FHL VIVE CENTER

FOR ENHANCED REALITY

ANNUAL REPORT

2021

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Masters student Michael Wu explains how to work with ROAR hardware during the Summer 2021 V2 Series Competition (Photo Credit Adam Lau)

MESSAGE FROM ALLEN YANG

Looking back in 2021, it is a year of endurance and a year of regrowth. After a full previous year of lock down, we were able to welcome students back to campus again and our hearts were filled with excitement to meet with our students and colleagues again in person.

With the reopening, the admission of our students in the AR/VR and Autonomy areas roared back and far exceeded the numbers from previous normal years. In total, we had nine MEng students who selected AR/VR capstone as their degree project, and 15 MEng students who selected Autonomy and Autonomous Driving capstone. More undergraduate students were able to volunteer being part of our capstone projects as well.

In terms of AR/VR, we have continued extending our partnership with Siemens. This year, our collaboration focuses on the topic of Digital Twin, namely, overlaying an information-rich digital model with its corresponding real-world objects. Such ability could greatly increase the productivity and safety in field engineering, services, and training practices. Vive Center will develop more robust and accurate “Snap-On” localization algorithms to better place visual digital models aligned with the real objects.

As part of our commitment to open source research for the AR/VR community, we have continued improving the code quality and performance of the OpenARK library, primarily focusing on enhancing the SLAM (Simultaneous Localization and Mapping) performance.

In Autonomy and Autonomous Driving, working closely with the College of Engineering, we have started a new program to teach Robotics, AI, and Autonomous Driving application to Grades 9-12 students as part of the College’s summer STEM outreach program, called ROAR Academy. Our initial class of 60 students provided high marks in the exit survey of our first year curriculum, which can be read here or in the ROAR Academy section below. Out of the 60 students, we were able to provide full fellowships to about 30% students who demonstrated financial needs.

Furthermore, we launched a year-round ROAR Ambassadors program to further develop the technical and leadership skills of top students who have the ambition to continue their learning journey about ROAR in their high schools. You may read about their stories below.

Also in 2021, our ROAR program was invited to team up with University of Hawaii and UCSD AI Racing team to participate in an exciting world-class full-scale AI car racing competition, known as the Indy Autonomous Challenge. We look forward to deploying our state-of-the-art perception and planning solutions on the advanced Indy Dallara chassis, and showing case its performance in Texas Motor Speedway and Las Vegas Motor Speedway later this year. We would like to also welcome a new partner in our ROAR program, VIA Technologies, whose founder and CEO Wenchi Chen has been a long-time sponsor of Berkeley and the Vive Center.

Finally, Vive Center will be launching a new program called Berkeley Defi Research Initiative (defi.berkeley.edu). The program will focus on advancing solutions to critical challenges in the rapid growing blockchain and decentralized finance applications. We look forward to admitting our first cohort of graduate students this year, and will forge new partnerships in this new space.

I welcome your suggestions to further our causes to improve our Center programs in the future.

Sincerely,

Allen Yang

Executive Director, FHL Vive Center for Enhanced Reality

Allen Yang (Photo Credit Adam Lau)

Shankar Sastry (Photo Copyright Noah Berger)

MESSAGE FROM SHANKAR SASTRY

2021 was a very eventful time for the FHL Vive Center. During the early part of 2021 in the height of the pandemic we renovated space at the Richmond Field Station to accommodate the growth of our Robot Open Autonomous Racing (ROAR) program. ROAR is an AR/VR based scale model car racing program, and was a tremendous favorite with Master of Engineering students in the new Autonomous Systems track launched by our Executive Director, Dr. Allen Yang. In fact, it was such a great success that it was offered to high school students in multiple cohorts over the summer, culminating in an in-person car race on the Bechtel Terrace on campus in August 2021. The surge of enthusiasm that ROAR has generated among our own students has been tremendous.

The broader research message of the FHL Vive Center has been to launch a program of formalizing human robot systems and their interactions. As AI/ML enabled systems and robots grow in sophistication we will be increasingly called upon to develop human robot teams. The training of such teams including the ability for humans and autonomous systems to learn about their preferences, to collaborative share tasks, is a far cry from the early days of robotics and automation where robots and human had distinct spaces of operation and the robotic systems were often relegated to performing a limited subset of tasks (referred to as dull, dirty, and dangerous in robotics parlance). We will increasingly be in a world where humans and automation will interact with each other in the joint performance of tasks and develop trustworthy teams which improve as they work together. We were grateful for the support of the Office of Naval Research to provide us funding to work on Human Machine Interaction with Guaranteed Performance Outcomes.

AR/VR environments suitably designed will be the key to seamless human machine teams working together. This then has become a huge focus of our new efforts in the FHL Vive Center. We look forward to many new breakthroughs in this area going forward.

All of our faculty, staff, and students in the FHL Vive Center wish you wonderful future in 2022.

Sincerely,
Shankar Sastry
Faculty Director, FHL Vive Center for Enhanced Reality

NEW BOARD MEMBER, SAID BAKADIR

The FHL Vive Center for Enhanced Reality is excited to announce the addition of Said Bakadir to our advisory board. Said Bakadir is joining us from Qualcomm Inc, where he is a Senior Director of Product Management. He is leading the XR (AR/VR) business including partner engagement, P&L, and product strategy. Said has played multiple roles in the industry, particularly within Qualcomm since he joined in 2005 in England.

He has played leading roles in engineering, customer engineering, product marketing, product management and business development. He has also managed numerous technologies and device launches, based on Snapdragon processors. These launches range from early simple GSM, UMTS feature phones and modem dongles, to recent smartphones, Robots, Drones, and XR products.

> *"Qualcomm has been in the innovation frontier of many groundbreaking technologies that are enabling the revolution of AR/VR market. As a veteran in innovation of the AR/VR market, we are thrilled that Said would like to devote his time and experience to strengthen the collaboration between emerging markets with academia, especially with Berkeley Vive Center's deep bench of faculty and researchers. I would like to warmly welcome Said to become a board member of the Vive Center, and look forward to working with him to further enhance our research and education programs at Berkeley" - Allen Yang*

FOCUSING ON K-12 OUTREACH AND EDUCATION

The first cohort of ROAR Academy who attended our in-person V2 Series on Bechtel Terrace. (Photo Credit to Adam Lau)

In 2021, the center has began working with the College of Engineering toward expanding efforts into K-12 outreach and education. Beginning with Summer 2021, the center began offering a two-week academy for motivated high school students who were interested in STEM subjects. This course focused on teaching python programming, introductory autonomous driving algorithms, and applications. High school students were able to work with UC Berkeley faculty and students to design their own solutions to the ROAR S1/S2 Software Simulation Series.

In addition, we wanted to offer our technical and financial support to students who were dedicated toward learning about the ROAR platform and were able to successfully compete in the competition. The ROAR Ambassador Program launched and was dedicated toward helping high school students bring the ROAR program to their high school experience. Each ROAR ambassador would be directly teamed up with one ROAR faculty member and one graduate student at Berkeley in a one year mentorship program and also receive a $2,000 grant.

During the Summer 2021, the center also worked in partnership with the Quest Academy where four students were named summer interns at the University of California, Berkeley College of Engineering and the FHL Vive Center for Enhanced Reality at UC Berkeley. These four interns would be working remotely as part of a team with Berkeley faculty and graduate students to build autonomous motion vehicles and design an Artificial Intelligence(AI) curriculum for elementary schools.

ROAR Summer Academy: Teaching High School Students Python Programming and Autonomous Driving Algorithms

ROAR Academy is a rigorous and intensive two-week program for high school students who have demonstrated an aptitude for academic and professional careers in science, technology, engineering and mathematics (STEM) subjects. Talented and motivated high school students who are entering 10th-12th grade in the Fall have the opportunity to work with UC Berkeley faculty, researchers, and scientists while focusing on learning about Python programming and introductory autonomous driving algorithms.

The students through this 10-day program will be expected to learn sufficient knowledge to participate in ROAR competition entirely in software simulation, dubbed the S2 series for K-12 students (compared to the current S1 series that includes college students and professional learners).

Thanks to ROAR virtualization software and other open-source Python and AI libraries, learners were able to attend the Academy through online lectures for 2022.

Michael Wu explains how the ROAR hardware functions to the ROAR Academy students. (Photo Credit to Adam Lau)

In total, three classes were offered during July and August to 60 students. The academy supported high school student's exploration of engineering as a career path by providing an interactive overview of machine learning, reinforcement learning, and upcoming autonomous driving technologies. We are very pleased to report that based on the end-of-program survey, the new learning experience for our enrolled high school students was overwhelmingly positive and supportive. Students surveyed described the Academy experience:

- Students described our program as: **Interesting, Engaging, Challenging, Comprehensive, Fast-paced, Well-organized, Hands-on, Informative, Intensive**
- More than 90% of the students preferred the ROAR Academy to stay at the same length or be a longer program.
- More than 83% of the students surveyed think the difficulty level was just right or slightly difficult.
- More than 80% of the students surveyed after completing ROAR Academy would love to continue to participate or attend future ROAR-related projects.

Parts of the UC Berkeley campus were converted into a racecourse for high school students on Saturday (Aug. 14) as part of a Robot Open Autonomous Racing (ROAR) competition. The event capped the summer ROAR Academy in which dozens of students worked with autonomous driving algorithms and tested them in Python-based environments.

The ROAR competition began three years ago as part of courses offered to undergraduates as well as to Master of Engineering students. Last year, the pandemic forced the conversion of the program into an online-only format. This year, the instructors adapted the program to ROAR Academy, a rigorous two-week summer program available to high school students.

Allen Yang, executive director of the FHL Vive Center for Enhanced Reality and chair of the ROAR Academy, said the ROAR program has three distinct racing leagues. The S1 Series will focus on testing autonomous AI algorithms through a Python-based racing simulation environment. The V1 Series will enable contenders to manually race their vehicles in virtual reality, akin to an e-sports platform. The A1 Series puts the AI programming to the test using RC cars in a 10-lap competition.

> *"Sunday's event was simply a way to reward students who took part in the ROAR Academy by giving them a fun way to learn the mechanics of vehicle control"*
>
> *- Allen Yang*

The first cohort of ROAR Academy who attended our in-person V2 Series on Bechtel Terrace. (Photo Credit to Adam Lau)

ROAR AMBASSADOR PROGRAM LAUNCHED

Cameron Shaw

Aaron Xie

The Berkeley ROAR Ambassador program was launched to recognize the outstanding efforts and dedication of selective students who have been veterans of our ROAR platform, who have successfully completed ROAR AI Racing, and would like to contribute more by becoming an advocate and leader at their own school communities. The program sponsors activities at ambassador schools including organizing AI and Autonomous Driving seminars, participating in ROAR AI Racing, providing program feedback to us, and potentially becoming an active researcher to help grow the Berkeley ROAR program. Each ROAR ambassador are teamed up with one ROAR faculty member and one graduate student at Berkeley.

We are thrilled to announce our new 2022 ROAR Ambassadors, Cameron Shaw and Aaron Xie. Beginning in 2022, they will be bringing the ROAR experience to their respective high schools with our technical and financial support.

Cameron Shaw

Cameron Shaw is a junior at the Athenian School in Danville, California. He has competed in the summer and fall 2021 ROAR simulation series. Cameron is also a member of Athenian's First Robotics Competition (FRC) team (852). He is currently studying Calculus BC, Multivariable Calculus, and Data Structures. Cameron is also presently assisting on a robotic arm motion planning project with graduate students in collaboration with a major automobile manufacturer. In his spare time, Cameron enjoys working on a variety of programming side projects involving Microsoft Azure, AWS, and MongoDB.

Aaron Xie

Aaron Xie is currently a high school junior at Campolindo High School in Moraga, California. He really enjoyed learning Python and AI during the ROAR Academy 2021 summer program and would like to continue exploring autonomous driving. When he isn't coding, Aaron enjoys playing music and strategy games.

QUEST ACADEMY STUDENTS FINISH SUMMER COLLABORATION WITH FHL VIVE CENTER

Quest Academy, a leading private, independent school for gifted students in Palatine, IL had four Quest Academy students work with the FHL Vive Center this summer in developing a ROAR JR Racing Program. These students worked remotely as part of a team with Berkeley faculty and graduate students to build autonomous motion vehicles and design an Artificial Intelligence(AI) curriculum for elementary schools. The Quest Academy students were selected based on test scores and their knowledge of Python, Artificial Intelligence and autonomous motion programming.

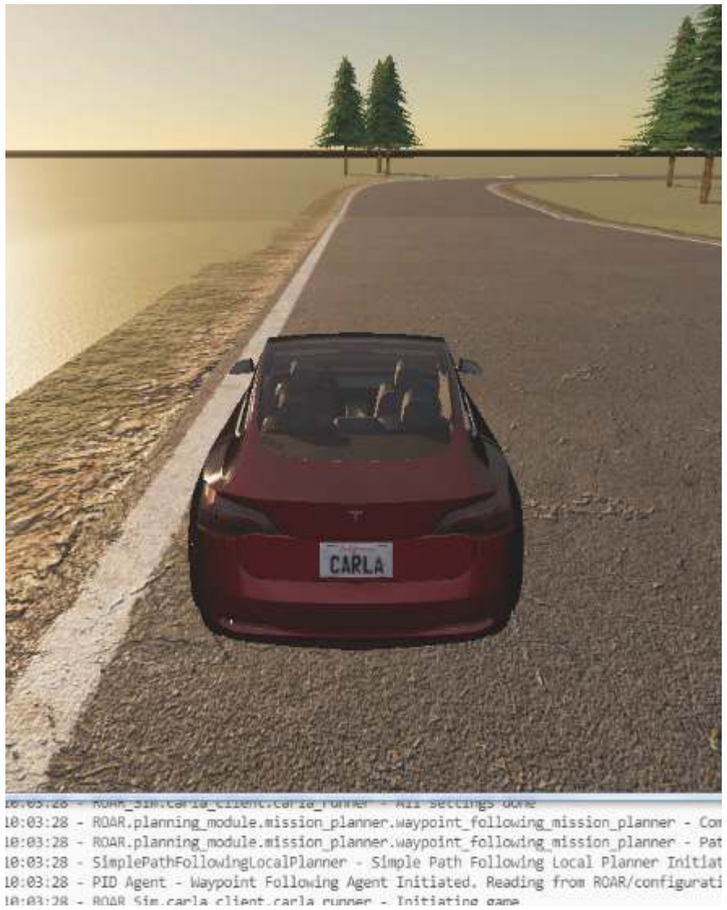
The UC Berkeley team was led by Dr. Allen Yang. His team has deep experience in AI and autonomous driving and UC Berkeley currently hosts a Robot Open Autonomous Racing (ROAR™) competition three times a year, in Spring, Summer and Fall, respectively.

Dr. Yang describes the UC Berkeley/Quest partnership: “In our efforts to develop innovative AI curriculum for younger ages as part of our K-12 AI Learning Initiative, it is critical to test and collaborate with highly qualified younger students who can provide meaningful feedback to our teams. We commend these Quest students for their commitment to this project and we look forward to their active participation this summer.”

The Berkeley team and Quest students spent the early part of the summer designing and optimizing autonomous driving vehicles. Afterwards, the team refining programming curriculum for the vehicles for elementary school students.

> *“In our efforts to develop innovative AI curriculum for younger ages as part of our K-12 AI Learning Initiative, it is critical to test and collaborate with highly qualified younger students who can provide meaningful feedback to our teams. We commend these Quest students for their commitment to this project and we look forward to their active participation this summer.” - Allen Yang*

S1/S2 SERIES COMPETITION



The S1/S2 Series Competition began in 2019 to tackle several remaining pain points in our community’s effort to bring such AI systems to be fully autonomous and be more safe than human drivers.

Additionally, since the dawn of the automobile industry in the early 1900s, motor racing has been one of the most exciting high tech games for both adults and teenagers alike who dream of owning and racing their own supercars.

Many advances in the automobile industry were first thoroughly battle tested via motor racing games, such as active suspension, traction control, paddle shifters, and recycling of kinetic energy. With the same mentality and concepts in mind, the ROAR program created their AI racing competitions based on the ROAR open-sourced software and hardware design. We wanted our participants to modify the reference designs with their own creativity and submit their work to be tested against others.

The ROAR program has kept a public record of the results, and also encouraged all participants to open source their software and algorithms to benefit the community. As such, all related technical reports are continuously published on the ROAR website in the blog section. Due to the pandemic, S1 Series (Software Simulation) became the primary competition. The S1 Series is a Python-based racing simulation environment that allows contestants to race their own developed autonomous AI agents.

Contestants were able to fully train and test their AI algorithms without any vehicle hardware.

S1/S2 SERIES WINNERS IN 2021

For 2021, we have been using the Berkeley Minor Map. We have researchers working on upgrading the virtual maps to simulate UC Berkeley's campus with release dates in 2022.

FALL 2021

The winners for the 2021 Fall ROAR S1/S2 series:

Grand Prize: Ryan Chen (Record: 1014.77 s)
Second Place: Aaron Xie
Third Place: Tianlun Zhang and Star Li

Special Awards:
Fastest Single Lap Time:
Ryan Chen (Record: 1.41 s)
Prime Directive (Fastest system that had zero crashes during competition): Ryan Chen

SUMMER 2021

The winners for the 2021 Summer ROAR S1/S2 series:

S1 Series First Place: (Roll ContRoll) James Cheney (Record: 1046.61 s)
Fastest Lap Time Prize: James Cheney
Prime Directive Prize: James Cheney

S2 Series First Place: (High School Rookies) Peter Peng, Rooney Xu, Charlie Sun, Amanda Chiang, William Situ (Record: 1999.4 s)
S2 Series Second Place: (Camshaft54) Cameron Shaw
S2 Series Third Place: (RCAI) Ryan Chen

SPRING 2021

The winners for the 2021 Spring ROAR S1 series:

Grand Prize: James Cheney and Chufan Guo (Record: 3595.43s)
Second Place: Michael Wu, Mark Scheble, and Adrian Liu
Third Place: Michael Wu, Star Li

Special Awards:
Fastest Single Lap: James Cheney and Chufan Guo (Record: 355.1s)
Prime Directive (Fastest system that had zero crashes during competition): James Cheney and Chufan Guo

FACULTY FUNDING AND UPDATES

PROFESSOR FRANCESCO BORRELLI AWARDED $3.5 MILLION IN FUNDING FROM U.S. DEPARTMENT OF ENERGY FOR NEXCAR PHASE II

Congratulations to Mechanical Engineering professors Francesco Borrelli and Roberto Horowitz and Civil and Environmental Engineering professor Scott Moura on receiving the US Department of Energy Advanced Research Projects Agency - Energy (ARPA-E) award. UC Berkeley received $3.5 million as part of an $18 million award to fund four projects that will help passenger vehicles operate more efficiently. The project will also support a post-doc and multiple PhDs between Borrelli's, Moura's, and Horowitz's labs. With this funding, UC Berkeley will adapt and expand its eco-route, eco-drive, and eco-charge controls to leverage connectivity and SAE (Society of Automotive Engineers) Level 4 (L4) automation to generate additional fuel efficiency benefits in electrified vehicles including EVs and PHEVs. UC Berkeley's NEXTCAR project resulted in a spin-off company, WideSense Inc., which will commercialize the technologies developed in both phases of the project.

This funding is part of Phase II of the Advanced Research Projects Agency-Energy's (ARPA-E) Next-Generation Energy Technologies for Connected and Automated On-Road Vehicles (NEXTCAR(link is external)) program. Launched in 2016, ARPA-E's NEXTCAR program focuses on reducing vehicle energy consumption by developing Connected and Automated Vehicle (CAV) technologies that optimize vehicle dynamic controls and powertrain operation, allowing a vehicle to automatically process and react to its surrounding environment, traffic conditions and nearby vehicles.

Current CAV technologies predominantly focus on the improvement of vehicle safety and adding driving convenience, while NEXTCAR is among the first of research efforts in this space to specifically focus on developing CAV technologies to reduce vehicle energy use.

Phase I of NEXTCAR focused on the development of CAV technologies for use in all vehicle classes, including cars, trucks, and buses, with the goal of enabling a 20% reduction in energy consumption. The teams moving on to Phase II of NEXTCAR are building on these goals with a specific focus on light-duty passenger vehicles, a 30% reduction in energy consumption, and taking vehicles to Level 4 of automation, where a vehicle is able to perform all driving operations on its own with optional human override.

Light-duty vehicles, like those targeted through NEXTCAR Phase II, are responsible for almost 60% of overall energy consumption in all vehicles across the transportation sector. CAV technologies can increase vehicle efficiency, which in turn can reduce emissions across the transportation sector.

The four teams selected to receive $18 million in funding through Phase II of NEXTCAR are UC Berkeley, Michigan Technical University, The Ohio State University, and Southwest Research Institute.

PROFESSOR LUISA CALDA'S VIRTUAL REALITY PROJECT PROVIDES AN ONLINE SPACE FOR ARCHITECTURE STUDENTS

Virtual Bauer Wurster's digital studio desk space will allow students and instructors in the College of Environmental Design to connect and collaborate on projects. (Photo courtesy of Luisa Caldas)

A team of UC Berkeley students and virtual reality specialists led by XR director and Architecture professor Luisa Caldas launched "Virtual Bauer Wurster," a fully immersive virtual reality program that allows CED students and faculty to wander exhibit spaces, review models, and engage almost like they used to from the comfort and safety of their own homes, using just a computer.

The project was initially created as a tool to replace the spark of in-person interactions lost when Berkeley moved to remote learning a year ago. But the platform will stick around long after the campus reopens, said Vishaan Chakrabarti, dean of the school.

The virtual space is the first of its kind at Berkeley, and can be accessed by CED students and faculty through a custom application and/or a web-based platform created by Caldas and her team of architecture and computer science students. Users can create an avatar, interact with other student's work, and communicate with one another.

Caldas said she hopes the event gives the public and campus community some insight on how the virtual space can be applied to other colleges and departments on campus. Most of all, she looks forward to the community the platform will help to create.

This project has been able to create a collective experience for students in VR during a tough year with minimal in-person interactions due to the pandemic.

> *"How do you communicate inside a virtual environment so that it isn't an isolated experience, but a collective one? That's ultimately what we wanted to achieve. We want students to be able to create synchronous interactions in the space and have tools that fit their style of communication" - Luisa Caldas*

Claire Tomlin (Photo Copyright to Noah Berger)

PROFESSOR CLAIRE TOMLIN NAMED NEW EECS DEPARTMENT CHAIR

Claire Tomlin begins July 1, 2021 as the new EECS department chair. She will be largely responsible for outward-facing communications and strategic matters. She will be just the second woman to hold this position since the EECS department was formed 90 years ago (Tsu-Jae King Liu was the first in 2014). Tomlin is known for her outstanding research in control systems and robotics, and is currently the Faculty Director of the CITRIS Sustainable Infrastructures Initiative.

PROFESSOR TOMLIN'S PROJECT ONE OF FIVE EECS FACULTY RECIPIENTS OF AI FOR ENERGY AND CLIMATE SECURITY AWARDS

On June 10, 2021, C3.ai Digital Transformation Institute (C3.ai DTI) announced the second round of C3.ai DTI awards, focused on using "artificial intelligence (AI) techniques and digital transformation to advance energy efficiency and lead the way to a lower-carbon, higher-efficiency economy that will ensure energy and climate security." Claire Tomlin was one of five EECS faculty-led projects received an award of $100,000 to $250,000, for an initial period of one year. Read more.

Affordable Gigaton-Scale Carbon Sequestration: Navigating Autonomous Seaweed Growth Platforms by Leveraging Complex Ocean Currents and Machine Learning – Claire Tomlin, Charles A. Desoer Chair in the College of Engineering

A promising approach to carbon sequestration utilizes seaweed, which fixates dissolved CO2 into biomass. Floating platforms that autonomously grow and deposit seaweed could scale this natural process to the open ocean, where the carbon is confined for millennia.

PROFESSOR YI MA's COMPANY DGENE RAISES $20M in SERIES A FUNDING

DGene, a Shanghai, China-based content creation company building tools to expand creativity and redefine virtual production and immersive entertainment, raised $20m in Series A funding.

Co-founded by three computer science experts: Jingyi Yu, dean of the School of Information and Technology at Shanghai Tech University, Jason Yang, former GPU Performance Engineering and Research manager at Advanced Micro Devices (AMD), and Yi Ma, Berkeley Electrical Engineering and Computer Sciences (EECS) professor, DGene is a content creation company researching and developing advanced artificial intelligence (AI) solutions to expand creativity and redefine virtual production and immersive entertainment. Real-world applications for DGene's technology include film and television content creation, entertainment, experiential marketing, concerts, sporting events, games, e-commerce and education.

FACULTY AWARDS

Professor Ruzena Bajcsy in her UC Berkeley Office (Credit to Franc Solina)

PROFESSOR RUZENA BAJCSY WINS IEEE MEDAL FOR INNOVATIONS IN HEALTHCARE TECHNOLOGY

Electrical Engineering and Computer Sciences professor Ruzena Bajcsy has won the IEEE Medal for Innovations in Healthcare Technology for "pioneering and sustained contributions to healthcare technology fundamental to computer vision, medical imaging and computational anatomy."

PROFESSOR RUZENA BAJCSY WINS PAMI AZRIEL ROSENFELD LIFETIME ACHIEVEMENT AWARD

EECS Prof. Emerita Ruzena Bajcsy has won the PAMI Azriel Rosenfeld Lifetime Achievement Award. This award is presented biennially by the IEEE Computer Society Technical Committee for Pattern Analysis and Machine Learning (TCPAMI) to honor outstanding "researchers in Computer Vision who have made major contributions to the field over their career and who have influenced the field in an extraordinary way."

EECS Prof. Jitendra Malik, one of the speakers at ICCV 2021 where the award was announced, said "Ruzena has been a pioneer in so many ways, with her work on active perception, medical image analysis, robotics and her mentorship of generations of researchers in whom she has inculcated the highest of values. Her career is full of many, many 'firsts.'"

PROFESSOR RUZENA BAJCSY NAMED 2021 AAAS FELLOWS

EECS Prof. Emeriti Ruzena Bajcsy has been named 2021 Honorary Fellows of the American Association for the Advancement of Science (AAAS), one of the scientific community's highest honors. Bajcsy, who was elected in the Engineering category, is known for her pioneering and multidisciplinary contributions to machine perception, robotics and artificial intelligence. Her work in the area of active perception revolutionized the field of robotic sensing and vision, as well as the area of elastic matching, which has advanced the field of medical imaging.

Shankar Sastry (Photo Copyright Noah Berger)

PROFESSOR SHANKAR SASTRY WINS 2021 ASME RUFUS OLDENBERGER MEDAL

Shankar Sastry wins 2021 American Society of Mechanical Engineers (ASME) Rufus Oldenburger Medal for his significant contributions and outstanding achievements to the field and profession of automatic control. Sastry, who was dean of Berkeley Engineering for over ten years, was cited "For fundamental contributions to the foundations of nonlinear, adaptive and hybrid control, control of robots and vehicles, and for contributions to control and robotics education." The medal will be presented at the ASME Dynamic Systems and Control Division Awards ceremony and dinner, which will take place at the newly instituted Modeling, Estimation and Control Conference (MECC 2021), in Texas in October.

LEADERSHIP

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Faculty Director, Blum Center for Developing Economies
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With your generosity, the potential of our faculty and students are limitless. For more information on how to support education and innovation initiatives with the Vive Center, please contact:

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