

illuminator

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A picture is worth a thousand roads

Grants will help researchers estimate flood levels using modeling and image data

By Keith Pierce

The Hampton Roads region is experiencing the nation's second highest rate of relative sea level rise. Exacerbated by climate change, the intensity and the frequency of storms is expected to increase, making the region even more susceptible to coastal flooding. With the help of two separate Department of Transportation (DOT) grants, totaling nearly \$300,000, researchers hope to at least ease transportation problems by using both real-time and historical modeling and image data. Led by Old Dominion University's Mecit Cetin, associate professor in civil and environmental engineering and director of the Transportation Research Institute and Navid Tahvildari, assistant professor, civil and environmental engineering, researchers are creating advanced systems to model, monitor and record road inundations due to recurrent flooding.

The first grant, worth \$108,000 for ODU and an additional \$42,000 for University of Virginia (UVA) co-collaborators, will help Cetin and his team leverage new and existing surveillance equipment to collect, archive and automatically analyze inundation levels on a large scale.



Mecit Cetin



Navid Tahvildari



"If this technology works the way we hope it will, it can be integrated into existing travel information systems, such as Google Maps or Waze," Cetin explained. "Measuring everything from location to how deep the water is, we can help citizens avoid these areas and aid emergency vehicles in rerouting."

The team, which also includes co-principal investigator, Khan Iftekharuddin, associate dean for research in the Batten College of Engineering and Technology, plans to build on their research in the future so that crowdsourced data (images from smartphones and social media) may also be processed automatically. Such systems can eventually be developed for any large-scale urban and rural transportation network to provide real-time, as well as archived data, for road inundations.

The second grant, worth nearly \$67,000 for ODU and an additional \$83,000 for collaborators at UVA and Virginia Tech, aims to employ state-of-the-art hydrodynamic and hydrologic models to study the impacts of sea-level rise on transportation infrastructure in flood-prone areas of Norfolk. An objective of the study is to improve inundation estimates and account for the effect of sea-level rise and

storm surge on shoreline erosion. The inundation estimates will then be used in transportation models to assess impacts on routing of emergency vehicles and positioning of mobile medical assets. The research team plans to extend this work in the future to include socioeconomic impacts of sea-level rise and recurrent flooding.

"These grants are very timely and relevant to ODU's research priority on sea-level rise, resiliency, and flooding," says Stephanie Adams, dean of the Batten College of Engineering and Technology. "To say that this work is important for the City of Norfolk, the region and even the nation, cannot be overstated. The College of Engineering at ODU is committed to taking an ongoing leadership role in this important work."

According to a recent report by the National Oceanic and Atmospheric Administration (NOAA), flooding caused by sea level rise is increasing along much of the east coast at a rate that projects that the majority of US coastal cities will experience recurrent flooding thirty or more days per year by 2050.

Embracing artificial intelligence through education

by Keith Pierce

When the average person hears the phrase, “artificial intelligence,” it conjures up scenes from a sci-fi thriller, where the unthinkable happens; artificial intelligence surpasses human intelligence and the world is run by robots. While we may not have to worry about robot domination just yet, the fear that artificial intelligence (AI) will replace at least some human job functions is a realistic concern for many. In fact, it’s already happening – think drone-delivered Amazon packages, robot waiters at Pizza Hut and self-driving Uber vehicles.

If you think it’s just low-paying manufacturing or hourly jobs that will see robotic replacements, think again. That’s what robots are now doing, thinking... again and again. With technology that goes beyond reading and writing, robots are beginning to emulate human behavior, doing things such as analyzing facial expression to detect mood, studying human activity to stop crime before happens and examining data to diagnose disease.

What about the jobs of the people responsible for designing and developing these intelligent systems? As intelligent machines become capable of sensing, perceiving, responding to and learning from other machines, will we have teams of super-intelligent robots capable of researching, brainstorming and then acting on their ideas? Are engineers designing their own replacements? Not exactly, says Ahmed Noor, professor emeritus of Modeling, Simulation & Visualization Engineering (MSV) at ODU.

“While much of the product design that happens autonomously begins with human decisions, artificially intelligent systems are in fact learning how to do more than just assembly-line type jobs,” Noor says. “However, though AI is enhancing the power of engineers to develop and design new products, the engineer is, and must remain, very much in control of the design process.”

Though not concerned about a robot takeover, in his article published in the October 2017 edition of Mechanical Engineering magazine, Noor describes the remarkable progress in AI. “Strong AI,” also known as artificial general intelligence (AGI), refers to a system that is able to learn and upgrade itself on its own without instructions. It also has the ability to operate with great autonomy, such as self-driving cars. “Artificial superintelligence,” (ASI), which has today’s scientists excited, refers to systems with intellect much higher than the human brain. This includes areas like scientific creativity, general wisdom and social skills, such as facial recognition systems that can determine a person is depressed or if a student is paying attention in class. ASI also offers implications for creating robotic clinicians capable of diagnosing illness faster and more accurately than human doctors.

Noor explains that AI has moved from automated systems to autonomous systems, but beyond 2017 will move to the next level – cognitive connected systems. These are systems that add superior intelligence and complex discerning ability to machines, leading to human feelings and thinking.

“We cannot keep thinking that these things are too far into our future, because they are already here,” he says. “We just have three choices when it comes to the rapid advancement of AI; we can either guide the change, resist the change or deny it altogether. It’s really up to us. Where do we want to be, that’s the question.”

As universities consider the implications AI has on educating future engineers, Noor believes that both students and faculty must think beyond today,



Ahmed Noor

tomorrow and even the day after tomorrow and ask themselves the question, ‘what about the day after that?’

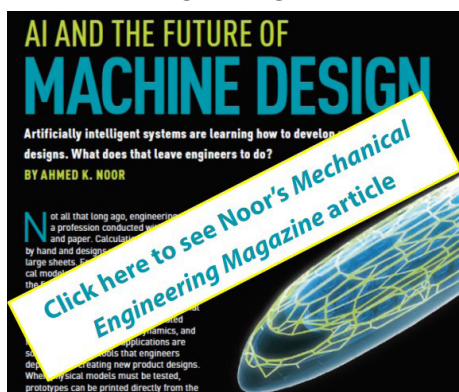
Noor describes AI as the new interface that is fundamentally altering our relationship with technology. From natural language processing, computer vision, machine learning, intelligent automation, deep learning and more, AI is evolving from advisor to orchestrator – from productivity enhancer to game changer. Training both students and faculty not to be intimidated by these advancements, but to embrace opportunities to work with them, is key to building on the capabilities of these intelligent systems, he says.

Universities worldwide are beginning to incorporate AI into their educational programs, such as IBM’s \$240M AI lab at MIT and SimCoach, an online intelligent virtual human counselor, developed at the USC Institute for Creative Technologies.

“ODU could benefit from the development of Cognitive Cybernetic Virtual assistants for providing customized information, and helping students and faculty in various other tasks,” Noor says.

“With intelligence technology permeating through every aspect of our lives, we must equip faculty with the knowledge and resources to teach students how to innovate beyond current innovation to become effective partners with and even developers of future of AI technologies.”

We need not be concerned about AI replacing humans, Noor says. “We have to see it as augmenting human intelligence, amplifying our strength, amplifying our thinking and amplifying our reach.”



Click here to see Noor's Mechanical Engineering Magazine article

Carol Considine a featured expert on NPR's Hurricane Irma coverage

by Jon Cawley

The Sept. 8 broadcast of National Public Radio's drive time news program "Morning Edition" focused on the unprecedented strength of Hurricane Irma and the infrastructure challenges posed by sea level rise and the increasing power of coastal storms.

Among the engineers interviewed was Carol Considine, an associate professor of engineering technology at Old Dominion University and member of the ODU Resilience Collaborative.

Considine told the show's national audience that higher sea levels will make any storm surge that comes ashore with Irma much more damaging.

"You're definitely going to have roadways that may be undermined and damaged from this type of storm," she said. "You're also going to have coastal flooding which could affect the storm water systems and communities."

The program was broadcast in the immediate aftermath of Hurricane Irma's devastating battering of St. Martin, Anguilla, Barbuda and several other Caribbean island nations, which sustained near-total destruction.

By then, Irma had decreased from a category 5 to a category 4 hurricane, but still sustained maximum winds of 155 miles per hour. The storm had also turned northward toward the continental United States, with Florida expected to be hit first.



Carol Considine

"Imagine speeding down the highway at 70 miles per hour with your car open while sticking your hand out of the window," said David Prevatt, of the University of Florida. "Now imagine jumping into a Maserati and going 185 miles per hour. The force in comparison to the 70 miles per hour is going to

be seven times as strong. This means Hurricane Irma's winds are exponentially stronger than anything that most people have ever experienced before."

Dams and levees are vulnerable to a storm of Irma's strength, as are electric power grids. Many of these U.S. systems are more resilient now, and building codes have improved since Hurricane Andrew 25 years ago, but Considine said the answer isn't solely to improve standards based on past storms.

"We need to start thinking about what we expect in the future and start changing the way we design to anticipate some of those future events," she said.

The ODU Resilience Collaborative is a consortium of leading University scholars actively engaged in research, education and outreach on critical resilience issues at the community, regional, national and global levels.

Click here to listen to the Morning Edition broadcast, visit the National Public Radio website now!

Inaugural Dean's Lecture Series

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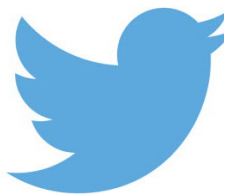
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***Seating is limited



Let's get social

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Use hashtag #ODUENGINEERING or CLICK ON ICONS TO CONNECT NOW!

Please 'like us' and 'follow us' on our social network sites. This not only does wonders for sharing and marketing all of the magnificent things happening in the college of engineering, but it's also a great way to receive real-time updates on BCET news, events and projects.

We are still in the very early stages of our social strategy. For example, while you will not see videos on our YouTube

channel yet, a video library is being planned to help populate the channel with videos that can be reposted and repurposed on ALL of our social channels. Our Facebook page needs to have 100 "LIKES" (not just followers) in order to create the username "@ODUEngineering." Our LinkedIn page will be an amazing networking resource, ideal for connecting alumni seeking to share their work as well as share career

opportunities with students. In order for our LinkedIn page to show alumni stats and career resources, it needs your help in attracting members.

We need YOU to help spread the word! Share these sites with students, staff, alumni, friends and family and let's watch it grow together!

Thanks for reading the illuminator!

We hope you enjoyed the first issue of the "illuminator," a new monthly e-newsletter designed to keep you informed of the exciting news, information and events in the Batten College of Engineering & Technology.

The illuminator is a monthly opportunity to showcase stories about the important work and incredible accomplishments of our faculty, students and alumni. With a goal to give readers inside access to what our faculty and students are researching, designing, building and thinking, the illuminator will include links to articles, videos and other behind-the-scene interviews and resources.

Though the illuminator will be delivered via email and will also be posted on the ODU Engineering website and social channels, please feel free to print and share it with your colleagues, contacts, family and friends. You can also repost copies through your own social channels, including networks of alumni, students,

professional organizations and friends of ODU Engineering.

As with anything new, the creation of this newsletter is a great opportunity to experiment. Therefore, your feedback, as well as your "feedforward" is valuable. What is feedforward? It is simply the opposite of feedback – where you, the reader, share your stories, successes and events – helping to provide content and knowledge that may not otherwise be made known to all of our audiences. We seek content that is timely, candid, genuine and relevant to the many audiences of BCET. We look forward to your feedback as well as your feedforward!

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www.ODU.edu/eng

The **illuminator** is a publication of the Batten College of Engineering & Technology

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