Smart Vehicle Concepts Center (SVC)

A National Science Foundation
Industry-University Cooperative Research Center

THE OHIO STATE UNIVERSITY

Annual Newsletter

www.SmartVehicleCenter.org

December 2022 Issue

SVC Companies	Status
American Axle and Manufacturing	Former Member
Advanced Numerical Solutions	Former Member
Army Research Laboratory	Former Member
Autoliv	**Current Member**
Battelle Memorial Institute	Former Member
BorgWarner	Former Affiliate
Bridgestone Americas Tire Operations, LLC	Former Member
Causis E-Mobility * **	**Invited Observer**
Eaton Innovation Center	Former Member
Edison Welding Institute	Former Member
Ford Motor Company	Former Member
F.tech R&D *	Former Member
Goodyear Tire & Rubber	Former Member
Honda D&M Americas Inc. *	**Current Member**
Hyundai-Kia Motors *	Former Member
LMS Software	**Invited Observer**
MES, Inc.	**Invited Observer**
MIT Lincoln Laboratory	Former Member
Moog Inc.	Former Member
MSC Software	**Invited Observer**
NASA Glenn Research Center **	**Current Member**
Owens Corning	Former Member
Parker Hannifin	Former Member
REL, Inc.	Former Member
Romax	**Invited Observer**
Solidica	Former Member
Tenneco, Inc.	Former Member
The Boeing Corporation	Former Member
Tokai Rubber	Former Member
Toyota Research Institute, Inc. *	**Current Member**
Transportation Research Center, Inc. *	Former Member
YUSA	Former Affiliate

*Multiple memberships **Member and Invited Observer ***Pending

Mission

The mission of the Smart Vehicle Concepts Center (SVC) is to:

- Conduct basic and applied research on smart materials and structures applied to ground and aerospace vehicles
- Build an unmatched base of research, engineering education, and technology transfer with emphasis on improved vehicle performance
- Prepare next-generation engineers at the PhD and MS levels who possess both theoretical and experimental expertise applicable to auto and aero vehicles

For additional details on SVC's research programs, membership fees, and personnel, please visit: www.SmartVehicleCenter.org

Spring 2023 Meeting Information

16th Semi-Annual Project Review and IAB Meeting

Dates: 23-24 March 2023
Location: The Ohio State University
E100 Scott Laboratory
201 West 19th Avenue
Columbus, OH 43210

Please visit
www.SmartVehicleCenter.org
for updates!

Welcome New SVC Members!

IAB Representative: Steven Combs (Autoliv)

Invited Observer: Causis E-Mobility

Faculty Investigators:
Qadeer Ahmed
Marcello Canova
Anne Co
Jung-Hyun Kim

From the left *(Sept. 2022 meeting)*: Ryan Hahnlen (IAB Chair/Honda D&M), Marcelo Dapino (Center Director)

Autumn 2022 15th Annual Project Review and IAB Meeting

The Smart Vehicle Concepts Center held its 15th Annual Autumn Meeting on September 29-30, 2022. While the simulcast format was made available, there was a notable in-person presence at nearly 80 percent. The lunch session and special keynote presentation were kicked off by welcoming remarks and introduction by **Prof. Robert Siston**, interim chair of the Department of Mechanical and Aerospace Engineering.

Prof. Andre Palmer, who is the Associate Dean for Research in the College of Engineering, Fenburr Ohio Eminent Scholar in Nanotechnology, and Professor of Chemical and Biomolecular Engineering at The Ohio State University delivered the special keynote presentation discussing research activities at the center, institutional, and at the individual principal investigator levels. In addition to this discussion, Prof. Palmer also presented his own research interests encompassing the development of novel hemoglobin-based oxygen carriers for a variety of applications.

On Day 1, in session III on emerging trends in smart vehicle research, we welcomed talks from two OSU faculty. **Prof. Qadeer Ahmed** shared his research focusing on energy-efficient mobility systems and **Prof. Marcello Canova's** work on the modeling of silicon-based anodes for high energy density Li-ion batteries was presented to Center attendees.

Dr. Ryan Hahnlen announced the Outstanding Student Award was conferred to **Ningxiner Zhao** for her presentation "Ultrasonic additive manufacturing for automotive structures: Joining of metal and fiber reinforced polymers" with **Prof. Marcelo Dapino** as project leader and mentored by **Dr. Hahnlen** of Honda D&M.

The Industrial Advisory Board assembled on day 2 of the meeting. While **Dr. Paul Gilmore** of Toyota Research Institute and **Dr. Christopher Brooks** and IAB Chair **Dr. Ryan Hahnlen** were present on site, new IAB representative **Mr. Steven Combs** of Autoliv and the remaining members attended the meeting remotely. Key items on the meeting agenda included review and approval of the March 2022 meeting's minutes, a Center operations update, and discussion of ongoing and future plans going into Phase IV as a graduated NSF Industry-University Cooperative Research Center. An Executive Session among corporate members was held after the conclusion of the IAB meeting.

Spring 2022 15th Semi-Annual Project Review and IAB Meeting

The 15th Semi-Annual Spring Meeting of the Smart Vehicle Concept Center welcomed the return to the in-person format on March 24-25, 2022. Adjustments were made to accommodate a synchronous format for those who could not attend on site. **Prof. David Talbot** delivered a special keynote presentation which discussed challenges and opportunities in high-speed power transmission systems. The early spring Ohio weather allowed us the opportunity for a group photo of the participants, and we welcome this as a new tradition for future SVC meetings.

On day 1, **Dr. Ryan Hahnlen** announced the Best Student Presentation Award recipient from the September 2021 meeting to **Souvik Mukhopadhyay** for SVC Project #60 "Distributed programmable actuation platforms" with Prof. Ardeshir Contractor as project leader and mentored by **Dr. Christopher Brooks** of Honda D&M and **Drs. Umesh Gandhi** and **Paul Gilmore** of Toyota Research Institute. This announcement in real time was a welcome return to normalcy with OSU students, faculty, and sponsors present.

The Industrial Advisory Board convened once on day 2 after the technical session research presentations were complete. The IAB meeting focused on approval of the September 2021 meeting minutes, completion of action items, an update on Center operations and financials, and members' perspectives focusing on Phase III graduation and drafting of the Phase IV bylaws and membership agreement. An Executive Session was held thereafter exclusively for the IAB members.

Click here for the latest State of the Center presentation

Accomplishments by SVC Researchers

Vivek wins a Best Poster Award at the Annual MAE Graduate Research Day

Posted: November 28, 2022

Vivek's poster presented his research on automotive safety systems, exploring smart reversible mechanical latching systems toward securing vehicle occupants in unconventional and severe loading conditions where conventional restraints provide insufficient protection. The work is supported by Autoliv and Honda within the NSF IUCRC Smart Vehicle Concepts Center.

MAE Research Day allows Department of Mechanical and Aerospace Engineering students to present their research to a broad audience consisting of prospective graduate students, current OSU students, faculty, and staff. This is a joint activity hosted by the Department of Mechanical and Aerospace Engineering and the Mechanical and Aerospace Engineering Graduate student Association (MEGA). The event was held October 28, 2022 in Scott Laboratory.

The top three out of fifty poster presenters receive funding to use for professional development or travel reimbursement to participate in conferences related to their research, and also receive credit for one research seminar.

Vivek is a doctoral student in the Smart Materials and Structures Lab; he is advised by Prof. Marcelo Dapino.

New wind sensor uses smart materials to improve drone performance

Posted: August 22, 2022

Drones need wind sensors to be able to take off safely as well as sense nearby objects in the sky.

Engineers have designed and successfully tested a more efficient wind sensor for use on drones, balloons, and other autonomous aircraft.

(photo: Getty Images)

These wind sensors – called anemometers – are used to monitor wind speed and direction. As demand for autonomous aircraft increases, better wind sensors are needed to make it easier for these vehicles to both sense weather changes and perform safer take-offs and landings, according to researchers.

Such enhancements could improve how people use their local airspace, whether it be through drones delivering packages or passengers one day flying on unmanned aircraft, said Marcelo Dapino, co-author of the study and a professor in mechanical and aerospace engineering at The Ohio State University.

Ahmed named associate editor of IEEE TTE

Posted: September 15, 2022

Qadeer Ahmed, an assistant professor in the Department of Mechanical and Aerospace Engineering, has been named an associate editor for IEEE Transactions on Transportation Electrification. He has served previously as a reviewer for IEEE, but this is his first time serving as an associate editor.

2022 RIYA Scholars: Excellence in Undergraduate Research Experience Continues

Ohio State's Research Internship for Young Academics (RIYA) Program has found a way to keep the connection with future engineers and leaders from India. Through innovative online methods and great communication, six scholars participated in the RIYA summer 2022 program from top-ranked mechanical engineering programs across India, with one worked on-campus and the rest worked from India in the virtual mode.

Shubham Hemchandra Deshmukh *(pictured left)* of Indian Institute of Technology – BHU and **Samarth Patil** *(right)* of VIT – Pune interned under the guidance of Prof. Ardeshir Contractor at Computational Laboratory for Energy Applied Research (CLEAR) along with interactions in the group discussions with **Prof. Rajendra Singh,** founder and director of this program.

SAE Forest R. McFarland Award

Posted: February 15, 2022

Qadeer Ahmed, an assistant professor in the Department of Mechanical and Aerospace Engineering is the recipient of the SAE Forest R. McFarland Award.

This award is given to individuals in recognition of their outstanding contributions to SAE Engineering events by way of planning, developing, and disseminating technical information through meetings, events, and other professional development programs.

Ahmed has been engaged in SAE World Congress, SAE COMVEC and the Vehicle Cybersecurity Workshop at SAE Government and Industry Meetings. “This award is an appreciation of my engagement with SAE activities,” said Ahmed. “It enables me to reach out to key experts in the industry and establish a good repute.”

Intellectual Property Generated by SVC Faculty

Inventions Disclosed		US Utility Patents Filed		US Patents Issued	
2022	Historical	2022	Historical	2022	Historical
12	76	13	40	5	13

Data generated by R. Zinn, Office of Innovation and Economic Development – Technology Commercialization

Publication Summary

It was a productive year for Smart Vehicle Concepts Center publications. Twenty-seven journal publications by faculty and students based on Center research appeared in prestigious journals; twelve papers were presented at society conferences and eleven theses/dissertations were successfully defended.

Congratulations SVC Graduates!

Bachelor of Science in Mechanical Engineering	
Sylvia Cressman	**Divij Prasad**
Sajan Patel	Lakshmi Surag Singavarapu
Doctor of Philosophy	
Hongqi Guo	Ismail Nas
Jinha Kwon	Akiva Wernick
Souvik Mukhopadhayay	Gowtham Venkatraman

From Spring 2022 to present

Bold face indicates thesis option

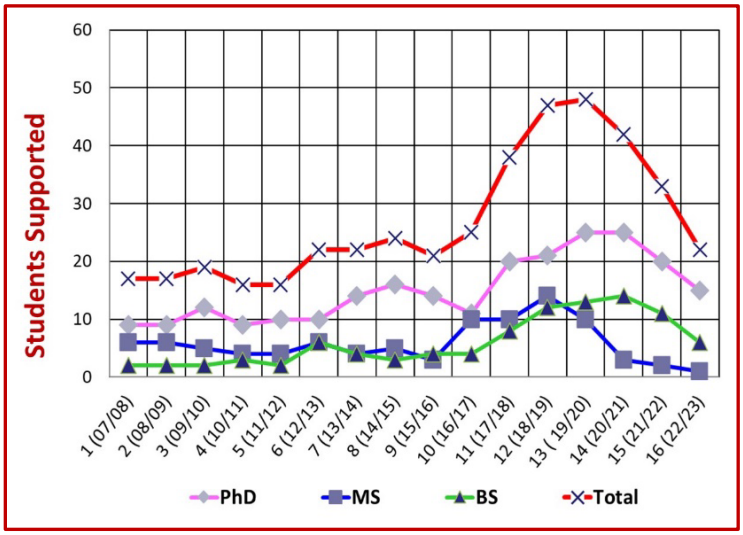
SVC Graduates (July 2007 – December 2022)

PhD	51
MS	61
BS	35
TOTAL	147

Students Supported from 1 August 2021 to 31 July 2022

PhD	16
MS	1
BS	10
TOTAL	27

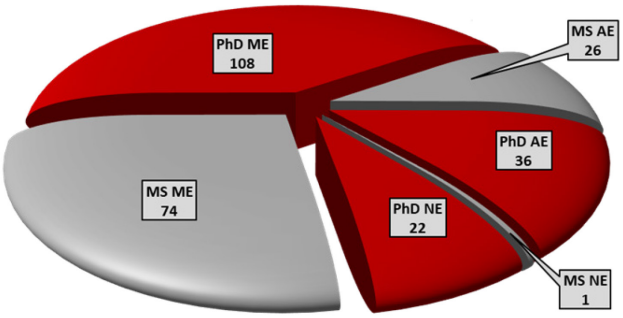
Student History



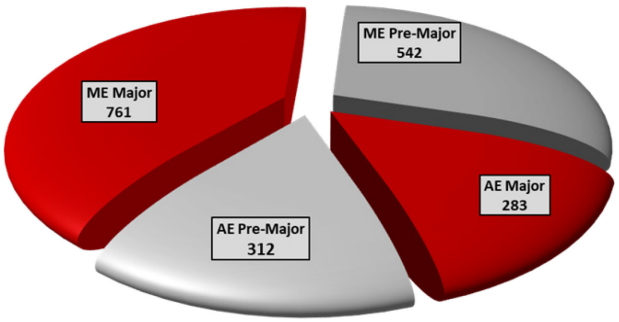
Former Students Employed by: **SVC Member Organization during Phase II or III*	
Apple	Intel Corp.
Army Research Laboratory*	Lam Research
Bechtel	Made In Space
Bruel & Kjaer	Magna Electronics
Cadence Design Systems	Moog, Inc.*
Caterpillar	NASA Glenn Research Center*
China Automotive Systems, Inc.	NHK International Corp.
Cummins	Owens Corning*
Edison Welding Institute*	Procter and Gamble
F.tech R&D*	Root Insurance
Ford Motor Company*	STERIS Corp.
GE R&D	Tesla, Inc.
General Motors	Toyota*
Goodyear*	Transportation Research Center*
Gorman Rupp	TRW Automotive
Honda D&M	US Army (Aberdeen Proving Ground)
Former Students Employed by Academic Institutions:	
Boise State University	MIT Lincoln Laboratory*
IIT Bombay (India)	OSU (post-doctoral researcher)
IIT Delhi (India)	South China University of Technology
IIT Tirupati (India)	Southern Illinois University

Department of Mechanical & Aerospace Engineering (MAE) Statistics

Graduate Student Enrollment
Autumn Semester 2022
MAE Graduate Students



Undergraduate Student Enrollment
Autumn Semester 2022
MAE Undergraduate Students



MAE Degrees Granted Summer 2021 - Spring 2022					
Mechanical	**283**	**Aerospace**	**93**	**Nuclear**	**4**
BS	211	BS	75		
MS	44	MS	8	MS	0
PhD	28	PhD	10	PhD	4

Links to NSF, IUCRC, and OSU Laboratories

[NSF home page]

[IUCRC home page]

[Acoustics & Dynamics Laboratory]

[Automated Computational Mechanical Laboratory]

[Center for Automotive Research]

[Computation Lab for Energy Applied Research (CLEAR)]

[Energy Innovation Lab]

[Hoelzle Research Lab]

[Micro/Nano Multiphysical Dynamics Lab]

[Smart Materials and Structures Laboratory]

[Smart Vehicle Concepts Center]

[Ultrasonic Additive Manufacturing Center]

SVC Faculty

MARCELO DAPINO

Honda R&D Americas Chair
Professor; Director of SVC
Expertise: Smart materials; Nonlinear coupled systems; Design; Control

QADEER AHMED

Assistant Professor
Expertise: Optimal and learning based control; Machine learning and data analytics; Health monitoring, fault diagnosis, cybersecurity

MARCELLO CANOVA

Professor
Expertise: Energy optimization and management of ground propulsion systems and hybrid-electric drivetrains

J.P. CHEN

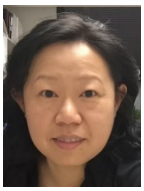
Professor
Expertise: Computational fluid dynamics; CFD simulation and coding; Turbulence modeling; Turbomachinery

HANNA CHO

Associate Professor
Expertise: Nonlinear NEMS/MEMS; AFM cantilever dynamics; Multi-functional ferroelectric material energy systems; Nano- and bio-science

ARDESHIR CONTRACTOR

Clinical Professor
Expertise: Solar energy; Smart grids; Electric mobility; Renewable energy storage; Material modernization



ANNE CO

Professor
Expertise: Advanced electrocatalytic materials; Nanoporous metals; New energy conversion and storage

DAVID HOELZLE

Associate Professor
Expertise: Learning/adaptive control systems; Additive manufacturing processes; Microsystems for mechanobiology research; Dynamics systems analysis

JUNG-HYUN KIM

Assistant Professor
Expertise: Energy-storage materials and devices; Li-ion materials and systems; Materials synthesis and battery cell fabrication, testing, and characterization

RAJ SINGH

Faculty Emeritus
Expertise: Noise & vibration control; Geared systems; Nonlinear dynamics; DSP

SOHEIL SOGHRATI

Associate Professor
Expertise: Advanced FEM; Modeling multiscale response of advanced/biomaterials and structures

The Smart Vehicle Concepts Center would like to wish everyone a Safe and Happy Holiday Season!