Wake Forest Institute for Regenerative Medicine and ISE.

**ISE:** What is regenerative medicine?

**ATALA:** Regenerative medicine is a science that tries to induce the same regeneration capacity that you have inside your body. It harnesses that capacity to create and regenerate tissues and organs within your own body.

**ISE:** You were the catalyst behind the partnership between WFIRM and ISE. What was your vision for this unique partnership?

**ATALA:** We started thinking about this concept of industrial engineering around 2007. We completed the paperwork for the partnership with North Carolina State University in 2010. We were seeking to apply the principles of industrial engineering to the field of regenerative medicine.
At the 2015 North Carolina Awards Gala held in November, Dr. Atala was one of six recipients of the North Carolina Award. He received the highest civilian honor given by the state from Governor Pat McCrory in the area of science. Presented annually since 1964, the award recognizes significant contributions to the state and nation in the fields of fine art, literature, public service and science.

**ISE:** How did you see the two capabilities coming together to work on a common goal?

**ATALA:** When we started, we were creating tissues and organs and implanting them into patients. But we were doing it all by hand. So the challenge is, how can we scale up these technologies? How can we bring industrial engineering strategies from manufacturing to scale up our procedures? That is what the partnership is all about. How can we work together to combine the biological sciences with industrial engineering to establish what became the first effort worldwide for industrial engineering in the field of regenerative medicine?

**ISE:** What has been the greatest achievement so far?

**ATALA:** The greatest achievement of the partnership so far has been the ability to interact with students and faculty at various levels. This allows us to bring together some of the best minds in the country in industrial engineering. As you know, NC State is currently rated #2 (best-engineering-colleges.com) in industrial engineering. The goal is to bring that area of expertise to our patients with a more effective and progressive approach.

**ISE:** What is the ultimate goal and objective of this partnership?

**ATALA:** The ultimate goal of this partnership is to incorporate typical manufacturing capabilities and industrial engineering systems that are persistent in other industries. We want to use these technologies to enable the mass production of tissues and organs, following the same type of strategies that this school, NC State, has brought about to other industries, such as the furniture industry and computer industry.

**ISE:** Who is the beneficiary of all this good work?

**ATALA:** The beneficiaries of this partnership have been our patients. This whole partnership is aimed at one goal: to bring these technologies to our patients, and in effect, make their lives better.

**ISE:** What is the ultimate goal and objective of this partnership?

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ISE “SEEN”

It’s an exciting time to be part of ISE, and these photos prove it. Have you been seen?

ISE undergrads together one last time at the Fall Graduation Ceremony

Zhuo “George” Tan and his baby celebrating at the Fall Graduation Ceremony

Tiantian Nie discusses her research with Paul Whitley at the ISE Homecoming Event

@NCStateISE on Twitter

Ismail Lekorchi talks with visitors to the ISE booth at the INFORMS Conference

Matt Rogers talks military logistics at the INFORMS Conference

Search ncstateise on LinkedIn

Julia Griffin presents her research at the State of North Carolina Undergraduate Research Symposium

Ismail Lekorchi talks with visitors to the ISE booth at the INFORMS Conference
Students create some amazing coasters with metals and plastics in the ISE316 class.

Team Lenovo (Rachel Gibson, Nathan Mauney, Addison Warden, Brian Linn) take home 1st place at Senior Design Day.

Dr. Anita Vila-Parrish talks with ABC11 News Channel about the Enloe High School senior design project.

Team Flanders (Matthew Billings, Kayla Summers, Christopher Turner, Taoufik Falsy) excited at Senior Design Day.

Dr. Maria Mayorga talks with WNCN News Channel about her medical drone research.

Sarah Rogers, Kaley Moser, Julianne Spencer and Katie Basinger collecting pig skin samples for their biomedical manufacturing research.

Got an ISE photo? Share it with us on Twitter or Instagram using the hashtag #NCStateISE.

Search ncstateise on Facebook.

Search ncstateise on Instagram.
Did you have a good day yesterday? Probably not as good as ISE’s Ashley Williams. She received the Kay Yow Scholar-Athlete of the Year Award and headlined the All-ACC Women’s Basketball Academic Team. Then, she and the Wolfpack Women’s Basketball Team went out and defeated Boston College 76-60 in the second round of the ACC Tournament. They never trailed in the game and picked up their 20th win of the season.

“ Ashley is an inspiring teammate. She excels in the classroom and on the court,” marvelled teammate and classmate Kaley Moser. “She works extremely hard at everything she does and always has enthusiasm.”

Williams is the eighth person to become a Kay Yow Scholar-Athlete of the Year. The award is, of course, named after the legendary Kay Yow, coach of the NC State’s women’s basketball team from 1975 to 2009. Among her many accomplishments, Yow is a member of the Naismith Hall of Fame and coached the U.S. women’s basketball team to Olympic gold in 1988. She also led the Wolfpack to four ACC Championships.

Williams and teammate Jennifer Mathurin, join 21 others on this year’s All-ACC Women’s Basketball Academic Team. For Williams, this is her second time on the All-ACC squad.

“Having Ashley, along with Kaley, in industrial engineering has been a great thing throughout my academic career,” confided Ashley Eli another teammate of Williams. “Not only is Ashley a good teammate but a good classmate as well. I’m so happy she made the All-Academic team and wish her the best in the future.”

Last month, Williams earned a spot on the College Sports Information Directors of America’s (CoSIDA) Academic All-District First Team.

Known for hitting three point shots, Williams also hits the books earning a 3.92 GPA and a spot on the Dean’s list every semester of her college career.

Williams is an inspiration to many for her academic and athletic successes. While she started her career on the team as a walk-on, she worked her way up to a starter in her third-year. It is quite an honor to have Williams in the ISE Department serving as a role model to many.
CHAOIS IN THE CARPOOL LANE

Dr. Anita Vila-Parrish, Michael Blum, Emmanuel Horton and Jia Lin talk with ABC11 News about solving the madness that is the carpool lane at Enloe High School as part of their senior design project.

Watch the video:

go.ncsu.edu/EnloeSeniorDesign

ISE JUMPS UP 3 PLACES IN THE RANKINGS

In the U.S. News and World Report’s 2017 rankings for industrial engineering graduate programs, NC State leaped up three places to #12 nationally (#7 among public universities).

NC State’s College of Engineering moved up to #27 nationally (#12 among public universities).
With the Connect NC Bond passing by a wide margin in March, the Engineering Oval building takes another giant step toward becoming the future home of ISE.

In the last decade, the ISE Department has grown in national rankings. This includes jumping up three spots to 12th in the nation according to the latest U.S. News and World Report rankings - seventh among public universities. Enrollment and research expenditures are up as well. These factors have allowed ISE to attract faculty members who are leaders in their fields and some of the brightest students from around the world. The passage of Connect NC brings us closer to putting our faculty, staff and students together with top businesses and government agencies on Centennial Campus which serves as a model for the ideal 21st-century research campus.

How you can help
While passage of the Connect NC public bond referendum provides $75 million for the Engineering Oval project, it does not fund the entire projected construction costs. The NC State Engineering Foundation has committed to raising $60 million in private donations. They have already received about $20 million in commitments. Early donors of $50,000 or more to the project will join the Cornerstone Society, a select group of donors who will:
- Receive name recognition inside the Engineering Oval building
- Be special guests at a groundbreaking ceremony on Centennial Campus when construction is set to begin
- Receive an invitation to other VIP events as well as special insider information about the project

If you are ready to help ISE make the Engineering Oval building a reality, contact: Lora Bremer, executive director of major gifts and campaign planning | 919.513.0983 | lora_bremer@ncsu.edu

The building
The Engineering Oval building will be the fourth academic engineering building on Centennial Campus and will sit between the Hunt Library and Engineering Building I.
- It will measure 227,000 square feet
- It will house more than 100 classrooms and state of the art laboratories
- The estimated cost is $154 million
More and more companies, large and small, collect big data and use advanced analytics to support their day-to-day operations and serve customers. A study by UC San Diego estimates that by 2024, the world’s enterprise servers will annually process data equal to a stack of books extending more than 4.37 light-years long. That is a lot of data to gather and analyze. Professionals who know how to decode and apply insight to this data are in greater demand than ever before.

Each November the Institute for Operations Research and the Management Sciences (INFORMS) hosts its annual conference to showcase leading research and practical applications of analytics.
This year ISE faculty and students joined over 5,000 colleagues in the City of Brotherly Love to present their solutions to some of the most challenging analytics issues in the industry.

Over the four day conference, ISE’s team of researchers presented their findings at 17 sessions. They spoke on a wide range of topics including improvements to healthcare methods, development of new advanced manufacturing techniques and creation of military logistical planning systems. But the researchers were not just there to teach, they were there to learn as well. The conference was an opportunity for students to connect with leading academia, industry experts, fellow students and prospective employers. They gained insight on how to help decision makers better understand the value of analytics as a competitive driver. These are skills that will serve them well as they prepare to start their careers.

ISE AWARDS

On the first night of the conference, seven ISE students competed against fellow scholars from around the country in a national poster contest. This was part of the Minority Issues Forum. ISE’s hopes were high as four of its seven students - Shakiba Enayati, Shadi Hassani Goodarzi, Nisha Nataraj and Zinan Yi - made it to the finals. The celebration began when they announced that Shadi Hassani Goodarzi received third place. “I am honored to receive this award and want to share it with Dr. Julie Ivy for supporting me through my research,” said Hassani Goodarzi. “I would also like to thank Dr. Maria Mayorga for co-chairing the Minority Issues Forum. I hope our efforts will motivate more undertakings in personalized medicine from a mathematical perspective.”

The following day, NC State’s INFORMS Student Organization became one of only 16 universities to receive the Cum Laude Student Chapter Award as part of the National Student Awards Ceremony. INFORMS gives the award to chapters that have shown outstanding performance and participation. “I was proud to receive this award on behalf of the NCSU INFORMS Student Chapter,” said Shakiba Enayati, ISE graduate student. “The NCSU Chapter was distinguished by the virtue of seminars featuring speakers from several academic departments and major industries as well as the strength of the meeting content. We are thrilled to be one of the pioneers in the Industrial Engineering and Operations Research community, and will proceed to lead other learning and service aspects in the industry.”

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On the first night of the conference, seven ISE students competed against fellow scholars from around the country in a national poster contest. This was part of the Minority Issues Forum. ISE’s hopes were high as four of its seven students - Shakiba Enayati, Shadi Hassani Goodarzi, Nisha Nataraj and Zinan Yi - made it to the finals. The celebration began when they announced that Shadi Hassani Goodarzi received third place. “I am honored to receive this award and want to share it with Dr. Julie Ivy for supporting me through my research,” said Hassani Goodarzi. “I would also like to thank Dr. Maria Mayorga for co-chairing the Minority Issues Forum. I hope our efforts will motivate more undertakings in personalized medicine from a mathematical perspective.”

The following day, NC State’s INFORMS Student Organization became one of only 16 universities to receive the Cum Laude Student Chapter Award as part of the National Student Awards Ceremony. INFORMS gives the
The 2014 Super Bowl ended on one of the most controversial plays in NFL history. Well, at least according to armchair quarterbacks around the world. You may recall the Seattle Seahawks marched down to New England’s one yard line with only seconds remaining. With one of the best power running backs in the game, Marshawn Lynch, the Seahawks were sure to give him the ball and let him hammer his way into the end zone.

To almost everyone’s surprise, they threw the ball. The Patriots intercepted it and won the Super Bowl. One person not surprised was ISE senior Will Burton. How did Burton know? His model told him.

Burton, along with another NC State student, Michael Dickey, developed a simulation model that predicts whether an NFL team will run or pass with surprising accuracy.

“We were interested in building something we could use during a game,” Burton explained. “We wanted to see if we could predict the next play.”

The model factors in many of the stats the average armchair QB might expect, like down and distance to go, time on the clock, point differential and turnovers. Burton believes those are the right mix of stats combined with historical data that has made his model so accurate. How accurate? It predicts run or pass correctly about 75 percent of
ISE’s Will Burton travels to Super Bowl 50 to talk with a national audience about his statistical model that predicts NFL plays with shocking accuracy.

the time. In some games last year, the model got it right over 90 percent of the time. “The model was built for general consumption,” Burton said. “If it was built for a specific team, I could get a lot more accurate.”

Burton’s model was impressive enough to get him an invitation to the 2015 Joint Statistical Meetings in Seattle last fall and then onto Media Row at Super Bowl 50 this February.

“We were looking for an analytical project last summer,” Will told the Adam and Joe Show. “We looked through all the possibilities and thought ‘Football: Pass or Run’ would be a cool thing.”
One of the exciting ideas Burton discussed was the possibility of using his algorithm to enhance TV’s coverage of games much like professional poker. “It would be a cool add-on,” Burton continued. “Imagine if they could tell viewers there was a 70 percent chance the next play was a run?”

Just before the Super Bowl this February, Burton’s model was featured in a Sports Illustrated article. He continued his media rounds during Super Bowl week which included several interviews with national sports outlets like CBS Sports Radio. He also made some new friends along the way like Betty Cantrell, the reigning Miss America (see photo).

So of course, everyone wanted a prediction for this year’s big game. “If the Panthers get the ball, they are going to start out with a run,” predicted Burton. “If the Broncos get the ball, they are going to start out with a pass.”

The Broncos received the opening kick-off and they started out with ... A PASS.
ATI uses a process called Hot Isostatic Pressing in order to condense specialty metals to ensure perfect density. ATI has recognized that the canister used is an integral part of the process cost. The ISE student team has been conducting a cost analysis on multiple different ways to manufacture the canister.

At ATI, canisters are filled with metal powders and disturbed in order to reach the highest packed density as possible. ATI currently uses a vibrating table in order to disturb the powder. The ISE student team’s goal was to find the best way to disturb the powder and increase the packed density.

Century Furniture has two upholstery facilities in Hickory, NC that share fabric inventory. The project targets optimizing the storage location of each material and reducing the number of fabric transfers between the two facilities. The ISE student team created a VBA tool that analyzes usage data from SAP and recommends a home storage plant based on where primary consumption occurs.

Currently, labor tracking methods at the Coty Distribution Facility are reflected as an aggregate total. When a worker clocks in for the day, there is no granular breakdown for what type of work they are doing. The ISE student team created a database for monitoring actions throughout the day.

Dyer Mobility is seeking to become the industry leader of disability services solutions. It is currently considering how to best provide personal mobility devices to manual wheelchair users at universities. The ISE student team created the decision tools needed for management which contain market research, user testing data, and economic analysis.
EMC

Location: Apex, NC
Leader: Andrea Rekrut
ISE Team Members: John Carver, Joe Figueroa, Mahlon Matthews

EMC products have ‘Kits’ that go along with all products that contain necessary materials for proper installation. These Kits are stored on the production floor nearest to the pack-out line where the Kits are packed with the final products.

The ISE student team has created a future state layout to optimize kit storage.

Enloe High School’s current carpool lane has become a traffic nightmare and a danger to students. Parents line up in two or three rows of vehicles, and sometimes traffic backs up for over a half mile.

To make the carpool experience less frustrating for parents and safer for students, The ISE student team will resolve the problem using existing infrastructure and a new carpool method with enforcement policies.

Guerbet

Location: Raleigh, NC
Leader: Odi Ikpe
ISE Team Members: Lindsay Emer, Elle Howe, Matthew Mullen

Guerbet produces syringes and vials containing various types of Contrast Imaging solution; a solvent used in MRIs and X-Rays to enhance the image. During the manufacturing process, an unknown amount of solution loss occurs.

The ISE student team will first identify the type of solution, then quantify the amount of loss, and finally develop a solution to reduce the level of loss.

At Guerbet, radiological contrast material is produced by mixing various powdered metals in solution. This process is currently handled manually with great labor requirements.

The ISE team has proposed semi-automated solutions to the powder mixing process, reducing labor expenditure and excess material loss.

IBM

Location: RTP, NC
Leaders: Juli Trexler, Michael Kincade, Kaylynn Harrison, Heath Hoffman, Kevin McCann
ISE Team Members: Braeden Barr, Karim Habbal, Taylor Smith

IBM provides technical support services for its hardware clients. As part of the support process, each customer receives a survey. The survey are processed through a website and then manually extracted, analyzed and distributed.

The ISE student team automated the data extraction process, as well as improved analytical results to increase productivity savings and survey score results.
Each semester the ISE Department has the pleasure of working with local companies on senior design projects. These projects are an opportunity for companies to utilize student resources and have new concepts and fresh ideas injected into their real-world projects. This sponsorship is rewarding for both the project sponsor and the student team. ISE would like to thank this semester’s sponsors for their participation in the program.

**Location:** Whitsett, NC  
**Leaders:** Cliff Richards, Glenn Stiles  
**ISE Team Members:** Blaine Little, William Martin, Nicholas Remy

At Lenovo, orders are comprised of different products and depending on the weight and quantities of products in each order are either shipped via a bulk shipping process or through a small pack process.

The ISE team modeled the current processes in a simulation and manipulated the simulation to come up with an order cut schedule that optimizes outputs for operators to follow.

**Location:** Raleigh, NC  
**Leader:** Casi Dailey  
**ISE Team Members:** Felix Cantos, Todd Goldfarb, Julianne Spencer

NC State Sports Medicine orders $100,000 worth of supplies annually without an inventory control system. This has led to lack of visibility of reorder points for supplies.

The ISE student team has created a financially-acceptable system that tracks inventory in a user-friendly way.

**Location:** Raleigh, NC  
**Leader:** Kristen Mostrom  
**ISE Team Members:** Codi Massey, Hiro Sato, Kady Ward

The NC State University Rifle Team’s shooting suits are prone to microbial growth. There is no adequate standardized protocol to reduce and inhibit the growth of microbes.

The ISE student team will provide and implement a protocol for the prevention and sanitization of microbial growth on the rifle shooting suits.

**Location:** Petersburg, VA  
**Leader:** Isaac Perkins  
**ISE Team Members:** Alex Lott, Aniket Desai, Eric Draeger

Since the construction of Tindall’s warehouse in 2008, it has never been properly laid out and the stored production materials have never been well-organized.

Using knowledge of EOQ and reorder points, the ISE student team recalculated inventory levels and redesigned the warehouse to help keep materials organized and improve material picking times as well as ensuring that business critical materials never run out of stock.

**Location:** Raleigh, NC  
**Leaders:** Anna Milner, Lauren Knapp  
**ISE Team Members:** Marie Erickson, Nicole Hamilton and Kelly Pomeroy

WebAssign creates and codes questions to be published into online learning modules. They are looking to increase capacity for the future.

The ISE student team improved department-wide efficiencies by focusing on three main areas: agile scrum practices, a data analysis tool, and continuous education.

To get more information about our senior design program, go to:  
go.ncsu.edu/ingearonline-seniordesign

**THANK YOU SPONSORS!**
INFORMS Student Organization, received the Cum Laude Student Chapter Award at the National INFORMS Conference in Philadelphia. INFORMS gives the award to chapters that have shown outstanding performance and participation.

The INFORMS Student Chapter’s purpose is to organize seminars, discussion groups and activities. Shakiba Enayati accepted the award on behalf of the organization.

Shadi Hassani Goodarzi, ISE graduate student, won 3rd place in the Minority Issues Forum Student Poster Contest at the National INFORMS Conference in Philadelphia. Hassani Goodarzi, Shakiba Enayati, Nisha Nataraj and Zinan Yi were four of the 10 semi-finalists in the competition.

They competed against college students from across the country including Michigan, Washington, South Florida, North Carolina A&T and Pittsburgh.

Rohan Shirwaiker, assistant professor, received the 2016 Outstanding Young Manufacturing Engineer Award from SME’s International Awards and Recognition Committee. The award recognizes Dr. Shirwaiker’s significant achievements and leadership in the field of manufacturing engineering as a young engineer.

Since 1980, the SME Outstanding Young Manufacturing Engineer Award has recognized manufacturing engineers, age 35 or younger, who have made exceptional contributions and accomplishments in the manufacturing industry.

Shu-Cherng Fang, University Alumni Distinguished Graduate Professor, received the 2015 Fellow Award from the Chinese Institute of Industrial Engineering (CIIE). The award is given to those members who have made significant contributions in theory and practice of the industrial engineering disciplinary to the society. It is the highest recognition of the institute.

Dr. Fang received the award at CIIE’s annual meeting in Taiwan over the winter break.
Paul Cohen, department head, received the Captain of Academia Award from the ISE Advisory Board during their October meeting. The award recognizes Dr. Cohen's distinguished academic leadership and significant achievements in the industrial and systems engineering profession. Over the last eight years, the department has become more interdisciplinary and has expanded into new, cutting-edge areas of research not traditionally considered industrial engineering.

Tim McGlothlin, executive director of the Ergonomics Center, was named a Fellow of the Institute of Industrial and Systems Engineers (IISE). A fellow is the highest classification of IISE membership. The award recognizes outstanding leaders in the profession who have made significant, nationally recognized contributions to industrial engineering.

Fellows make notable contributions in the areas of management, technical innovation and practical innovation. They volunteer significant time and effort on behalf of IISE while enhancing the institute's visibility.

Ashley Williams, junior, earned College Sports Information Directors of America (CoSIDA) Academic All-District Honors in February. She also received the Kay Yow Scholar-Athlete of the Year Award and was a member of the All-ACC Women's Basketball Academic Team.

Williams, who is known for hitting three point shots as a member of the NC State Women's Basketball Team, has also been hitting the books. Along with her impressive 3.92 GPA, she has made the Dean's List every semester of her college career.

Anita Vila-Parrish, director of undergraduate programs, received the 2016 George H. Blessis Outstanding Undergraduate Advisor Award from the College of Engineering at NC State. Dr. Vila-Parrish received $1,000 and a certificate at the COE spring faculty meeting. Also, COE will engrave her name on a permanent plaque displayed in Page Hall.

Dr. Vila-Parrish also received the 2016 C.A. Anderson Outstanding Faculty Award from the ISE Department at the 40th Annual C.A. Anderson Award Ceremony. ISE students select the winner of the Anderson Award each year.

Jonathan Addison, ISE senior, received the Field Performer of the Year from the ACC Conference. This is the second year in a row that Addison has received the award.

Addison, a long jumper on NC State’s Track and Field Team, has had an outstanding start to 2016. Along with the ACC award, he has received First-Team All-ACC honors, USTFCCCA National Athlete of the Week, ACC Men's Field Performer of the Week, and USTFCCCA Southeast Athlete of the Year. Addison has earned ACC All-Academic Team honors three times during his time in the ISE Department.
The ISE Department receives valuable input from its advisory board. The board maintains and fosters relationships with students, faculty, the Dean of the College of Engineering, the community and alumni. The advisory board assists the department head in achieving department goals and provides counsel and advice from its unique perspective. Board members are typically engaged in other ways, such as helping to connect the department with industry stakeholders. The advisory board meets each semester.

Dr. Leslie Alexandre
Director, Research Development and Collaborations at Georgia Regents University Cancer Center

Dr. Tony Atala
Director of the Wake Forest Institute for Regenerative Medicine
W.H. Boyce Professor and Chair of the Department of Urology at Wake Forest University

Larry Bowman
BSIE, North Carolina State University 1973
ISE Distinguished Alumni 2008
Principal with Bowman Investments, LLC

Edward Fitts (Chair)
BSIE, North Carolina State University 1961
ISE Distinguished Alumni 2006
Founder and CEO of Dopaco, Inc. (Retired)

Gayle Lanier
BSIE, North Carolina State University 1982
ISE Distinguished Alumni 2007
Senior VP and CCO of Duke Energy

Dr. Leon McGinnis
Ph.D., North Carolina State University 1975
ISE Distinguished Alumni 2006
Professor Emeritus in the H. Milton Stewart School of Industrial and Systems Engineering at Georgia Tech

F. Scott Moody
BSIE, North Carolina State University 1980
ISE Distinguished Alumni 2015
Co-founder and CEO of K4Connect

Joe Pleasant, Jr.
BSIE, North Carolina State University 1972
ISE Distinguished Alumni 2010
Chief Information Officer and Senior Vice President of Premier, Inc. (Retired)
Would you like to help the Department continue to provide world-class industrial engineering education and relevant, cutting-edge research? Here are some options:

**Annual Giving:** Annual gifts to ISE are generally for an unrestricted purpose. Gifts of more than $1,000 qualify for membership in the Dean’s Circle. Annual gifts from alumni are measured as “participation rate” and directly affect national rankings.

**Endowment:** An endowment is a fund held in perpetuity that benefits a specific purpose. Most endowments held by the Department are either for scholarships or endowed faculty purposes.

**Planned Giving:** Planned gifts can be as simple as a bequest (including us in your estate plans). Other options include trust vehicles and annuities, which have the potential to provide an income stream and significant tax benefits.

**Capital Gifts:** These gifts go toward “brick and mortar” projects. Donors are given “naming opportunities.” These include the planned Engineering Oval building.

**In-Kind Gifts:** These are gifts of goods or services to the Department at a discount or no cost.

**Special Gifts:** These gifts are directed to unique projects, centers or initiatives as directed and approved by the Dean of Engineering.

For more information, please contact Mike Walsh at 919.515.7237 or mpwalsh2@ncsu.edu. The Federal Tax Identification Number for the Engineering Foundation is 56-6046987.
A HIGHER GEAR

A look at some of the numbers that shape the Edward P. Fitts Department of Industrial and Systems Engineering at NC State

17
SENIOR DESIGN PROJECTS this spring which is a record

48
PERCENTAGE OF WOMEN accepted into our fall of 2016 incoming class which is the highest number of women ever accepted

1
STUDENT ATHLETES, in the Olympics. Anton Ipsen has already made Denmark’s Olympic Swimming Team and Jonathan Addison will compete at the U.S. Olympic Trials this summer.

3
PLACES that ISE jumped in the current U.S. News and World Report Rankings

11
VARSITY ATHLETES currently in ISE

Anton Ipsen
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