Constantinos Mavroidis Translational Research Award

Northeastern University
College of Engineering

Applying Research Innovations to Advance Technology Development

The Constantinos Mavroidis Translational Research Award recognizes and rewards outstanding College of Engineering researchers for accomplishments in applying research innovations to advance technology development. It was established to confer honor upon individuals, who, by their contributions to their applied research, have brought recognition to themselves, the College, and Northeastern University as an exemplar of our focus on experiential engineering education.

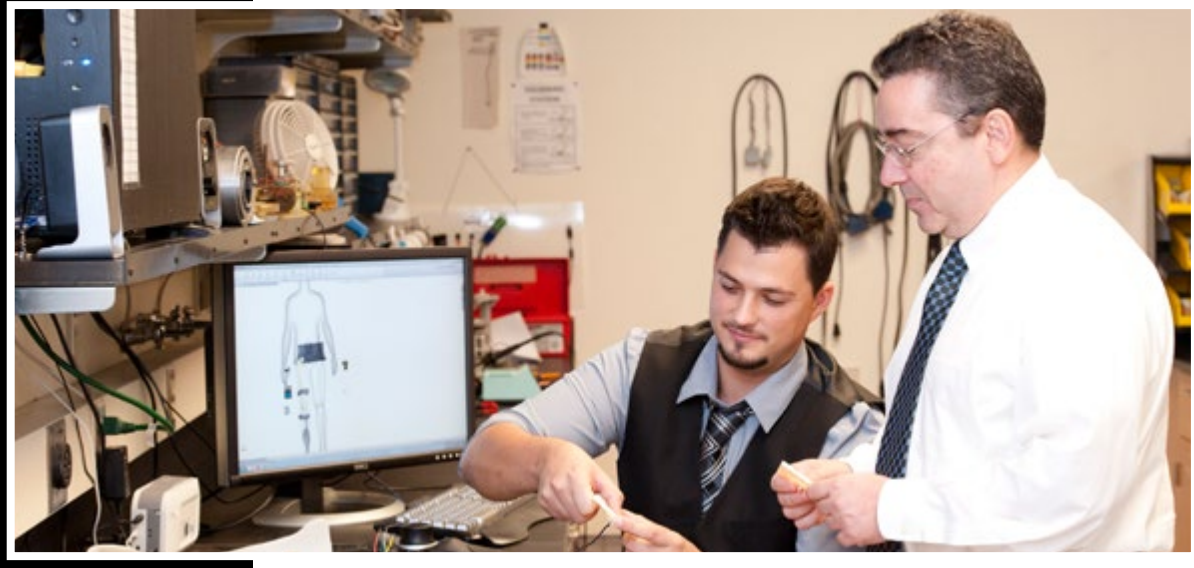
Originally named the Outstanding Translational Research Award, in 2020 the award was renamed in honor of Constantinos Mavroidis, a College of Engineering Distinguished Professor of Mechanical and Industrial Engineering and Director of the Biomedical Mechatronics Laboratory. His admirable dedication, accomplishments, and contributions to research and education embody the essence of the award. Professor Mavroidis was the first recipient of this award at its inaugural launch in April 2014.

To learn more about the Constantinos Mavroidis Translational Research Award visit: **coe.northeastern.edu/awards/translational**

Biography of Constantinos Mavroidis

DR. CONSTANTINOS MAVROIDIS was born on April 9, 1964 in Athens, Greece. He graduated from the Athens College High School in 1983 and received a Diploma in Mechanical Engineering from the National Technical University of Athens in 1988. He then moved to Université Paris VI where he studied under Professors Jean Claude Guinot of UP-VI and Bernard Roth of Stanford University, in the general area of kinematics of serial link manipulators. After receiving MS and PhD degrees from UP-VI, in 1989 and 1993, respectively, he became a post-doctoral fellow in the Mechanical Engineering Department of Massachusetts Institute of Technology, where he worked with Professor Steven Dubowsky between 1993 and 1996. He then moved to Rutgers University as an Assistant Professor of Mechanical Engineering in 1996 and established the Robotics and Mechatronics Laboratory. He was promoted to the rank of Associate Professor with tenure in 2001. His NSF CAREER award in 1999 was titled "Design of Robotic Systems Using Analytical Methods and Rapid Prototyping." His research interest in biomedical robotics led to a visiting professorship in the Department of Surgery at Harvard Medical School in 2001 and to a faculty position in the Department of Mechanical Engineering at Northeastern in 2004. While at Northeastern, he established the Biomedical Mechatronics Laboratory, was promoted to Professor in 2006, and was named College of Engineering Distinguished Professor in 2011.

Research and teaching interests of Professor Mavroidis were in the general areas of robotics and mechatronics. He worked on a wide range of topics, including rehabilitation and medical robotics, nanorobotics and nanomedicine, smart material based advanced actuators, among others. During his impactful career, Dinos established an excellent track record: he held visiting appointments at Stanford University, University of Tokyo and Harvard University; he gave 55 invited presentations; he held editorial positions in numerous prestigious engineering journals; he served in the organization committees of over 40 international conferences; he received numerous prestigious awards including the NSF CAREER award and the American Society of Mechanical Engineers (ASME) Freudenstein/General Motors Young Investigator Award; he was made a fellow of the ASME in 2006 and a fellow of the National Academy of Inventors in 2013. Throughout his career Dinos co-edited one book, wrote 19 book chapters, published over 65 peer reviewed journal papers, 90 conference proceedings, and had 15 issued U.S. Patents. His work continues to be cited strongly. His 2013 CV indicates his h-index to be 28 with 2,425 citations as of January 27, 2013. His latest h-index is 50 with 9,925 citations as of August 10, 2020.



COE Distinguished Professor Constantino Mavroidis and postdoctoral researcher Richard Ranky, PhD'12, work on a robotic device for gait rehabilitation. Two inventions for stroke rehabilitation by Professor Mavroidis and his team received over $1 million from the National Science Foundation, including the Robotic Gait Rehabilitation (RGR) Trainer and the Active Knee Rehabilitation Orthotic Device (AKROD) for rehabilitation of the pelvis and the knee, respectively. The project was in collaboration with the Harvard Medical School-affiliated Spaulding Rehabilitation Hospital's Motion Analysis Laboratory. The AKROD project also included an industry collaboration between Northeastern and WGI, Inc., a Massachusetts-based leading supplier of precision parts and assemblies for aerospace, industrial, and medical applications. Northeastern and the company signed an R&D licensing agreement for Electro-Rheological Fluid (ERF)—otherwise known as "smart fluid"—technology. ERF is the foundation of a series of devices invented by Professor Mavroidis and his team, including AKROD.

"Dinos' greatest strengths were his vision to connect the detail and diligence of lab research with the needs of the world outside, as well as assembling a team to make it a reality. "

Richard Ranky, PhD'12
Mechanical Engineering

Richard Ranky, PhD'12
Mechanical Engineering

I didn't apply to any other grad school because I knew that I wanted to come to Northeastern, and I knew that I wanted to study with Dinos Mavroidis. In Fall of 2007, he gave me an opportunity to start working at his lab in biomedical mechatronics, and it will always be one of the most valuable experiences of my life.

Dinos' greatest strengths were his vision to connect the detail and diligence of lab research with the needs of the world outside, as well as assembling a team to make it a reality. He instilled a strong awareness of how to bridge the translational gap so that research can thrive and benefit the world outside of our cavern in Egan. Especially in the medical field, being able to work directly with physicians and physical therapists reminded us about the impact of the work, and the value of getting it right.

From working with his group, I feel very lucky to have learnt firsthand how to cultivate concepts and find the right people to talk to. Spaulding Hospital, UMDNJ, Health Science Entrepreneurs, MassChallenge, and my fellow lab mates taught me lessons that set me up for success. When navigating through new challenges and late nights, without the collaboration and mentorship of this network I would not be where I am today.

Each student chooses to take on the risk to start a new life, move to a new city, and invest years into something unknown that they hope is the right decision. Having been out of school for a bit now, I've come to realize that each faculty too take on the same risks when accepting new members of their labs. Dinos was able to see the potential in all of us and built a team with a culture of mutual respect, support, and intellectual dedication which are a credit to the University, and to his memory.

Professor Mavroidis' Research Excellence Legacy

PROFESSIONAL SOCIETY FELLOWSHIPS

American Society of Mechanical Engineering (2006)

National Academy of Inventors (2013)

EXTERNAL AWARDS

Best Paper Award at the American Society of Mechanical Engineers

(ASME) Design Technical Conferences (1994)

ASME Freudenstein/General Motors Young Investigators Award (1998)

Rutgers University Johnson and Johnson Discovery Award (1998)

Class 1 NASA Tech Brief Award for new technology disclosure (1999)

National Science Foundation CAREER Award (2000)

Class 1 NASA Tech Brief Award for new technology disclosure (2002)

Finalist for Best Paper Award ASME Mechanisms and Robotics

Conference, ASME Design Technical Conferences (2002)

Popular Science Best of What's New Award in the Personal Health category from the invention, entitled "Smart Orthotic Device Using Electrorheological Fluids" (2004)

Literati Club Awards for Excellence (Best Paper Award) for the journal Assembly Automation (2005)

Cover page in IEEE Transactions on Nanotechnology (2009)

Best Poster Award and Finalist for the Best Demo Award at the 2010

IEEE Haptics Conference (2010)

Finalist for the Best Paper Award in Medical Robotics at IEEE International Conference on Robotics and Automation (2010)

NORTHEASTERN COLLEGE OF ENGINEERING AWARDS

Søren Buus Outstanding Research Award (2007)

Outstanding Translational Research Award (2014)

Northeastern University's Research, Innovation, and Scholarship Expo (RISE) award for the project "Interactive Cyclists Accident Prevention System (iCAPS)" (2014)

Faculty advisor to five additional Northeastern University RISE winning student project teams (2010 - 2013)

U.S. PATENTS AWARDED

10/15/2019	Razor blade coating
8/20/2019	Gait training system and methods
4/2/2019	Gear stabilization techniques
1/8/2019	Curved bearing contact system
8/2/2016	Multiple degree of freedom rehabilitation system having a smart fluid-based, multi-mode actuator
1/5/2016	Customizable embedded sensors
12/1/2015	Lower extremity exoskeleton for gait retraining
3/10/2015	Systems and methods of using a hieroglyphic machine interface language for communication with auxiliary robotics in rapid fabrication environments
9/16/2014	Patient specific ankle-foot orthotic device
6/26/2012	Virtual ankle and balance trainer system
3/27/2012	Electro-rheological fluid brake and actuator devices and orthotic devices using the same
9/27/2011	Instrumented handle and pedal systems for use in rehabilitation, exercise and training equipment
9/13/2011	Gear bearing drive
8/24/2004	Active quick connecting/disconnecting connector
4/30/2002	Prosthetic, orthotic, and other rehabilitative robotic assistive devices actuated by smart materials

SELECT RESEARCH PROJECTS

Customizable Sensors for Humans Using an Integrated Polymer: C-SHIP
National Science Foundation

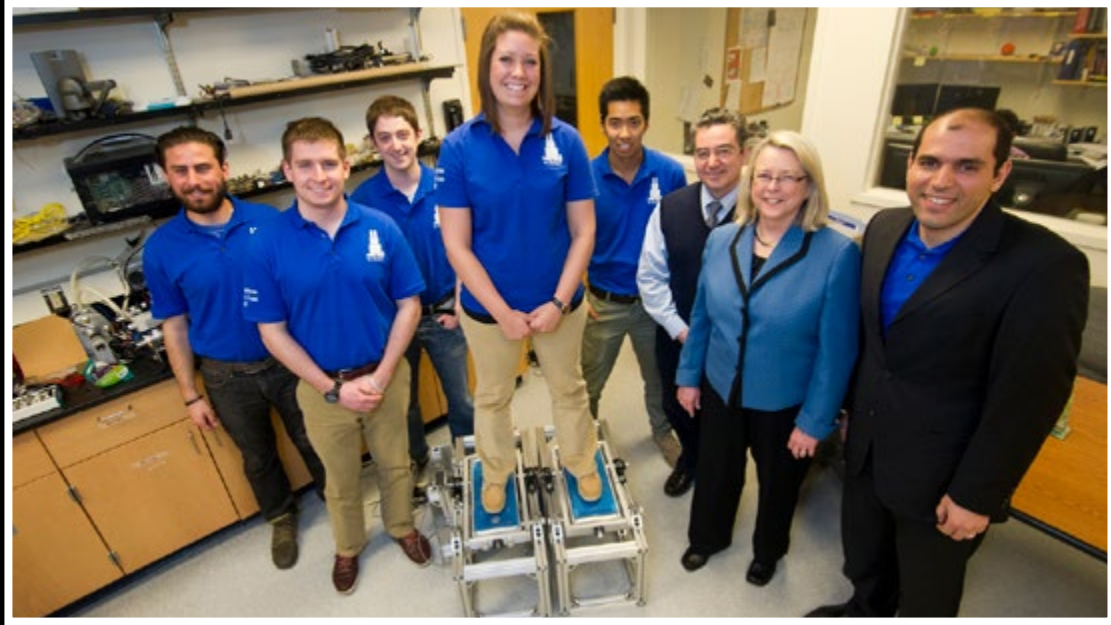
Commercialization of Lower Body Robotic Exoskeletons for Gait Retraining
National Science Foundation

Compact Drive System for Planetary Rovers and Space Manipulators
National Aeronautics and Space Administration

CPS: Breakthrough: A Cyber-Physical Framework for MRI Guided Magnetic Nano-Particles
National Science Foundation

The Gear Bearing Drive: A Novel Compact Actuator for Robotic Joints
National Science Foundation

Robotic Leg Advancement Device
National Science Foundation



Professor Constantinos Mavroidis stands with the Virtually-Interfaced Robotic Ankle and Balance Trainer Capstone team. vi-RABT is a robotic ankle rehabilitation device designed to assist patients recovering from strokes and athletic injuries. vi-RABT is a 2013 Northeastern University RISE winner for Entrepreneurship in the Engineering and Technology category.

Professor Constantinos Mavroidis, and Richard Ranky, PhD ‘12 and postdoctoral researcher, discuss a commercially-available multi-piece sensor array, in rear, and a custom 3D-printed version with embedded sensors and electronics that give it greater customizability and a smaller size.

Professor Constantinos Mavroidis (PI), along with students Amir Farjadian, Qingchao Kong, Carlo Sartori, Matt Gowie, and Elica Farjadian, won Northeastern's 2011 RISE award for Entrepreneurship in the Engineering and Technology category for the project "Interactive Cyclists Accident Prevention System (iCAPS)". They also received Northeastern's 2014 RISE Excellence in Entrepreneurship Award–a $5K award given to the presentation that earns the highest honors during the exhibition. iCAPS is a "smart" bike system that creates a safety zone around the cyclist, provides long-term educational feedback, and alerts the cyclist in case of imminent accident.

Yalgin Ozsecen, MS'10
Mechanical Engineering

Over the years at Northeastern University, Dinos built a great environment for learning and research. I found great value in working with Dinos during my graduate studies from 2008 to 2010. Dinos embraced diversity of thought and always trusted his research associates and collaborators in mission-critical tasks. He fostered interdisciplinary research by integrating local and international researchers into exciting projects. He found ways to integrate electro-mechanical engineering approaches to these diverse fields and brought in new challenges to study within his group. Some of his translational research activities included the following topics: Biomedical Devices, Physical Therapy, Nanorobotics, Smart Materials, MRI Compatibility, Wearable Devices. Now, when I look back to the problems that Dinos chose to research, I can say that he had an exceptional ability to identify high-impact translational research topics that could be used to enhance quality of life.

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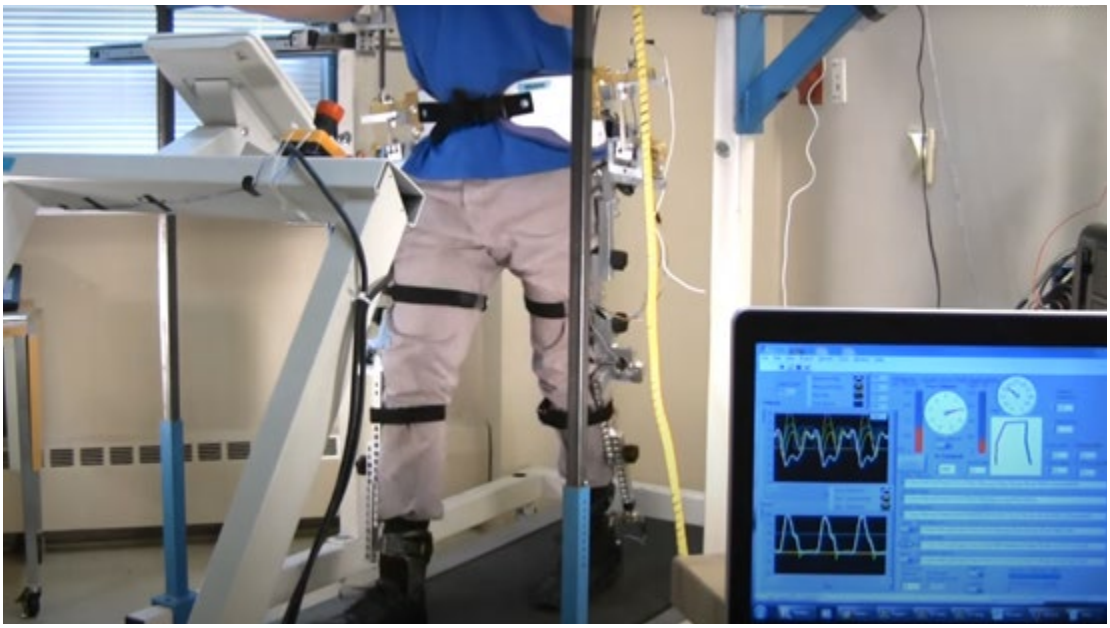
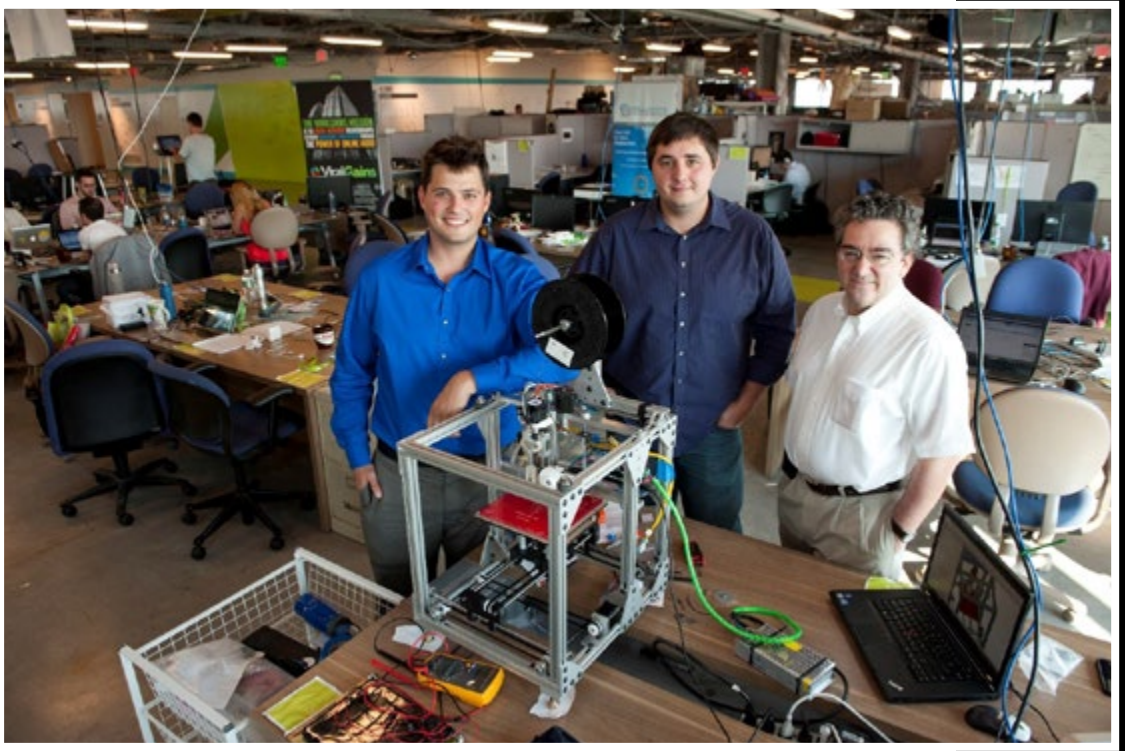


After Maciej Pietrusinski, PhD'12, defended his thesis on "The Robotic Gait Rehabilitation Trainer," he and Professor Mavroidis created a spin-off, AndrosRobotics. The start-up invented the Robotic Leg Advancement Device (R-LAD) and received funding from the National Science Foundation to develop a proof of concept, leading to an industrial partner, funding, and furthering the company.

Richard Ranky, PhD'12, and Professor Mavroidis received the Graduate Award in the Engineering and Technology category at Northeastern's RISE in 2012, for the project "3D Printed Sensors in Wearable Medical Devices using C-SHIP". This is a novel solution to build a force measuring sensor inside the device body by injecting the core sensing element after the part has been built and cleaned, rather than fitted externally afterwards.



Together with Professor Constantinos Mavroidis (right), students Richard Ranky, PhD'12 (left), Mark Sivak, PhD'12 (center), and Lexi Carver, MS'15, spun off 3-Spark from Northeastern's Biomedical Mechatronics Laboratory. The company specializes in 3-D printing technologies for the education and consumer markets and was a finalist in the 2013 MassChallenge program.

Mark Sivak, PhD'12
Interdisciplinary Engineering

I first met Dinos in 2006 when he became my capstone advisor and I was able to see how he viewed translational research from the very beginning. He entrusted our group of five undergrads with developing a project based on new technologies at the time: 3D printing and 3D scanning. That project would end up with a patent and landed me a position in his lab for grad school. Over my five years in the Biomedical Mechatronics Lab, I worked on nearly a dozen different projects from industry sponsored research, and internal, national and international grants, other students' incubated startups, and even some of my own ideas.

Dinos viewed technology as both an avenue to increase quality of life, but also as a wilderness to explore and mine for new ideas. We had partnerships ranging from Spaulding to Rutgers to institutions in Europe. He hired students from all over the world and cultivated a laboratory culture of teamwork, fun, and excellence. He was fiercely loyal to his students, feeling personally responsible for their success. Throughout my PhD, he was supportive of my plans to pursue an interdisciplinary PhD and was a great doctoral advisor. He fostered an entrepreneurial spirit in his students, encouraging them to bring their research out of the basement of Egan and into the world.

Dinos was a private man who could be difficult to get to smile but enjoyed a good joke. I got to see him interact with son when he would visit the lab or his office. On a very personal note, seeing how obviously he loved his wife and son impacts me with my own family life today.

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Mark Sivak, PhD'12
Interdisciplinary Engineering

“Dinos…often pushed the lab [team] to operate as a start-up that also disseminates knowledge and useful discoveries to the world.”

Elias Barasitos, PhD’17
Mechanical Engineering

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Mechanical Engineering

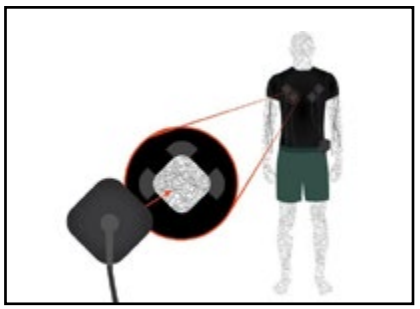
As I considered coming to Northeastern University for my graduate studies, I was intrigued by the depth of research combined with the entrepreneurial focus at Dinos’ Biomedical Mechatronics Laboratory.

A kind and hard-working educator and innovator, Dinos consistently displayed genuine interest in his student’s professional success, and often pushed the lab [team] to operate as a start-up that also disseminates knowledge and useful discoveries to the world. His guidance, understanding, and wisdom would often evoke my scientific curiosity and lead me to the threshold of my own mind.

Thanks to his support and recommendations, I won a prestigious NASA Space Technology Research Fellowship—which enabled me to earn a PhD degree in Mechanical Engineering, and further provided me with a rare opportunity to work at the world’s leading center for robotic exploration of the solar system: the Jet Propulsion Laboratory.

Dinos’ legacy and contribution to science and technology will continue to live and be cherished and remembered by so many.

Undergraduate engineering students Caitlyn Bintz (shown), Drew Lentz, Jason Chrisos, Avi Bajpai, and Andrew Clark, advised by Professor Mavroidis, received Best Poster Award at the 2010 Northeastern University Research Expo, in the category Interdisciplinary Topics, Centers and Institutes, for their project “ATLAS Bimanual Rehabilitation System: A Low Cost Smart Glove System for Virtual Rehabilitation”. The rehabilitation gloves help stroke victims and wounded vets regain their fine motor skills by monitoring movement in the hands and arms as the wearer plays virtual reality games.



The senior capstone design team of Trevor Lorden, Alex Moran, Adam Morgan, Joe Sheehan, Thomas Wilbur and Kyle Peters, advised by Professor Mavroidis, received the Entrepreneurial (People’s Choice) Award at Northeastern’s 2012 RISE, for their project “SQUID: Exercise Effectiveness and Muscular Activation Tracking”. They also received the Best Project Award in the category Interdisciplinary Topics, Centers and Institutes for undergraduates. SQUID is a sensor-equipped shirt that connects with an Android app and interactive website. It is made up of a compression athletic shirt with sensors attached to it, which translate electronic signals into data that is fed into the SQUID Android app and an accompanying website.





“While the academic world knows him as ‘Professor Constantinos Mavroidis’, I knew him simply as ‘Dad’. Though at a young age I could not understand the complexity of his work, I was proud of him. I knew that his work was influential to his students, of paramount importance to the scientific world and through his innovations he offered hope to people who are in need.

He was and still is my hero. The time I spent with him and all the knowledge and happiness he gave me are part of a mosaic which I call his legacy; a legacy as a father, as a mentor, and as my inspiration in life.”

Alexandros Mavroidis

“What fascinated me and became an objective when I came to Northeastern was to create new devices that could help people. Eventually what we develop in the lab will give us new products that could be useful to people in their everyday life or to improve their quality of life.”

Constantinos Mavroidis
COE Distinguished Professor
Mechanical and Industrial Engineering
Director of the Biomedical Mechatronics Laboratory
Northeastern University

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