

CUICAR
CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH

POWERING THE FUTURE

CUICAR.COM

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*Chair & Executive Director,
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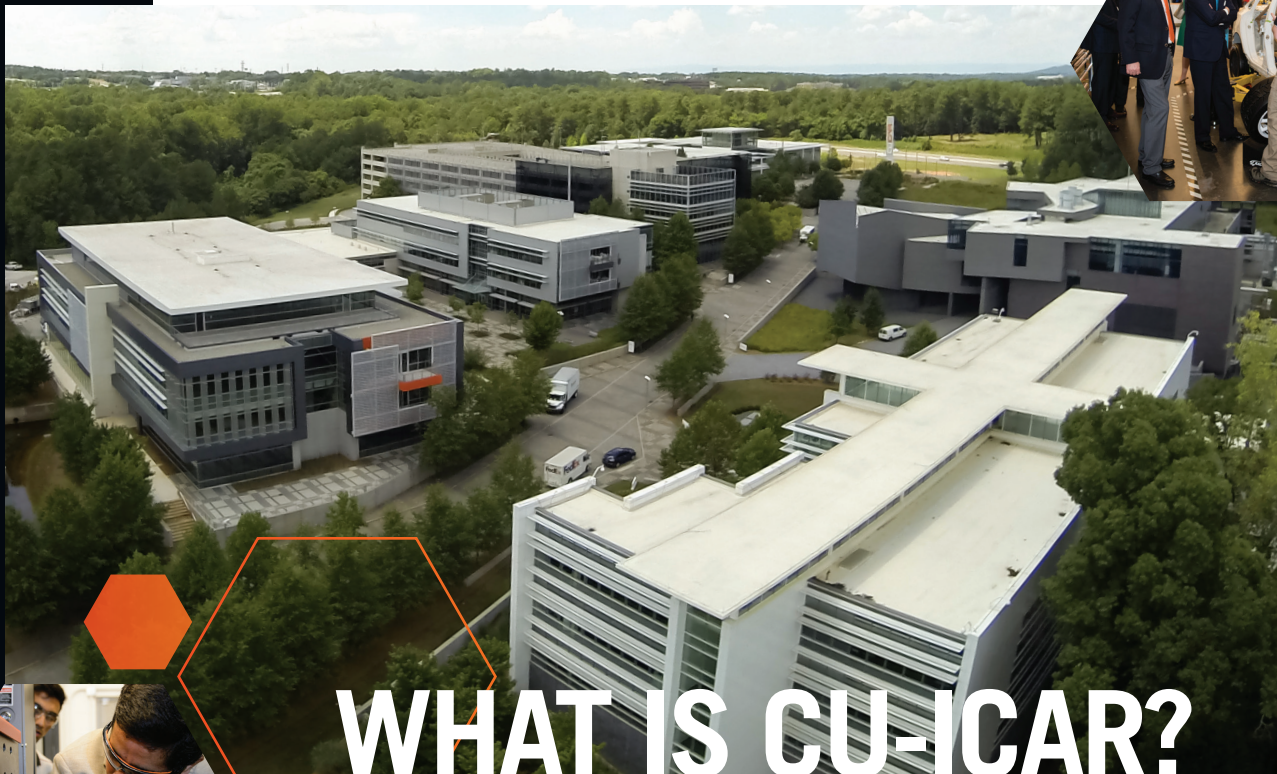
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When it comes to industry, we get it.

Not only are we training the next generation of engineers, but we're developing cutting edge technology for the world's industry leaders—through research and through our partnerships.

All of this, when paired with our award-winning 250-acre campus and translational research, proves that CU-ICAR is helping to power industry into the future.



WHAT IS CU-ICAR?

CU-ICAR is an advanced research campus where education, research and corporate engagement come together to create a global venue for public/private partnerships.

Our internationally recognized \$250 million campus was developed in collaboration with BMW, Michelin, Timken, and the state of South Carolina. The campus includes full-scale automotive testing equipment, graduate education programs in automotive engineering and facilities that bring industry and Clemson University researchers together to provide solutions for sustainable mobility.

CU-ICAR combines:

- **Exceptional Education Programs:** 480+ advanced degrees awarded by the Department of Automotive Engineering
- **Breakthrough Basic & Translational Research** driven by industry needs and conducted in world-class labs
- **Award-Winning Research Campus:** Home to 20+ global industry partners, 1,100+ employees, and unparalleled corporate engagement benefits
- **State-of-the-Art Facilities** accessible for commercial use to companies and professionals for applied R&D on new technology
- **Deep Orange**, an educational program for systems integration and accelerated vehicle prototyping, now celebrating a decade of innovation
- **New Advanced Manufacturing Tracks** for undergraduate, graduate, and continuing education students

CU-ICAR

POSITIONED FOR

INNOVATION

Situated on 250 acres of prime property on I-85 in Greenville, South Carolina, CU-ICAR is at the center of the Charlotte-Atlanta corridor.

Surrounded by hundreds of OEMs and Tier 1/2/3 Suppliers, CU-ICAR and partners collaborate in one dynamic location where we foster innovation, provide unmatched academic experiences and build strategic public-private partnerships.



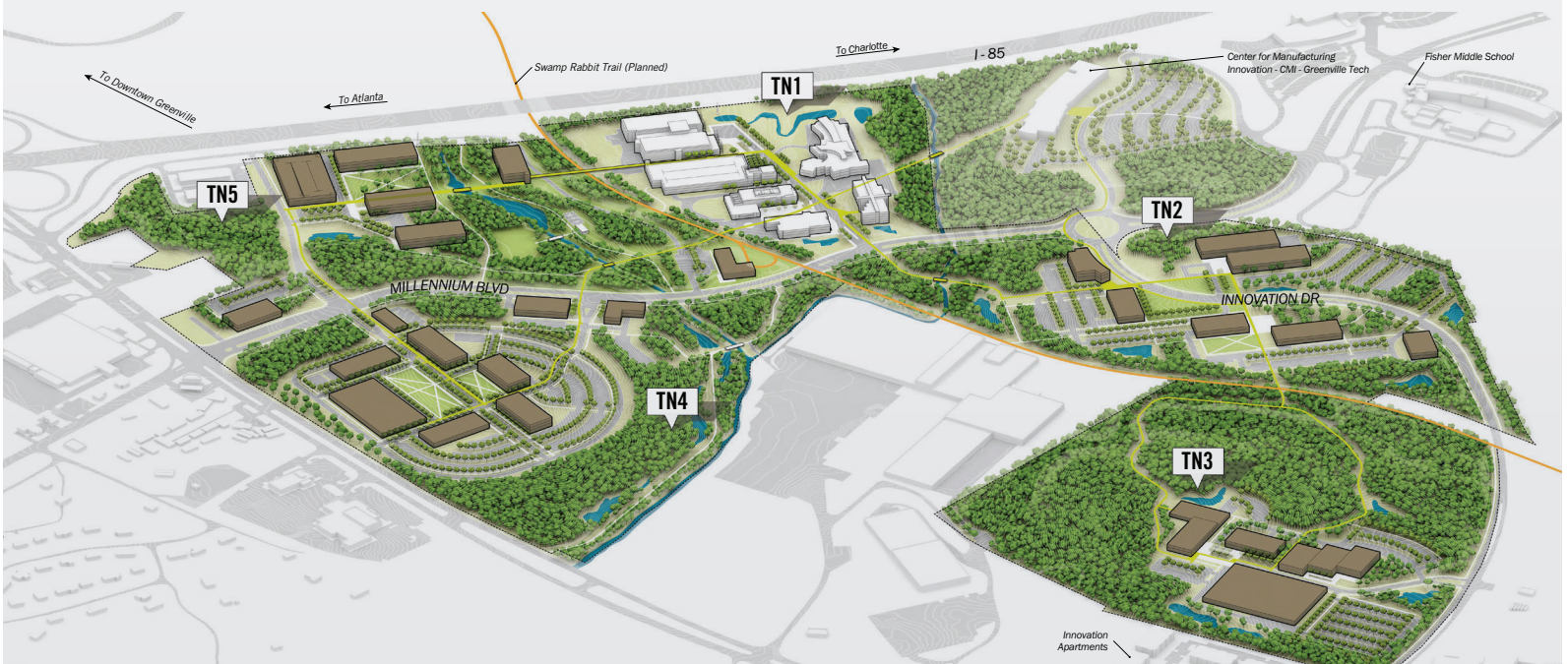
This is an exciting and challenging time for the global automotive industries. CU-ICAR's focus on public/private partnerships makes it easy for industry to rely on our cutting-edge research, and our graduates as the industry leaders of tomorrow."

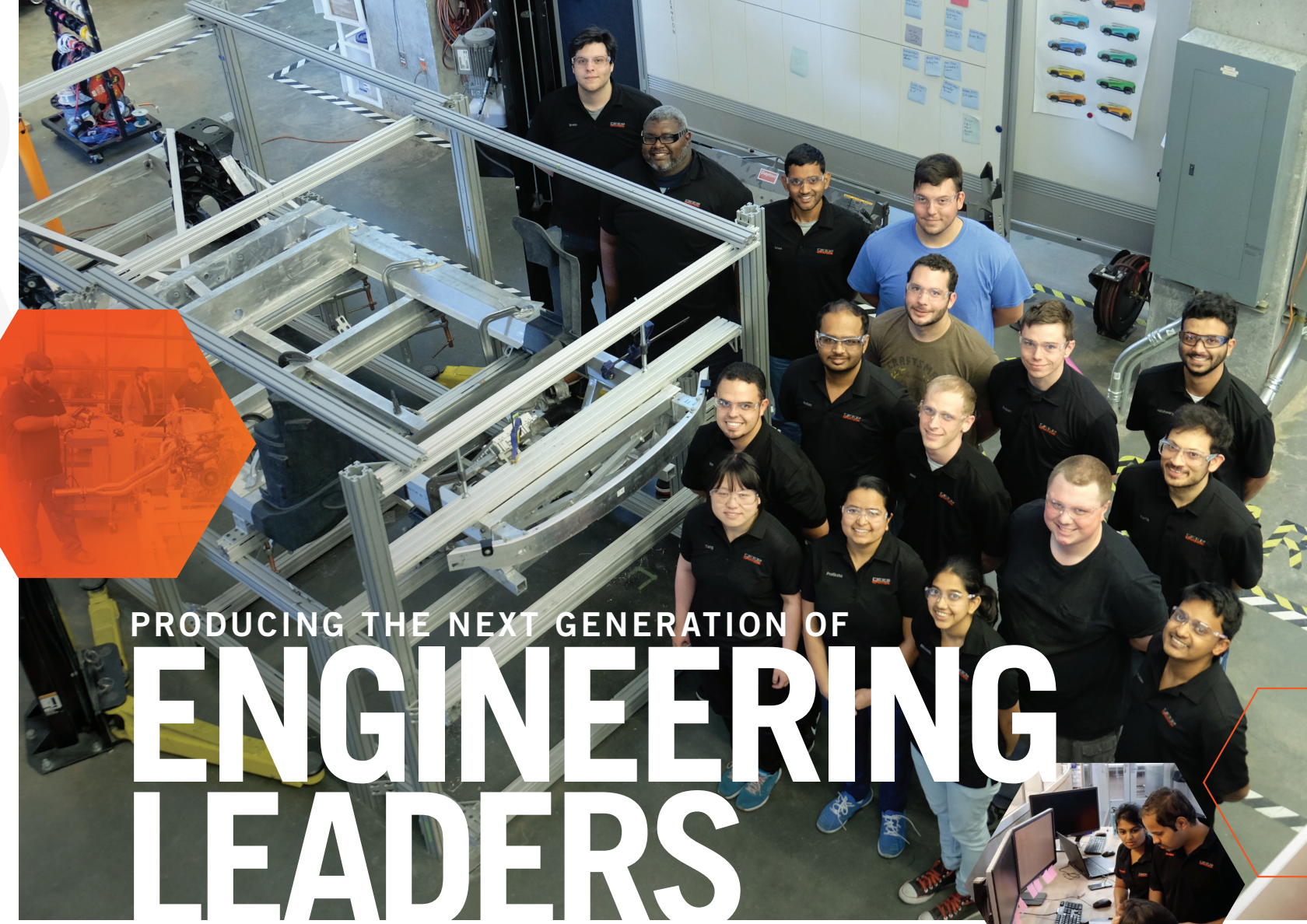
— DR. NIKOLAOS RIGAS
Executive Director, CU-ICAR, and Clemson Associate Vice President for Strategic Initiatives



CU-ICAR is on the cutting edge in terms of preparing our students for today's—as well as tomorrow's—automotive careers. From our expanding number of graduates, to our increasing faculty research productivity and awards, all key indicators attest to the fact that we have realized our original vision: to create a world-class, multi-disciplinary program providing talent and research to the automotive industry."

— DR. ZORAN FILIPI,
Chair & Executive Director, Clemson University Department of Automotive Engineering, and Timken Endowed Chair in Vehicle System Design





PRODUCING THE NEXT GENERATION OF
**ENGINEERING
LEADERS**

200+
*200+ current M.S.
and Ph.D. students in
Automotive Engineering.*

480+
*480+ advanced
degrees awarded
since 2007.*

95%
*95% of all graduates
employed in the
automotive industry.*

CU-ICAR is home to the nation's first graduate Department of Automotive Engineering. Our students participate in our world-renowned program to become leaders among the next generation of innovators.

Our curriculum was developed with input from top industry leaders, and blends in-depth technical study and a modern approach to system engineering with the leadership and business acumen needed to thrive in a global economy.

Ture to our mission, 95 percent of all graduates find employment within the automotive industry upon graduation—many employed with global leaders like BMW Group, Fiat Chrysler Automobiles, Ford Motor Company, Honda, Toyota, and more.

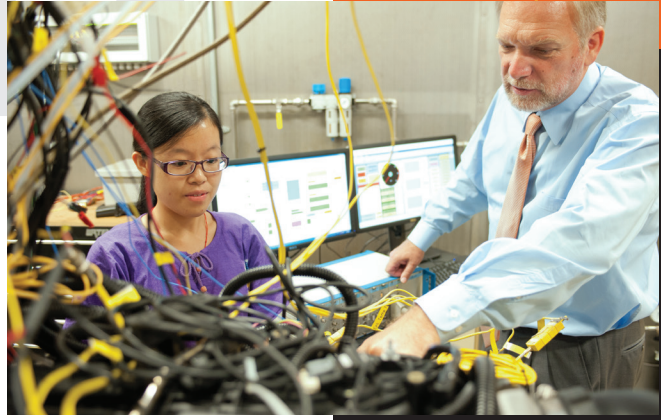
New undergraduate and graduate programs will complement and broaden our educational offerings at CU-ICAR.

FACULTY

Attracting the leaders of today to teach the leaders of tomorrow.

CU-ICAR faculty, through investments by private industry and matching funds from the state of South Carolina, include some of the most distinguished endowed chairs in the nation.

- **Dr. Zoran Filipi**
*Timken Endowed Chair
in Vehicle System Design*
- **Dr. Venkat Krovi**
*Michelin Endowed Chair
in Vehicle Automation*
- **Dr. Laine Mears**
*BMW Endowed Chair in
Advanced Manufacturing*
- **Dr. Chris Paredis**
*BMW Endowed Chair in
Systems Integration*
- **Dr. Robert Prucka**
*Kulwicki Endowed Professor
in Motor Sports Engineering*



CU-ICAR's research portfolio is driven by industry needs.

We continuously analyze the market and survey industry leaders to identify future trends and R&D focus. Based on this knowledge, our research clusters and “technology identity” are centered in five research areas:

- **Advanced Powertrains**
- **Advanced Manufacturing & Materials**
- **Design & Integration of Complex Systems**
- **Connected & Automated Vehicles**
- **Human Factors**

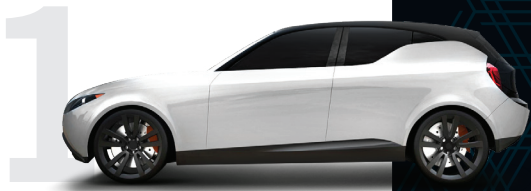
More than 67% of CU-ICAR's research portfolio is sponsored by industry.

This high ratio of private sector vs. public sector funding exemplifies our focus on adding value to industry.



RESEARCH

THE FUTURE OF AUTOMOTIVE INNOVATION



A Concept for Generation Y



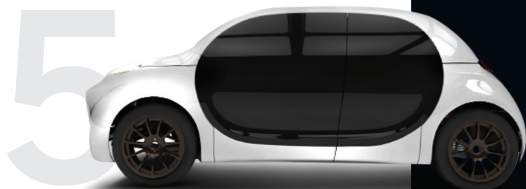
Human Machine Interface



A Hybrid Mainstream Sports Car



Versatile Low-Volume Derivative



Urban Mobility for Gen Y & Z



UBox: An Urban Utility Vehicle



An Automotive Icon Reinvented

Deep Orange is a vehicle prototype program that provides an exceptional educational experience with extensive industry collaboration during the M.S. degree program in automotive engineering.

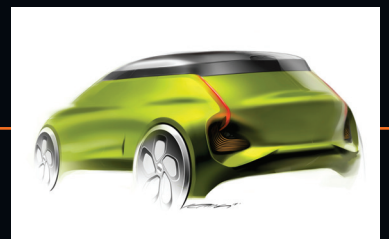
Our students develop sustainable mobility solutions balancing environmental, social and economic aspects. Each project incorporates breakthrough product innovations and new processes, providing the automotive engineering students with hands-on experience in vehicle design, engineering, prototyping and production.

DEEP ORANGE DEVELOPMENT



Strategy & Value Proposition

Through market analysis, students identify a unique selling proposition and develop a start brief for their concept vehicle.



Ideation & Design

Students generate design and engineering concepts and perform initial functional, geometric and cost analyses to select the most promising alternative.

DEEP ORANGE 7

MINI REINVENTED

For the seventh generation of the Deep Orange program, students were challenged to reimagine the MINI and develop a fully-functional, drivable concept vehicle for the MINI brand, targeting the premium U.S. market for 2025 and beyond.

With the BMW Group in Munich as the primary sponsor, students were in charge of determining which innovations would fit the MINI brand, as well as how these innovations would be integrated into the vehicle.

The 18-student team unveiled the project at BMW in Greer, South Carolina in 2017.

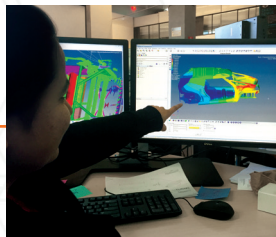


PHASES



Concept Development

During a fulltime Deep-Orange internship over the summer, students turn their concept into detailed design specifications.



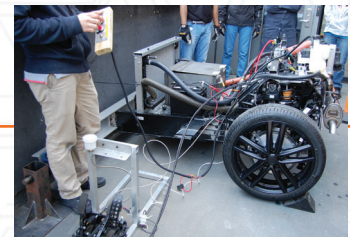
Systems Integration

Students use a model-based approach for virtual systems integration and interface negotiation.



Prototype Build

Students are responsible for building the prototype, from machining the parts to assembling the vehicle.



Test, Evaluation & Validation

During and after the build process, students perform systematic testing to verify functionality and evaluate vehicle performance.

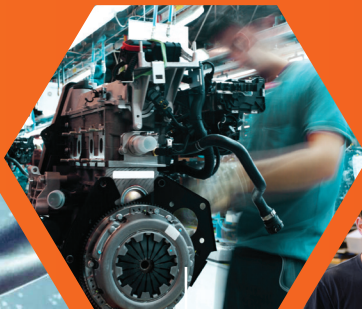
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CORPORATE

The CU-ICAR campus is an innovation ecosystem that helps companies make connections and build relationships.

We have created a community where industry literally meets academia. Today, CU-ICAR currently has 21 Campus Partners from around the world. These on-site residents work in close quarters with our students and faculty and share the many amenities of the Millennium Campus.

Smart & Sustainable Manufacturing



Materials Innovation: Manufacturing of Composites & Light Weighting



Advanced Manufacturing Planning, Control, & Assembly Operations



Robotics, Sensors, Wearables & IoT

Autonomous Systems in the Manufacturing Environment



CU-ICAR was recognized as one of four best practices for industry education collaboration by the U.S. Department of Commerce and was awarded the Emerging Research Science Park Award by the Association of University Research Parks.

ENGAGEMENT

CLEMSON CENTER FOR ADVANCED MANUFACTURING

Established late 2017, the Clemson Center for Advanced Manufacturing is the university's ambitious commitment to education, research, innovation and workforce development in support of an industry sector that is vitally important to the future of South Carolina, the Southeast and the United States.



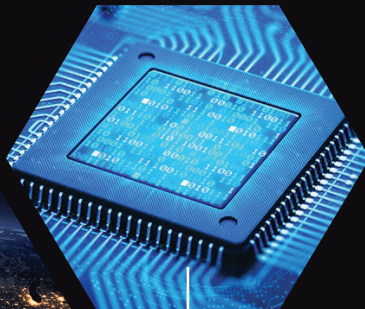
Our goal for Clemson's Center for Advanced Manufacturing is to create a world-class enterprise dedicated to interdisciplinary research and translational activities related to all aspects of advanced manufacturing."

— DR. ANAND GRAMOPADHYE
Dean of the Clemson University College of
Engineering, Computing & Applied Sciences.



Intelligent
Systems
Integration

Manufacturing
Supply Chain &
Optimization



Digital
Manufacturing
Including
Industry 4.0



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