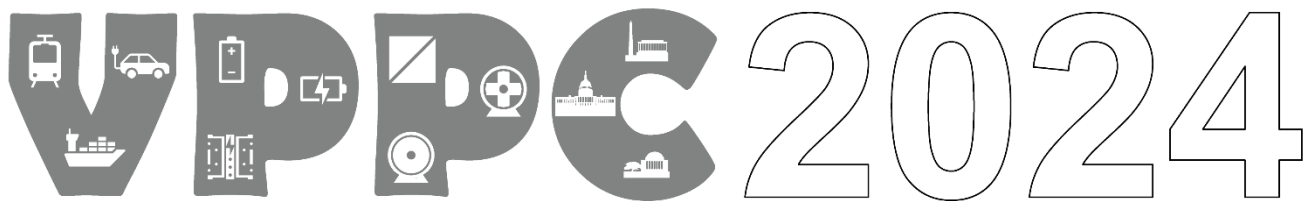




Final Program



2024 IEEE Vehicle Power and Propulsion Conference

7 – 10 October 2024

Ronald Reagan Building and International Trade Center

Washington DC, USA

Welcome from the General Chairs

On behalf of the Organizing Committee, it is our great pleasure to welcome you to the 21st IEEE Vehicle Power and Propulsion Conference (IEEE VPPC 2024), taking place at the iconic Ronald Reagan Building and International Trade Center in Washington, DC. This year, we are thrilled to co-host a joint event with the IEEE Vehicular Technology Conference (VTC2024-Fall), marking a particularly special milestone—the 100th IEEE Vehicular Technology Society Conference and the 75th anniversary of the IEEE Vehicular Technology Society.

Since its inception in 2004, VPPC has grown into a flagship event of the VTS, renowned for gathering leading engineers, researchers, and professionals from around the world. It is one of the key international conferences dedicated to electrified vehicle power, propulsion, and related technologies. Rotating between America, Europe, and Asia, VPPC continues to foster a dynamic platform for multidisciplinary discussions and innovation in electric vehicles and their systems.

The conference theme, “Connect Green e-Motion”, underscores our commitment to advancing sustainable mobility technologies. VPPC 2024 will offer a rich program, featuring three outstanding keynote speakers, four tutorials, 18 oral and 7 virtual technical sessions. Our conference covers cutting-edge topics including electric and hybrid vehicle modeling, energy storage, power electronics, motor drives, charging technologies, intelligent transportation systems, and more.

Our esteemed keynote speakers—Prof. Hiroshi Fujimoto from The University of Tokyo, Japan, Dr. Burak Ozpineci from Oak Ridge National Laboratory, USA, and Prof. Yunwei (Ryan) Li from University of Alberta, Canada—will share their insights on topics ranging from advanced control of electric vehicles to charging trends and AC/DC

microgrid structures. Their expertise, along with the VPPC Panel Session featuring industry and government perspectives, promises to ignite engaging discussions.

In addition to an exceptional technical program, we are delighted to celebrate the 75th anniversary of IEEE VTS with a special Cocktail Reception and Banquet Dinner and guided tours, providing you with opportunities to experience the vibrant energy of beautiful Washington, DC.

We would like to express our heartfelt gratitude to our sponsors, volunteers, speakers, authors and attendees for their invaluable contributions to the success of this event. Without your support, this milestone celebration would not be possible.

We thank Ms. Cerry Leffler and Dr. Rodney Clint Keele (VTS Program Administrators), and their team for their invaluable work and collaboration in organizing a remarkable joint program for the benefit of VPPC and VTC-Fall participants. This allows us to continue to strengthen the Vehicular Power and Propulsion (VPP) community within the VTS. Special thanks to Professor Weihua Zhuang, President of the VTS, and Professor J.R. Cruz, Vice-President of the VTS Conference, for their continued support.

We invite you to take full advantage of the tutorials, keynotes, technical sessions, networking opportunities, and the stunning backdrop of Washington, DC. Be sure to join us in celebrating the rich history of IEEE VTS and pick up one of our special edition T-shirts commemorating this momentous occasion.

Welcome to VPPC 2024, and Happy 75th Anniversary, IEEE VTS!

Minh C. Ta and Hicham Chaoui
General Chairs, IEEE VPPC 2024

Welcome from the TPC Chairs

We are delighted to welcome you to the 2024 IEEE Vehicle Power and Propulsion Conference (IEEE VPPC 2024), taking place from October 7 to 10, 2024, in Washington, DC, USA. IEEE VPPC has firmly established itself as the flagship conference for advanced vehicle technologies, where electric transportation is examined from a rigorous technical perspective. As electric vehicles increasingly populate our roads, it is exciting to be part of this transformative period in mobility, and we can confidently affirm electric vehicles are here to stay!

This year's conference is designed to foster meaningful exchanges and collaborations within the global community dedicated to electrified vehicle power, propulsion, and related technologies. We have prepared an extensive technical program that includes eight regular tracks covering diverse topics such as energy storage, power electronics, intelligent transportation systems, charging infrastructures, hydrogen fueling, and electric railways. In

addition, eight special sessions, coordinated by Special Sessions Chairs Prof. Rui Araujo (University of Porto, Portugal), Mohamed Bakhouya (International University of Rabat, Morocco) and Ton Duc Do (Nazarbayev University, Kazakhstan), will provide fresh perspectives on emerging and specialized areas in this field.

The technical program features 18 oral sessions with 87 papers selected for in-person presentations and 31 papers chosen for virtual presentations from 212 submissions received worldwide. All accepted papers will be published in the conference proceedings and made available on IEEE Xplore, subject to IEEE's quality standards. Additionally, we are pleased to offer three keynote addresses by leading experts and four tutorials on some of the most challenging and innovative aspects of vehicle power and propulsion technology.

This year is particularly significant, as the conference coincides with the 75th anniversary of the IEEE Vehicular Technology Society. For the second time, the entire VTS community will come together, providing a unique opportunity to “connect green e-motion” with colleagues from both the VPPC 2024 and the VTC2024-Fall conference. All attendees will have full access to both events, fostering a broader exchange of ideas and networking opportunities.

As we celebrate these advancements, we remain mindful of the challenges ahead. The vehicle power and propulsion community must continue to innovate, designing more efficient energy systems, developing cost-effective solutions, and promoting green technologies responsibly.

Training the next generation of engineers and researchers is essential to achieving these goals.

We extend our deepest appreciation to the Track Chairs, Technical Program Committee members, special session organizers, tutorial chairs, and all volunteers who contributed to the success of this conference. Most importantly, we thank the authors for their invaluable contributions and for choosing to share their cutting-edge research with our community.

We look forward to your active participation in IEEE VPPC 2024 and hope that you will find the conference stimulating, inspiring, and rewarding.

Joao Pedro Trovao, Nadia Yousfi Steiner and Ricardo De Castro, *TPC Chairs*, IEEE VPPC 2024

Welcome from the VPPC Steering Committee Chair

On behalf of the Vehicle Power Propulsion Conference (VPPC) steering committee, it is my great pleasure to welcome you to the 21st VPPC.

IEEE VPPC is a rotating conference between Asia, Europe and America in order to share experience worldwide on new concepts and technology on Vehicle Power Propulsion. However, this year IEEE VPPC comes back in America to contribute to a joint conference with VTC2024-Fall for that conference’s 100th edition. The steering committee has decided to take this opportunity to strengthen the links of all scientific communities of IEEE VTS.

Special thanks to Prof. Weihua Zhuang, VTS President, and Prof. J.R. Cruz, the VTS Vice-President Conference, for their strong supports. Warm thanks to Cerry Leffler and Rodney Clint Keele (VTS Program Administrators) for their huge work in this still difficult context. Great thanks to Prof. Ta Cao Minh (University of Sherbrooke, Canada), VPPC2024 general chair, for facing the challenge of the organization of this joint event, and despite the complexity

of the task, organising a high-level event with the valuable help of Prof. Hicham Chaoui (Carleton University, Canada) the conference co-chair. Many thanks to Prof. Joao Trovao (University of Sherbrooke, Canada), Prof. Ricardo De Castro (University of California – Merced, USA) and Dr. Nadia Steiner (University of Bourgogne FC, France), the Technical Program Committee chair and co-chairs for their hard work to keep a high-level scientific program. A key international conference needs a high-motivate volunteers that can propose relevant adaptations in any context. We are lucky to have such a strong and dynamical team!

For the next editions, IEEE VPPC 2025 will be organized in Hangzhou (China) and IEEE VPPC 2026 will be held in Lyon (France) to continue to connect scientists all over the world.

I hope you will enjoy IEEE VPPC 2024, and I am looking forward to meeting you in-presence!

Alain Bouscayrol, *Chair*
VPPC Steering Committee

Welcome from the VTS President

On behalf of the IEEE Vehicular Technology Society, it is my great pleasure to welcome you to the 100th edition of the IEEE Vehicular Technology Conference, IEEE VTC2024-Fall, and the IEEE Vehicle Power and Propulsion Conference, IEEE VPPC 2024, in Washington, DC!

Both VTC and VPPC offer opportunities for you to report your latest R&D achievements, to get informed of various technological advances, to exchange ideas with technical leaders, and to network with your peers in the field of mobile communications and networks, connected vehicles, electric vehicles, autonomous driving, and more.

Organizing two world-class conferences requires a strong team of volunteers who have devoted both their time and their technical expertise. I would like to take this opportunity to thank and congratulate the VTC organizing

committee, including General Co-Chairs Lingjia Liu, John Smee and Thomas Rondeau and Technical Program Committee Co-Chairs Mike Buehrer, Rui Dinis, and Song Guo, and the VPPC organizing committee, including General Chair Minh Ta and Co-Chair Hicham Chaoui, TPC Chair Joao Trovao, and TPC Vice-Chairs Nadia Yousfi Steiner and Ricardo De Castro. Both conferences would not be possible without the leadership of VTS Vice President for Conferences, J.R. Cruz. The organizing committees have been working diligently in planning and running this event with the excellent technical programs, tutorials, workshops, and industry panels. I would also like to recognize the generous support of the conference sponsors which will significantly enhance the experience of all participants in the conferences.

This is a key moment in our history. 2024 marks the 75th anniversary of the Vehicular Technology Society. The Society was first established in 1949 within the Institute of Radio Engineers (IRE) and under the name IRE Professional Group on Vehicular Communications (PGVC). We have partnered with the IEEE History Center to bring an exhibit of VT history to the Ronald Reagan Building. Please visit the exhibit and learn more about our shared history.

We also celebrate the 100th edition of the Vehicular Technology Conference. The first edition of VTC was held in 1950 in Detroit, Michigan (USA) with eight technical presentations, six exhibitors, and 94 registered attendees – how we have grown! We hope you will wear your 100th edition shirt proudly, take photos, make new connections, and enjoy the giveaways and special events this week, including the Banquet on Wednesday evening.

Finally, we commemorate the 140th anniversary of IEEE this year. If you are not yet a VTS member, I invite you to join while you are here in Washington, DC. We are offering complimentary membership to new members as an IEEE Day offer. Visit the VTS table in the exhibitors area to select promotional items and join the Society. As a member, you will benefit from all the services and resources that VTS provides. We look forward to your contributions to the VT community!

I would like to thank everyone for attending the conferences this year. Together, we are creating new history for VTS, VTC, and VPPC. I wish all of you a great time in Washington, DC!

Weihua Zhuang, *President*
IEEE Vehicular Technology Society

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Industry Liaison, Exhibition and Workshops Co-Chairs	<i>Divya Garikapati</i> <i>Son Tong</i>	Toyota USA, USA Siemens R&D, Belgium
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Finance Chair	<i>J. R. Cruz</i>	The University of Oklahoma, USA
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	<i>Satadru Dey</i>	Pennsylvania State University, USA
	<i>Theodoros Kalogiannis</i>	Vrije Universiteit Brussel, Belgium
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Track 3: Vehicular Electronics and Intelligent Transportation Systems	<i>Souso Kelouwani</i>	University of Quebec at Trois-Rivières, Canada
	<i>Valentin Ivanov</i>	Technische University of Ilmenau, Germany
	<i>Francis F. Assadian</i>	University of California in Davis, USA
	<i>Bin Xu</i>	University of Oklahoma, USA
Track 4: Control and Energy Management of Transportation Systems	<i>Bedatri Moulik</i>	Amity Institute of Technology, India
	<i>Jiangfeng (Jeff) Zhang</i>	Clemson University, USA
	<i>Tedjani Mesbahi</i>	INSA Strasbourg, France
	<i>Mauro Salazar</i>	Eindhoven University of Technology, Netherland
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	<i>Divya Garikapati</i>	Toyota USA, USA
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	<i>Honnyong Cha</i>	Kyungpook National University, Korea
	<i>Binh-Minh Nguyen</i>	University of Tokyo, Japan
	<i>Jorge Garcia</i>	University of Oviedo, Spain
Track 7: Hydrogen Refueling Infrastructures and Fuel Cell Vehicles	<i>Marie-Cécile Péra</i>	University of Bourgogne Franche-Comté, France
	<i>Loïc Boulon</i>	University of Quebec at Trois-Rivières, Canada
	<i>Javier Solano</i>	European Institute for Energy Research (EIFER), Germany
	<i>Abel Chuang</i>	University of California in Merced, USA
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	<i>Zhongbei Tian</i>	University of Birmingham, UK
	<i>Michele Vignati</i>	Politecnico di Milano, Italy
	<i>Sebastian de la Torre Fazio</i>	University of Malaga, Spain
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	<i>Theo Hofman</i>	Eindhoven University of Technology, Netherlands

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Tutorials

A range of tutorials will be held on Monday 7 October 2024 given by experts from industry and academia.

Monday, 7 October 2024 9:00-12:30 Continental C

T1: Towards Health-Aware Energy Management Strategies in Fuel Cell Hybrid Electric Vehicles Using Online Identification

Mohsen Kandidayeni, Loïc Boulon, Souso Kelouwani, Université du Québec à Trois-Rivières, Canada

This tutorial delves into the critical role of online identification in enhancing the energy management of fuel cell hybrid electric vehicles (FCHEVs). As FCHEVs become more prevalent, optimizing their performance through advanced energy management strategies is paramount. The tutorial will explore why online identification is indispensable for accurately managing the power between electrochemical sources—like fuel cells and lithium-ion batteries—to minimize hydrogen consumption and extend system lifespan. It will cover modeling techniques for electrochemical power sources, review parameter and state estimation methods, and discuss the integration of these estimations into energy management strategy design. Attendees will gain insights into practical examples of online parameter estimation and the design of health-aware energy management strategies. This session is designed to equip participants with the knowledge to contribute to the development of more efficient and durable FCHEVs.

Mohsen Kandidayeni (Member, IEEE) was born in Tehran, Iran, in 1989. He earned his B.S. degree in mechanical engineering and his Master's degree in mechatronics from Arak University, Iran. He received his Ph.D. in electrical engineering from the University of Quebec at Trois-Rivières (UQTR), Canada, in 2020. He then served as a Postdoctoral Researcher at the Electric Transport, Energy Storage, and Conversion Lab (e-TESS) at the University of Sherbrooke, Canada, from May 2020 until the end of 2023. Currently, he is an assistant professor in the Department of Electrical and Computer Engineering at UQTR.

Dr. Kandidayeni has received several prestigious awards, including the Best Thesis Award from UQTR in 2020 for Natural Sciences and Engineering, the FRQNT postdoctoral research scholarship (B3X, 284914) from 2020 to 2023, the FRQNT doctoral research scholarship (B2X, 259542) from 2018 to 2020, the IEEE TEC 2021 award (3-minute doctoral thesis challenge), and the third prize in the Energy Challenge at the 4th Québec Mines+Énergie (November 2019).

He has been actively engaged in research, authoring, co-authoring, and reviewing numerous articles for prestigious scientific journals, and participating in various international conferences. His scholarly work has resulted in approximately 65 journal and conference publications. His research interests include energy-related topics such as hybrid electric vehicles, fuel cell systems, energy management, multiphysics systems, modeling, and control.

Loïc Boulon (Senior Member, IEEE) received the master degree in electrical and automatic control engineering from the University of Lille, Lille, France, in 2006, and the Ph.D. degree in electrical engineering from the University of Franche-Comté, Besançon, France, in 2009. Since 2010, he has been a Professor with the University of Quebec at Trois-Rivières (UQTR), Trois-Rivières, QC, Canada, where since 2016, he has been a

Full Professor and the Director with the Hydrogen Research Institute since 2019. His work deals with modelling, control, and energy management of multiphysics systems. He has authored and co-authored more than 180 scientific papers in peer-reviewed international journals and international conferences and given more than 40 invited conferences all over the world. His research interests include hybrid electric vehicles and energy and power sources (fuel cell systems, batteries, and ultracapacitors).

Dr. Boulon is in the top three of the world's most prolific authors of the topic "2844 – Proton Exchange Membrane Fuel Cell (PEMFC)" in Elsevier SciVal for the 2013 – 2022 decade. In 2015, he was general chair of the IEEE-Vehicular Power and Propulsion Conference in Montréal, QC, Canada. He has been the Vice President, Motor Vehicles, of the IEEE Vehicular Technology Society and he found the "IEEE VTS Motor Vehicle Challenge." He has been the holder of the Canada Research Chair in Energy Sources for the Vehicles of the future, and he is currently the Director of the Réseau Québécois sur l'Énergie Intelligente.

Souso Kelouwani (Senior Member, IEEE) received the Ph.D. degree in robotics systems from Ecole Polytechnique de Montreal, in 2011. He completed the postdoctoral internship on fuel cell hybrid electric vehicles with Université du Québec à Trois-Rivières (UQTR), in 2012. Since 2017, he has been a Full Professor of mechatronics with the Department of Mechanical Engineering, UQTR. He holds four patents in U.S. and Canada. He has published more than 100 scientific articles. He holds the Canada Research Chair of Energy Optimization of Intelligent Transport Systems (2018-2023) and the Noovelia Research Chair of Intelligent Navigation of Autonomous Industrial Vehicles. He developed expertise in the optimization and the intelligent control of vehicular applications. His research interests include optimizing energy systems for vehicle applications, advanced driver assistance techniques, and intelligent vehicle navigation taking into account Canadian climatic conditions. He has a member of the Hydrogen Research Institute. He is a member of the Order of Engineers of Quebec. In 2019, his team received the First Innovation Prize in partnership with DIVEL, awarded by the Association des Manufacturiers de la Mauricie et Center-du-Québec for the development of an autonomous and natural navigation system. In 2017, he received the Environment Prize at the Gala des Grands Prix d'excellence en transport from the Association québécoise du Transport (AQTr) for the development of hydrogen range extenders for electric vehicles. He is the Winner of the Canada General Governor Gold Medal, in 2003. He was the Co-President and the President of the technical committee of the IEEE International Conferences on Vehicular Power and Propulsion, in Chicago, USA, in 2018, and in Hanoi, Vietnam, in 2019.

Monday, 7 October 2024 9:00-12:30 Continental B

T2: Autonomie AI

Ayman Moawad, Bokai Xu, Argonne National Laboratory, USA

AutonomieAI, developed by the Vehicle and Mobility Systems Group at Argonne National Laboratory, is a novel toolkit for efficient energy estimation of a wide variety of vehicles under various trip scenarios, routes and drive cycles. Based on Autonomie studies, it leverages state-of-the-art Machine Learning techniques to deliver fast energy prediction of vehicles, enabling co-simulation with transportation level system tools and opening doors for large-scale optimization at city, network or national level. AutonomieAI is the result of large neural network-based

model architectures, trained on very large and unique high fidelity vehicle simulation data. It is lightweight, deployable, efficient and has accuracy comparable to specialized and complex physics-based simulation softwares. Applications of AutonomieAI have potential to offer the flexibility to assist in solving eco-routing problems, optimize for vehicle and powertrain selection, study charging decision behavior, and optimize for charging station placement. Autonomie AI is now fully integrated into AMBER, Argonne's next-generation model-based systems engineering (MBSE) platform.

Ayman Moawad is a principal research engineer in the Vehicle and Mobility Simulation group at Argonne National Laboratory. He received a master's degree in Mechatronics, Robotics, and Computer Science from the Ecole des Mines, France and a master's degree in Statistics from the University of Chicago, USA. His research interests include engineering applications of artificial intelligence for energy consumption and cost prediction of advanced vehicles, machine learning, large scale data analysis, and high-performance computing.

Bokai Xu is a predoctoral researcher in the Vehicle and Mobility Simulation group at Argonne National Laboratory. He received his Master of Science in Data Science degree from University of Michigan in 2023. His research interests include data Science, data driven modeling, AI based modeling for vehicles and transportation systems.

Monday, 7 October 2024 14:00-17:30 Continental B

T3: Argonne's Multi-Connected and Automated Vehicles (CAVs) Simulation Tool and Anything-In-the-Loop (XIL) Test Workflow for High-Fidelity Energy Impacts Assessment

Jongryeol Jeong, Argonne National Laboratory, USA

This tutorial will introduce Argonne's suite of simulation tools and Anything-in-the-loop (XIL) test workflow, focusing on the assessment of energy impacts in connected and automated vehicles (CAVs) under various automated driving controls. Argonne's multi-CAVs simulation tool allows for multiple vehicles to interact in virtual environments for route-based scenarios, enabling the development of energy-efficient controls and evaluation of energy impacts in CAVs. The XIL test workflow validates controller functionality and energy impacts in real vehicles on a dynamometer, while interacting with simulated surrounding environments generated by the multi-CAVs simulation tool.

This tutorial will cover the main concepts and modeling process of the simulation tool, live demonstration of running simulations using the graphical user interface, use cases, and recent results. Additionally, the seamless process of the XIL test workflow will be explored through a step-by-step workflow covering pre-test development, design experiments, test preparation, test execution, and analysis, along with insights into validating the simulation tool using experimental results. Overall, participants will gain valuable knowledge of Argonne's state-of-the-art simulation and testing tools for high-fidelity energy impacts assessment in CAVs.

Jongryeol Jeong received Ph. D. in Mechanical Engineering from Seoul National University in Seoul, Korea in 2015. He is currently working in Argonne National Laboratory's Vehicle and Mobility Systems group in the Center for Transportation Research as a Principal research engineer. He is interested in research of modeling, simulation, optimization and control for electrified and intelligent vehicles.

Monday, 7 October 2024 14:00-17:30 Continental C

T4: Optimizing Charging Strategies for Electric Bus Fleets: A Robust Modelling Approach

Jónatas Augusto Manzolli, University of Coimbra, Portugal; João Pedro F. Trovão, University of Sherbrooke, Canada

The large-scale adoption of electric buses offers sustainable and reliable transportation but poses challenges in designing appropriate charging strategies to accommodate the operational requirements of fleets. The optimization of these strategies is crucial to avoid disrupting daily operations due to insufficient energy for trips, aiming to minimize operational costs and prevent grid overload during peak demand.

This tutorial introduces a robust optimization model designed to offer solutions that consider uncertainties in energy consumption, enabling operators to establish cost-effective and resilient charging plans. The tutorial will discuss features such as battery ageing, time-of-use tariffs, vehicle-to-grid (V2G) capabilities, and operational constraints in electric bus optimization. Furthermore, a reformulation approach is proposed to solve the model and manage its computational complexity. An illustrative case study conducted using real-world data from a mid-sized city underscores the model's effectiveness. The tutorial will be divided into two parts. The first part introduces and explains the mathematical model, the reformulation approach, and the results of the case study, aiming to provide insights into the developed methodological approach. The second part proposes a hands-on approach where the optimization model will be implemented in the Python programming language. This aims to give participants insights into how to implement, run, and visualize optimization problems in virtual environments.

Jónatas Augusto Manzolli (Member, IEEE) is a Fellow Researcher at the Institute for Systems Engineering and Computers at Coimbra (INESCC) in Portugal. He holds an MSc in Energy for Sustainability from the University of Coimbra (Portugal) and a BSc in Electrical Engineering from the University of Campinas (Brazil) and the Technical University of Munich (Germany). Previously, he worked as a software developer at IAV Automotive Engineering in Munich, Germany. His research interests encompass optimization, AI, urban transportation, and electric vehicles. He earned the SYLFF award from the Tokyo Foundation for Young World Leaders in 2020. He founded the Power and Energy Society (PES) chapter at the University of Coimbra in 2020 and served as the vice-chair of the IEEE Student Branch from 2020 to 2021. His experience in the field has led him to deliver several technical talks on electric mobility and optimization and to serve as an invited researcher at the University of Sherbrooke and McGill University in Canada.

João Pedro F. Trovão (Senior Member, IEEE) received his Ph.D. degree in electrical engineering from the University of Coimbra, Portugal, in 2013. He is a professor with the Department of Electrical Engineering and Computer Engineering, University of Sherbrooke, Sherbrooke, QC, Canada, where he holds the Canadian Research Chair position in Efficient Electric Vehicles with Hybridized Energy Storage Systems. He is an author/coauthor of over 175 journal and conference papers. His research interests cover the areas of electric vehicles, hybridized energy storage systems, energy management and rotating electrical machines. Dr. Trovão was the General Chair of the 2018 IEEE Vehicle Power and Propulsion Conference, Chicago, US and He is a Senior Editor for the Automotive Electronics topic of the IEEE Vehicular Technology Magazine.

Registration

Registration will take place in the Amphitheater Foyer. Hours are:

- Monday 7 October 0700 – 1730
- Tuesday 8 October 0700 – 1730
- Wednesday 9 October 0800 – 1730
- Thursday 10 October 0800 – 1730

Keynotes

Tuesday, 8 October 2024, 11:00–12:30 Amphitheater

Traction drive components and charging trends for electric vehicles

Burak Ozpineci, *Head, Vehicle and Mobility Systems Research, Oak Ridge National Laboratory, USA*

Oak Ridge National Laboratory (ORNL) has been at the forefront of advancing electric traction drives and wireless charging technologies. Under the Electric Drive Technologies Consortium, ORNL has led the efforts to significantly enhance the performance of electric drive systems. Key objectives include increasing power density by more than eightfold, reducing costs by 50% compared to 2015 benchmarks, and improving overall efficiency. This ambitious initiative has united top experts from industry, academia, and national laboratories to address the most challenging aspects of electric drive technology.

The research conducted under the consortium has focused on critical components such as capacitors, power modules, inverters, thermal management systems, and electric motors. This presentation will showcase the cutting-edge component technologies developed through these collaborative efforts, emphasizing the innovations that have emerged as a result. These advancements not only mark significant progress in electric motor drive technologies but also lay the groundwork for their widespread adoption in next-generation electric vehicles, driving us toward a more sustainable and efficient transportation future.

In addition to electric traction drives, ORNL has made groundbreaking progress in wireless charging technology, including the demonstration of a 270kW wireless charging system using patented polyphase charging coils. The presenter will also discuss current research in this area, offering insights into future trends and the potential impact on the electric vehicle industry.

Burak Ozpineci earned his B.S. degree in electrical engineering from Orta Dogu Technical University, Ankara, Turkey, in 1994. He then completed his M.S. and Ph.D. degrees in electrical engineering at the University of Tennessee, Knoxville, in 1998 and 2002, respectively. Since 2001, he has been with Oak Ridge National Laboratory, where he began as a student and has held positions as a researcher, founding group leader of the Power and Energy Systems Group, group leader of the Power Electronics and Electric Machinery Group. He currently serves as a Corporate Fellow and the Section Head of the Vehicle and Mobility Systems Research Section. Additionally, he has a joint faculty appointment with The University of Tennessee. Throughout his career, Dr. Ozpineci has received numerous accolades, including being named

a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) for his contributions to transportation electrification and wireless charging of electric vehicles. His achievements have been recognized with awards such as the IEEE Power Electronics Society (PELS) Vehicle and Transportation Systems Achievement Award and the IEEE Industry Applications Society (IAS) Outstanding Young Member Award, as well as the Nagamori Award, the U.S. Department of Energy Vehicle Technologies Office Distinguished Achievement Award, and several R&D 100 Awards. Dr. Ozpineci is actively involved in the IEEE, currently serving in various leadership roles, including as Vice President for Technical Activities of the IEEE Transportation Electrification Council.

Wednesday, 9 October 2024, 8:30–9:10 Amphitheater

Advanced control of electric vehicles and development of wireless in-wheel motors

Hiroshi Fujimoto, *Professor, The University of Tokyo*

Electric vehicles (EVs) have attractive potential not only for energy and environmental performance, but also for vehicle motion control because electric motors have a fast and measurable torque response. The speaker's lab has developed a completely original EV with active front and rear steering systems. We installed high-torque, direct-drive in-wheel motors and lateral force sensors on all wheels.

The first part of this talk will briefly introduce our recent studies on advanced motion control and autonomous driving to improve safety, driving comfort, and energy efficiency. In the second part, a new type of in-wheel motor will be introduced that receives electric power by wireless power transfer using magnetic resonance coupling and control signals by wireless communication to avoid disconnection of power and signal cables. This system is called Wireless In-Wheel Motor (W-IWM). In this system, it is also possible to transmit power directly to the in-wheel motor without cables from underground coils for dynamic charging to extend the driving range. This presentation provides an overview and design methods of the W-IWM. We also evaluate the characteristics of the W-IWM when installed in an electric vehicle and demonstrate its effectiveness through driving tests.

Hiroshi Fujimoto received the Ph.D. degree in electrical engineering from the Department of Electrical Engineering, The University of Tokyo, Tokyo, Japan, in 2001. In 2001, he joined the Department of Electrical Engineering, Nagaoka University of Technology, Niigata, Japan, as a Research Associate. From 2002 to 2003, he was a Visiting Scholar at Purdue University. In 2004, he joined the Department of Electrical and Computer Engineering, Yokohama National University, as a Lecturer and became an Associate Professor in 2005. He joined the Department of Electrical Engineering, The University of Tokyo in 2010, as an Associate Professor, and became a Professor in 2021. Dr. Fujimoto was the recipient of the Best Paper Awards from the IEEE Transactions on Industrial Electronics in 2001 and 2013, Isao

Takahashi Power Electronics Award in 2010, Best Author Prize of SICE in 2010, the Nagamori Grand Award in 2016, and First Prize Paper Award from the IEEE Transactions on Power Electronics in 2016. He has been an AdCom member at large from 2015 to 2023 in IES. He also serves journal editor in IES such as the associate editor of Industrial Electronics Magazine from 2006 and Technical Editor of IEEE/ASME Transactions on Mechatronics (TMECH) from 2010 to 2014. He has been a management committee member of TMECH from 2017 to 2021 and is currently a Senior Editor of TMECH from 2023. He served as a general chair of IEEE/IES International Conference on Mechatronics (ICM'21), Program Co-chair of AMC'20, ICM'19, ICM'23, AIM'10, AIM'19, AIM'23, AIM'24, Conference Editorial Board Chair of AIM'17-'19.

Thursday, 10 October 2024, 8:30–9:10 Amphitheater

Electric Vehicle Charging with AC/DC Microgrids Structure

Yunwei (Ryan) Li, *University of Alberta*

The rapid expansion of electric vehicles (EVs) reflects the global push for energy transition through sustainable and eco-friendly transportation solutions. Major global economies have set ambitious plans for the coming decades to significantly develop EV infrastructure. However, existing electrical infrastructure often cannot provide the high power required for fast EV charging without significant upgrades. Additionally, the upfront and maintenance costs of power electronics in high-power EV charging remain critical concerns.

This presentation focuses on hybrid AC/DC microgrid structures as an innovative solution for fast EV charging. It highlights recent advancements and emerging trends in EV charging technology enabled by hybrid AC/DC microgrid solutions, with particular emphasis on novel structural designs, converter technologies, power and energy management control strategies, and grid support mechanisms. These advancements will not only accommodate the growing number of EVs but also contribute to a more robust and adaptable electric grid.

Dr. Yunwei (Ryan) Li is currently a University of Alberta Senior Engineering Research Chair and Chair of the Department of Electrical and Computer Engineering. Dr. Li received the Ph.D. degree from Nanyang Technological University, Singapore. Dr. Li was a Visiting Scholar with the Aalborg University, Denmark in 2005, and a Postdoctoral Research Fellow at Ryerson University, Canada 2006 – 2007. In 2007, he also worked at Rockwell Automation Canada before joined University of Alberta. His research interests focus on power electronics and their applications in distributed energy resources, microgrids, renewable energy, transportation electrification, and electric motor drives. His research has produced more than 450 papers with over 24,000 citations.

Dr. Li is currently the Vice President for Products of IEEE Power Electronics Society (PELS). He was the Editor-in-Chief for IEEE Transactions on Power Electronics Letters 2019-2023. Prior to that, he was Associate Editor for IEEE Transactions on Power Electronics, IEEE Transactions on Industrial Electronics, IEEE Transactions on Smart Grid, and IEEE Journal of Emerging and Selected Topics in Power Electronics. Dr. Li served as the general chair of IEEE Energy Conversion Congress of Exposition (ECCE) in 2020. Dr. Li received the Nagamori Foundation Award in 2022 and the Richard M. Bass Outstanding Young Power Electronics Engineer Award from IEEE PELS in 2013. He is a Fellow of IEEE, a Fellow of Canadian Academy of Engineering, and recognized as the Clarivate Highly Cited Researcher.

Industry Panel

Tuesday, 8 October 2024, 16:00-17:30 Amphitheatre

Electric Vehicles: Perspectives from Industry and Government Agencies

Moderator: Steven Torrisi

Toyota Research Institute, USA

Panelists: Patrick Herring

Glimpse, USA

Ann Xu

ElectroTempo, USA

Sulekha Chattopadhyay

IEEE-WIE, USA

Daniel Breton

Electric Mobility Canada, Canada

Chen Ling

Toyota Research Institute of North America, USA

Hosam Fathy

University of Maryland, USA

Social Events

Coffee breaks will take place in the Atrium Ballroom. Lunches are included in the full registration. The lunches will be in the Atrium Ballroom. You will need your ticket to gain entry. Do not forget these as they cannot be replaced. The reception on Monday evening, which is also in the Atrium Ballroom, is open to all attendees, including student and life registrations.

We are planning a beautiful evening under the stars with a fun and picturesque Washington, DC Signature Dinner Cruise on the Potomac River! Our banquet will be an incredible night out with a delicious chef-curated buffet, savored alongside the breathtaking backdrop of the city skyline. While staying cozy and warm in the comfortable indoor spaces, you'll soak in spectacular views of Washington, DC's iconic landmarks, such as the Washington Monument and Lincoln Memorial. This unforgettable dining experience is complete with beer and wine, a live DJ entertainment, games, open-air decks, and dancing into the night! Set sail for a one-of-a-kind dinner cruise evening you won't soon forget!

We will be leaving on charter busses from the Ronald Reagan Convention Center beginning at 5:30pm on the 9th and will begin pick up after the dinner at 9:30pm to return to the Convention Center. You must have a banquet ticket to join. If your registration package does not include the banquet, you can always go the registration site and add a ticket there.

VPPC2024 Technical Papers

Tuesday 8 October 2024

Tuesday, 8 October 2024 14:00-15:30 Continental B

2I: Energy Generation and Storage

Chair: *Satadru Dey and Tedjani Mesbahi*

1 A Framework to Estimate Life Cycle Emissions for Vehicle-Integrated Photovoltaic Systems

Maurizio Clemente, Luuk van Sundert, Mauro Salazar, University of Eindhoven; Theo Hofman, Eindhoven University of Technology

2 Electric Vehicle Performance Enhancement Utilizing Hybrid Energy Storage Systems

Hossam Hussein, SM Sajjad Hossain Rafin, Ibtissam Kharchouf, Mahmoud S. Abdelrahman, Osama A. Mohammed, Florida International University

3 HiL Demonstration of Online Battery Capacity and Impedance Estimation with Minimal a Priori Parametrization Effort

Camiel Beckers, Feye Hoekstra, Frank Willems, TNO

4 Method to Quantify Interfacial and Charge Transfer Resistance in the Context of Lithium-Ion Cell Ageing

Richard Stocker, HORIBA; Asim Mumtaz, University of York; Neophytos Lophitis, Cyprus University of Technology

Tuesday, 8 October 2024 14:00-15:30 Continental C

2J: Electric Railway

Chair: *Michele Vignati and Sebastian de la Torre*

1 Optimal thermal management on the storage vessel for cryogenic hydrogen-powered hybrid train

Zhan Xu, Yizhe Zhang, Ning Zhao, University of Birmingham; Shihao Li, Yan Yan, Southeast University; Stuart Hillmansen, University of Birmingham

2 Comparative Study of Artificial Intelligence based Energy Management Strategies for Railway Vehicles

Josu Olmos, Haizea Gaztañaga, Urtzi Iparragirre, IKERLAN Technology Research Centre

3 Detailed simulation and energy management of the trains in the new proposed Green Line in Jerusalem

Maoz Eitan, CAF-SHAPIR; Sebastian de la Torre, Universidad de Malaga

4 Challenges of Holistic Approach for Energy Management Strategies of Hybrid Dual-mode Trains

Ayoub Aroua, University of Lille; Clément Dépature, SNCF; Walter Lhomme, University of Lille; Matthieu Renault, Jérôme Déon, SNCF Voyageurs, Centre d'Ingénierie du Matériel

Tuesday, 8 October 2024 14:00-15:30 Oceanic B

2K: IEEE VTS Motor Vehicles Challenge 2024 I

Chair: *Ke Li and Mario Porru*

1 Asymmetric Supply of a Dual Three-Phase PMSM through a Hybrid Energy Storage System in Marine Electric Propulsion Systems

Alessandro Serpi, Mario Porru, Andrea Turno, University of Cagliari; Fabio Tinazzi, Marco Pastura, Mauro Zigliotto, University of Padova

2 Efficient Energy and Loss Management Control Strategy for a Hybrid e-Racing Vehicle

Edoardo Ferri, Samuele Grillo, Davide del Giudice, Christian Laurano, Adriano Demetrio, Politecnico di Milano

3 Energy management system of an Electric Vehicle - IEEE VTS Challenge 2024

Giovanni Righetti, Leonardo Serena, Andrea Sassella, Mario Costantini, Mariagrazia Tristano, Basilio Lenzo, University of Padova

4 Loss Minimization Algorithm Based Strategy for EV Hybrid Energy Storage System Optimization

Alexander González Medina, Facundo Aguilera, Manuel Javier Vidal Cué, Grupo de Electrónica Aplicada (GEA), IITEMA, CONICET-UNRC

5 IEEE VTS Motor Vehicle Challenge 2025 - Energy Management and Control of a Marine Electric Propulsion System

Mario Porru, Alessandro Serpi, University of Cagliari; Fabio Tinazzi, Ludovico Ortombina, University of Padova

Wednesday 9 October 2024

Wednesday, 9 October 2024 11:00-12:30 Meridian B

4D: Energy Storage I

Chair: *Ali Sari and Giambattista Gruosso*

1 Method to Quantify Ohmic Resistance in the Context of Lithium-Ion Cell Ageing

Richard Stocker, HORIBA; Asim Mumtaz, University of York; Neophytos Lophitis, Cyprus University of Technology

2 Multi-layer optimisation of Hybrid Energy Storage Systems for electric vehicles

Wouter Andriess, Jorn van Kampen, Theo Hofman, Eindhoven University of Technology

3 Parameter Estimation for a Generic Na-ion Battery Model Using The Curve Fitting Approach

Lakhdar Mamouri, Thomas Pavot, Tedjani Mesbahi, INSA Strasbourg - University of Strasbourg - ICube (UMR CNRS 7357)

4 The effect of increasing the thermal conductivity of a cylindrical cell housing on thermal performance

Joshua Ireland, James Marco, Warwick University; Ryan McGlen, Boyd Corporation

Wednesday, 9 October 2024 11:00-12:30 Continental B

4I: Hydrogen Fueling Infrastructure and Fuel Cell Vehicles

Chair: *Marie-Cecile Pera and Loïc Boulon*

1 A 3D Multiphysics Study of Different Channel Designs Of PEM Electrolyzer

Rafika Louli, UTBM, FEMTO-ST, FCLAB, CNRS, Belfort, France

2 Statistical investigation of the most influential parameters on the cold start of PEMFC

Mattéo Gantzer, Université de Franche-Comté; Stefan Giurgea, FEMTO-ST Institute, UTBM; Daniel Hissel, Nadia Steiner, University of Bourgogne Franche-Comté

3 Impact of Optimal Fuel Cell Management System on Fuel Cell Hybrid Electric Vehicle Efficiency

Yakoub Zine, Université de technologie de Belfort Montbéliard

4 Impact of start-stop and load cycling on the lifetime of PEMFC-powered vehicles.

Wafa Hafsa Saidouni, Université de Franche-Comté

5 Methodology for characterizing the aging of a PEMFC based on a real-life usage database

Thomas Maugis, University of Franche Comté; Samuel Hibon, Alstom, Saint Ouen; Didier Chamagne, David Bouquain, Université de Franche-Comté FEMTO-ST, FCLAB, UTBM, CNRS

Wednesday, 9 October 2024 11:00-12:30 Continental C

4J: Vehicular Electronics and Intelligent Transportation I

Chair: Ricardo Pinto de Castro and Rochdi Trigui,

- 1 Adaptive Mode-Switching Coordinated Control based on Stability Domain for Longitudinal-Lateral-Vertical Decoupling X-By-Wire Electric Vehicles**
Sheng Zhao, Xiaodong Wu, Hangyu Lu, Shanghai Jiao Tong University
- 2 Basic Study on Wheel Speed Based Driving Force Control for Multi-motor Electric Vehicles with Global Stability Analysis**
Binh-Minh Nguyen, University of Tokyo; Takumi Ueno, Yuki Hosomi, Tona Sato, The University of Tokyo; Shinji Hara, Tokyo Institute of Technology; Hiroshi Fujimoto, The University of Tokyo
- 3 Green Light Optimal Speed Advisory Customization for Urban Buses: an Experimental Approach**
Daniele Vignarca, Stefano Arrigoni, Lorenzo Maglia, Edoardo Sabbioni, Politecnico di Milano
- 4 Research on CAN FD Transceiver Interoperability Automated Test System**
Yingpeng Tong, Feng Luo, Tongji University; Fengjian Hu, IHR (Shanghai) Automotive Electronic Technology Co., Ltd.
- 5 Sensor-agnostic material classification scheme - An approach derived from an infrared material dataset supporting virtual perception testing**
David J. Ritter, Relindis Rott, Virtual Vehicle Research GmbH

Wednesday, 9 October 2024 14:00-15:30 Meridian B

5D: Power Electronics

Chair: Marina Perdigão and Alessandro Serpi

- 1 Advancing Grid Integration of Photovoltaics with Solid-State Transformer Technology: Control Mechanisms and Conversion Efficiency**
Babatunde Soyoye, Indranil Bhattacharya, Mohamed Mansour, Mary Vinolisha Antony Dhason, Tennessee Technological University
- 2 Geometric Scaling Laws for Axial Flux Permanent Magnet Motors in In-Wheel Powertrain Topologies**
Olaf Borsboom, Arnab Bhadra, Eindhoven University of Technology; Mauro Salazar, University of Eindhoven; Theo Hofman, Eindhoven University of Technology
- 3 High Pole Number Outer-Rotor SPM Machine for Sustainable 150kW High-Speed EV Traction**
Adam Walker, Tianjie Zou, Liam Portanier Mifsud, Peter Connor, Hailin Huang, Xiang Ren, George Batho, Oliver Tweedy, Christopher Gerada, University of Nottingham; Adham Kaloun, Robert Bosch

Wednesday, 9 October 2024 14:00-15:30 Continental B

5I: Control and Energy Management

Chair: Tedjani Mesbahi and Mohsen Kandidayeni

- 1 A Basic Study on Modelling and Range-Extension Control for Dual IM-PMSM Electric Vehicles**
An-Toan Nguyen, Quy Nhon University; Binh-Minh Nguyen, University of Tokyo; Joao Pedro Trovao, University of Usherbrooke; Minh C. Ta, University of Sherbrooke
- 2 Design of a Modular Test Bench for Real-Time Analysis of Energy Management Systems and Autonomous Driving Requirements in Automotive Power Nets**
Michael Ebnicher, Technical University of Munich (TUM); Laurenz Tippe, BMW; Alberto de Vergara Oberloher, Technical University of

Wednesday, 9 October 2024 11:00-12:30 Oceanic B

4K: EMR and Other Graphic Descriptions I

Chair: Nassim Noura and Alain Bouscayrol,

- 1 Current Control Schemes for Grid Following Inverter-based Onshore Electrified Ship**
Van-Toi Tran, Lam Vu-Ngoc, Linh H. Tran, Thanh Vo-Duy, Hanoi University of Science and Technology; Joao Pedro Trovao, University of Usherbrooke; Bao-Huy Nguyen, Université de Sherbrooke
- 2 Energetic Macroscopic Representation of a Partial Power Converter based Fuel Cell Electric Vehicle**
Anatole Desrevelaux, Le CNAM - SATIE; Clement Mayet, Université de Lille - L2EP; Olivier Bethoux, Sorbonne Université; Eric Laboure, CentraleSupélec - Paris Saclay University; Alessio Iovine, William Pasillas Lepine, CNRS, CentraleSupélec, Paris Saclay University; Francis Roy, Stellantis
- 3 Enhanced EMR-Based Modelling for Lithium Battery Aging Studies in Electric Urban Buses**
Marco A. M. Ferreira, IPC-ISEC, Polytechnic Institute of Coimbra; Pascal Messier, Université de Sherbrooke; Paulo G. Pereirinha, IPC-ISEC, Polytechnic Institute of Coimbra / INESC Coimbra; Joao Pedro Trovao, University of Usherbrooke
- 4 Modeling and Control of Multi-phase Motor Fed by Multi-level Inverter for Electric Vehicles**
Huy Luong-Gia, Bao-Huy Nguyen, Linh H. Tran, Hanoi University of Science and Technology; Minh C. Ta, University of Sherbrooke; Thanh Vo-Duy, Hanoi University of Science and Technology
- 5 Scalable simulation framework of e-axles for electric vehicles**
Ayoub Aroua, Walter Lhomme, Alain Bouscayrol, University of Lille; Kurt Stockman, University of Ghent

Munich (TUM); Joachim Fröschl, BMW Group; Hans-Georg Herzog, Technical University of Munich (TUM)

- 3 Enhanced Energy Management using Powertrain and Mission parameters : Case study of a Distributed Hybrid Propulsion Light Aircraft**
Baptiste Legrand, University of Franche-Comté; Arnaud Gaillard, Univ. Bourgogne Franche-Comte, UTBM; David Bouquain, Université de Franche-Comté FEMTO-ST, FCLAB, UTBM, CNRS
- 4 Flexible Automotive Power Management: Formalization of an Auction-based Approach**
Tobias Schürmann, FZI Research Center for Information Technology

Wednesday, 9 October 2024 14:00-15:30 Continental C

5J: Vehicular Electronics and Intelligent Transportation II

Chairs: Souso Kelouwani and Hicham Chaoui

- 1 Vehicle Convoy Control for Minimizing Total CO2 Emissions Considering Social Acceptability**
Yutaro Itoh, DENSO CORPORATION; Tatsumi Sugiyama, Shigenori Ichinose, J-QuAD DYNAMICS Inc.
- 2 Energy-Efficient Adaptive Cruise Control for BEVs in Urban Scenarios with Traffic Lights Negotiation**
Chengyang Ye, Stefano Favelli, Andrea Tonoli, Politecnico di Torino
- 3 Motor-Temperature-Aware Optimal Energy Management for Dual-Motor Electric Buses**
Sheng Yu, Imperial College London; Cuneyt Haspolat, AVL Research and Engineering; Yaprak Yalcin, Saleh Msaddi, Istanbul Technical University; Boli Chen, University College London; Simos A. Evangelou, Imad M. Jaimoukha, Imperial College London

4 Wheel-speed based Driving Force Control for On-board Motor Electric Vehicles with Absolute Stability Analysis and HIL Evaluation

Yuki Hosomi, Binh-Minh Nguyen, Hiroshi Fujimoto, The University of Tokyo; Hiroaki Ikeda, Tatsuro Nohara, Komatsu Ltd.

Wednesday, 9 October 2024 14:00-15:30 Oceanic B

5K: EMR and Other Graphic Descriptions II

Chair: Clement Mayet and Joao Trovao

1 Study of an EV Driving Range Evolution Considering Battery Capacity Degradation

Martin Chaud, Ronan German, University of Lille; Margot Gaetani-Liseo, Université Claude Bernard Lyon 1; Clement Mayet, Université de Lille - L2EP; Serge Alhelou, Mouhamadane Fall, Alla Ndiaye, Alain Bouscayrol, University of Lille; Pascal Venet, Laboratoire Ampère, Université de Lyon

2 Control schemes of electric vehicle charging using CC-CV strategy

Salma Fadili, Alain Bouscayrol, University of Lille; Eric Noirtat, Sherpa Engineering; Philippe Delarue, University of Lille - LEP; FIANI Philippe, Sherpa Eng.; Clement Mayet, Université de Lille - L2EP

3 Systematic Modeling of a Steering Vehicle Differential Using Power-Oriented Graphs

Davide Tebaldi, Roberto Zanasi, University of Modena and Reggio Emilia

4 Power-Hardware-In-The-Loop for Electric Vehicle Battery Validation

Pascal Messier, Université de Sherbrooke; Mathieu Blanchard, SysNergie inc; Félix-Antoine LeBel, Université de Sherbrooke; Joao Pedro Trovao, University of Usherbrooke

Wednesday, 9 October 2024 16:00-17:30 Meridian B

6D: Motor Drives

Chair: Alessandro Serpi and Ke Li,

1 Highly Manufacturable Edgewise Winding Design Integrating Cooling Solutions for High Power Density Applications

Ellis George, Adam Walker, Fengyu Zhang, Gaurang Vakil, Christopher Gerada, University of Nottingham

2 Choosing the thermal optimal in-slot cooling channel position for an automotive electric motor

Liam Portanier Mifsud, Peter Connor, Adam Walker, Tianjie Zou, Hailin Huang, Dr Xiang Ren, George Batho, Oliver Tweedy, Christopher Gerada, University of Nottingham; Christian Egger, Robert Bosch GmbH

3 Robust Wheel Speed Control of Electric Vehicles with Respect to Backlash and Dead-time in Powertrains

Yussuf Shakhin, Ahmad Bala Alhassan, Nazarbayev University; Minh C. Ta, University of Sherbrooke; Binh-Minh Nguyen, University of Tokyo; Do Ton

4 Design of a 1MW-Class Permanent Magnet Machine Featuring Multiphase Hairpin Windings for Electric Aircraft Propulsion

Anh Thanh Huynh, Hailin Huang, Jianan Jiang, Tianjie Zou, David Gerada, Tao Yang, Christopher Gerada, University of Nottingham; Min-Fu Hsieh, National Cheng Kung University

Wednesday, 9 October 2024 16:00-17:30 Continental B

6I: Modeling, Analysis and Simulation

Chairs: Divya Garikapati and Namwook Kim

1 A Modular Model for Determining Cornering Resistance of Heavy-Duty Vehicles

Alenka Beckers, Camiel Beckers, Paul Mentink, TNO; Igo Besselink, Eindhoven University of Technology; Steven Wilkins, TNO

2 An experimental analysis of driver influence on battery electric bus energy consumption

Mattia Belloni, Davide Tarsitano, Edoardo Sabbioni, Politecnico di Milano

3 Integrating System Modeling with CFD Simulations to Define Design Points for Supercapacitor Module Optimization

Guven Ogus, Flanders Make - Belgium; Remi de Coster, Zhenmin Tao, Mohsen Akbarzadeh, Flanders Make; Grigoris Koltsakis, AUTH; Stephan Schlimpert, Flanders Make, Core Lab MotionS

4 Meeting Multiple Driving Needs: Design of a Novel Low Voltage Reconfigurable Electric Vehicle

Eugenio Tramacere, Stefano Favelli, Raffaele Manca, Politecnico di Torino; Renato Galluzzi, Tecnologico de Monterrey; Andrea Tonoli, Politecnico di Torino

5 Minimizing the Energy Consumption of BEV Speed Trajectory Based on Dynamic Programming

Sungtak Hong, Jehwi Yeon, Jaekwang Jung, Hyein Sung, Dongeon Kim, Namwook Kim, Hanyang University

Wednesday, 9 October 2024 16:00-17:30 Continental C

6J: Batteries, Charging Systems and Infrastructures

Chairs: Paulo Pereira and Giambattista Gruosso

1 Simulation-Based Analysis of Battery Electric Vehicles Driving Range in Response to Thermal Conditions

Jehwi Yeon, Sungtak Hong, Jaekwang Jung, Hyein Sung, Dongeon Kim, Namwook Kim, Hanyang University

2 System-level thermal and electrical modeling of battery systems for electric aircraft design

Thomas Kuijpers, Jorn van Kampen, Theo Hofman, Eindhoven University of Technology

3 Dynamic Simulation Model of an inWheel IPT System based on Experimental Characterization

Isidro Ribeiro, Valter Costa, Universidade de Coimbra; Miguel Torres, Instituto Politécnico de Coimbra; Emanuel Marques, André M. S. Mendes, Universidade de Coimbra; Marina Perdigão, Polytechnic Institute of Coimbra

4 Electric Vehicles as Flexibility Providers for the Electric Distribution Grid: Main Challenges, Opportunities, and Trends

Lucélio M. da Costa, Álvaro Gomes, University of Coimbra, INESCC; Paulo G. Pereira, IPC-ISEC, Polytechnic Institute of Coimbra / INESC Coimbra

5 Prediction of Electric Vehicle Charge Profile using Battery Digital Twin

Subhajeet Rath, Steven Wilkins, TNO

Wednesday, 9 October 2024 16:00-17:30 Oceanic B

6K: Recent Results I

Chairs: Jonatas Manzolli and Mohsen Kandidayeni

1 Design and Analysis of a Pole-Changing Vernier Memory Machine

Andrea Floris, University of Cagliari

2 Efficiency Improvement of a Multi-Stack PEM Fuel Cell System with Optimised Oxygen Excess Ratio and Operating Temperature

Naima Sehli, Mohsen Kandidayeni, Marie Hébert, Souso Kelouwani, Loïc Boulon, Université du Québec à Trois-Rivières

3 Impact of Battery Temperature on Charging Time of an Electric Vehicle for Slow Charging

Swapnil Revankar, Ronan German, University of Lille; Audrey Grolleau, UQTR; Alain Bouscayrol, University of Lille; Loïc Boulon, Université du Québec à Trois-Rivières

4 The Influence of Overcharging and Over-Discharging on the Capacity Degradation of Lithium-Ion Batteries
Joelton Deonei Gotz, Federal Technological University of Paraná;
Marco Antonio Simões Teixeira, Pontifical Catholic University of

Paraná; Fernanda Cristina Corrêa, Federal Technological University of Paraná - UTFPR; Emilson Ribeiro Viana, Alceu André Badin, Milton Borsato, Federal Technological University of Paraná

Thursday 10 October 2024

Thursday, 10 October 2024 11:00-12:30 Continental B

7I: Recent Results II

Chairs: Michele Vignati and Minh C. Ta

1 Assessment of Torque Vectoring Controllers Performance through Subjective-Objective Ratings

Michele Asperti, Michele Vignati, Edoardo Sabbioni, Politecnico di Milano

2 Model predictive humidity distribution control for polymer electrolyte membrane fuel cells

Benjamin Fuchs, Christoph Hametner, Stefan Jakubek, TU Wien

3 Shock absorbing seats for vehicles subjected to blast impacts

Akitoshi Takei, Hiroyuki Fujiwara, National Defense Academy

Thursday, 10 October 2024 11:00-12:30 Continental C

7J: Recent Results III

Chairs: Paulo Pereirinha and Ricardo Pinto de Castro

1 Impact of electric vehicle charging on the power grid: a simulation framework for the validation of new services

Alessia Moretto, Cesar Diaz-Londono, Giambattista Grusso, Politecnico di Milano

2 European Ports Transition - A new Approach of a Load Model, Consumption Integration of Renewable Energy Sources and Energy Storage Systems Profiles

Cristina Agreira, Polytechnic University of Coimbra, INESC Coimbra

3 Comprehensive Framework to Electrify Public Transit Buses: An Application to the City of Sao Paulo, Brazil

Pedro Logiodice, Hussein Basma, Carlos Bueno, Oscar Delgado, The International Council on Clean Transportation

4 Planning for electric vehicles evacuations: energy, infrastructure, and storage needs

Farzan ZareAfifi, Ricardo de Castro, Sarah Kurtz, University of California, Merced

Thursday, 10 October 2024 11:00-12:30 Oceanic B

7K: Social, Economic and Urban Impacts of Electric Vehicles and Their Infrastructures

Chairs: Julia Frotey and Eric Hittinger

1 Assessing the social acceptance of electric vehicles on a campus of university

Lucie Juncker, Elodie Castex, Alain Bouscayrol, Eugénie Masclef, University of Lille

2 Estimation of the energy consumption and GHG emission of a public rail transport system in France combining tramways and metros for daily commuting

Clement Mayet, Université de Lille - L2EP; Anas Hankour, Métropole Européenne de Lille; Bachira Lakhdari, Sonia Rezoug, Alain Bouscayrol, University of Lille; Philippe Delarue, University of Lille - LEP; Charles Brocart, Métropole Européenne de Lille (MEL)

3 Measuring Consumer Willingness to Enroll in Battery Electric Vehicle Smart Charging Programs

Pingfan Hu, George Washington University; Brian Tarroja, Matthew Dean, Kate Forrest, University of California, Irvine; Eric Hittinger, Rochester Institute of Technology; Alan Jenn, University of California, Davis; John Helveston, George Washington University

4 Techno Economic Study of Second life Batteries for Affordable e-mobility campus

Ronan German, University of Lille; Eric Hittinger, Rochester Institute of Technology; Elodie Castex, Alain Bouscayrol, University of Lille

Virtual Papers

Tuesday, 8 October 2024 17:30-19:00 Online

V1: Energy Storage II

Chair: Luigi Piegari

1 A CHB grid-forming Energy Storage Control Strategy Considering SOC Balance in Unbalanced Grid

Lin Zhu, Zhao Liu, Yan Gu, Yongkang Zhou, Zechen Wang, Nanjing University of Science and Technology

2 Battery internal resistance and state of health estimation based on modified Van Genuchten-Gupta model compared to a feedforward neural network

Arafat Fousseni, Université du Québec à Chicoutimi; Khaled Ziane, Centre de recherche et d'innovation en intelligence énergétique; Martin J.-D. Otis, Université du Québec à Chicoutimi

3 Characterization and modeling of the swelling behavior of a LiFePO₄ pouch cell in multiple operating conditions

Daniel Koch, Technische Hochschule Ingolstadt; Murillo Stein, Universidade Federal de Santa Catarina; Samuel Luna de Abreu, Instituto Federal de Santa Catarina; Sergej Diel, Hans-Georg Schweiger, Technische Hochschule Ingolstadt

4 Study of battery SOH estimation method based on electrochemical impedance spectroscopy

Ruoyu Wang, Nanjing University of Science and Technology

5 State of Safety Assessment in Electric Vehicle Battery Packs

Jihoon Moon, The Pennsylvania State University; Geetika Vennam, Tanim R. Tanvir, Idaho National Laboratory; Christopher D. Rahn, The Pennsylvania State University

6 Value-Based Pricing for Innovations: A Model for Determining and Optimizing Customer-Oriented Prices for Active Balancing Systems

Michael Seefried, Thiemo Hein, David Oeser, Andreas Ziegler, Gunther Bohn, Uwe Sponholz, Technical University of Applied Sciences Würzburg-Schweinfurt

Tuesday, 8 October 2024 17:30-19:00 Online

V2: Thermal and Energy Management

Chair: Kaibo Li

1 Computationally efficient model predictive control for electric vehicle battery thermal management

Kaibo Li, Dinh Quang Truong, University of Warwick; Kairui Yao, esa

2 Dynamic thermal management control solution for an air-cooled automotive Lithium Ion battery pack

Ane Sainz de la Maza, UPV/EHU; Elena Trancho, TECNALIA, Basque Research and Technology Alliance (BRTA), Derio, Spain; Edorta Ibarra, UPV/EHU; Beñat Arteta, Tecnalia, Basque Research and Technology Alliance (BRTA); Eneko Otaola, Tecnalia Research & Innovation; Nicola Delmonte, University of Parma (UNIPR)

3 Optimizing Interior PMSMs for Energy Efficiency: Simple Dynamic Direct Voltage Control for Electric Vehicle during Standard Driving Cycles

Mohamad Alzayed, Hicham Chaoui, Carleton University

4 A Generic Approach to Extracting Maximum Power from PMSG Wind Turbines without Current Sensors

Mohamad Alzayed, Carleton University; Sina Zarrabian, The State University of New York; Hicham Chaoui, Carleton University

5 A Modified Deadbeat Predictive Current Control with Improved Dynamic Performance under Insufficient Voltage Margin for IPMSM

Qichao Hu, Xiaoyan Huang, Zhejiang University

6 Active Support Performance of Grid-connected Multi-power Conversion System Based on Grid-following/Grid-forming Control

Tianwei Li, Puyang Wang, Fuluan Chen, Tianming Gu, Nanjing University of Science and Technology; Dejian Yang, Gangui Yan, Northeast Electric Power University; Ze Ma, Hongsheng Yuan, Beijing Mechanical Equipment Institute

7 Current Sensorless Direct Voltage Control of Surface Mounted Permanent Magnet Synchronous Motor Driven Electric Vehicles

Alaref Elhaj, Mohamad Alzayed, Hicham Chaoui, Carleton University

8 Hysteresis in Sodium-ion Batteries: Temperature and Relaxation Time Effects

Sary Yehia, INSA Strasbourg, ICube Laboratory, Lebanese American University; Lakhdar Mamouri, INSA Strasbourg - University of Strasbourg - ICube (UMR CNRS 7357); Nagham El Ghossein, Lebanese American University; Tedjani Mesbahi, INSA Strasbourg & ICube laboratory

9 SOH Estimation Algorithm and Hardware Platform for Lithium-ion Batteries

Mohammad Alsmadi, Jaber Abu-Qahouq, University of Alabama

Tuesday, 8 October 2024 17:30-19:00 Online

V3: Power Electronics and Motor Drives

Chair: Ronan German

1 Dynamic Bidirectional-Controlled Inverter-Based Grid Optimized by Neural Networks

Mohamad Alzayed, Carleton University; Michel Lemaire, Université du Québec à Trois-Rivières, OPAL-RT; Hicham Chaoui, Carleton University; Daniel Massicotte, UQTR - Université du Québec à Trois-Rivières - Canada

2 Enhanced Efficiency in Electric Vehicle Operation: Easy Dynamic Direct Voltage MTPA Control without Current Sensing for Interior PMSMs

Mohamad Alzayed, Hicham Chaoui, Carleton University

3 Optimization of PMSM Sensorless Control based on EKF for Electric Vehicle Applications

Bachir Bendjedja, University of Amar Thelidji

4 Parameter Adaptive Control of the Virtual DC Machine Based on Sigmoid Function

Yan Gu, Zhao Liu, Lin Zhu, Yongkang Zhou, Zechen Wang, Nanjing University of Science and Technology

5 Phase Current Reconstruction of Five Phase Open-Winding Permanent Magnet Synchronous Machine Using Single DC Bus Current Sensor

WangYongFu, QingDao university

6 Gain Scheduled Control with Youla Interpolation Conditions: A Design Example

Trevor Vidano, Francis Assadian, University of California, Davis

Wednesday, 9 October 2024 17:30-18:30 Online

V4: IEEE VTS Motor Vehicles Challenge 2024 II /Railways

Chair: Vo Duy Thanh,

1 Comparison of Energy Management Strategies for an e-Racing Vehicle with Hybrid Energy Storage

Josè Roberto Boffino de A. Monteiro, Stefan Thiago Cury A. dos Santos, University of Sao Paulo; Mehrshad Pakjoo, Luca Perbellini, Luigi Piegari, Rafael Souza Baquero, Politecnico di Milano

2 Health-aware Energy Management Strategy for Fuel Cell Hybrid Self-Guided Vehicle with Conflict-aware Navigation Approach

Ghofrane Benarfa, Ali Akrem Amamou, Massinissa Graba, Marie Hébert, Souso Kelouwani, University du Québec à Trois-Rivières

3 Real Time Adaptive Energy Management Strategy for Electric Vehicles with Hybrid Energy Storage System

Simone Barcellona, Marzio Barresi, Holguer Noriega, Riccardo Scalabrin, Rafael Souza Baquero, Politecnico di Milano

4 Robust Energy and Powertrain Losses Management of a Dual-Sources e-Racing Vehicle

Hari Maghfiroh, Oyas Wahyunggoro, Adha Imam Cahyadi, Universitas Gadjah Mada

5 Design of a 1200Nm High Torque Density In-Wheel Magnetic Geared Motor for Electrical Vehicals

Yongxuan Wu, Hailin Huang, Tianjie Zou, Xiang Ren, Christopher Gerada, University of Nottingham

6 Towards Passenger Friendly Stations: An Indian Railways Case Study for Urban Rejuvenation

Kshitij Saxena, AECOM

Wednesday, 9 October 2024 17:30-18:30 Online

V5: Understanding and Mitigating PEM Fuel Cell Degradation for Mobility

Chair: Nadia Steiner

1 Bayesian Neural Networks with semi-empirical signal processing for PEM Fuel Cell Fault Diagnosis

Abderazek Cheikh, FEMTO-ST Institute, FCLAB, Univ. Bourgogne Franche-Comte

2 Enhanced Monitoring and Prediction of PEMFC Degradation in Accelerated Stress Tests

Taha Al Rafei, Université de Franche-Comté; Nadia Steiner, University of Bourgogne Franche-Comté; Elodie Pahon, Univ. Bourgogne Franche-Comté FEMTO-ST, FCLAB, CNRS Belfort, France; Daniel Hissel, University of Bourgogne Franche-Comté

3 Review of performance recovery procedures applied to Proton Exchange Membrane Fuel Cell Vehicles

Fabian Van der Linden, Symbio, Saint-Fons; Simon Morando, Symbio Bavans, France

Wednesday, 9 October 2024 17:30-18:30 Online

V6: Modelling of Electric Vehicles

Chair: Walter Lhomme

1 Development of an Energy Management Strategy for Multi-Stack Fuel Cell Hybrid Electric Vehicle Using Deep Reinforcement Learning

Razieh Ghaderi, Miloud Bagaa, Mohsen Kandidayeni, Loïc Boulon, Université du Québec à Trois-Rivières; Joao Pedro Trovao, University of Usherbrooke

2 Energy Management for Electrified Tracked Vehicles via Improved Soft Actor-Critic Algorithm

Qicong Su, Beijing Institute of Technology

3 Implementing Neural Networks in Model Predictive Controller for Battery Thermal Management System of Electric Vehicles

KiHeon Nam, Changsun Ahn, Pusan National University

4 Machine Learning-Enhanced Aging-Aware Energy Management Strategy for Electric Vehicles

Yashar Farajpour, Hicham Chaoui, Carleton University; Souso Kelouwani, University du Québec à Trois-Rivières

5 Improving Efficiency of Farming Tractor Implement by Electrification

Federica Grossi, CNH; Mauro Cittadella, Luigi Biagiotti, University of Modena and Reggio Emilia; Ciro Mariniello, CNH

6 Super-Twisting Sliding Mode Control of a Fully Active Parallel Topology for Hybrid Electric Vehicles

Mohammed-Amine Mossadak, Mohammed 6 Polytechnic University of Benguerir; Nassim Noura, University of Québec at Trois Rivières; Ahmed Chebak, Green Tech Institute/University Mohammed VI Polytechnic of Benguerir

7 The Impact of Dynamic Deceleration Limit on Optimal Speed Planning for Fuel Cell Hybrid Electric Vehicles

Seyed Mohammad, Souso Kelouwani, Ali Akrem Amamou, Mohsen Kandidayeni, Mehdi Soleymani, Université du Québec à Trois-Rivières

Wednesday, 9 October 2024 17:30-18:30 Online

V7: Power system modelling

Chair: Nguyen Bao Huy

1 The impact of stack allocation on the performance of a hybrid multi-stack fuel cell system

Hamid Bakhshi Yamchi, Mohsen Kandidayeni, Souso Kelouwani, Loïc Boulon, Université du Québec à Trois-Rivières

2 Method for defining Hybrid Powertrain Architectures for Off-Highway Vehicles based on Power Flow Analysis

Federica Grossi, Fabio Scolari, Ciro Mariniello, Simone Ferrante, CNH

3 Integration of the fuel cell degradation in a 0D/1D vehicle system model in GT-SUITE

Julie Aubry, Georges El Hajj, Léo Gauthier, Symbio

4 Active Suppression of Low-Order Current Harmonics for 400kW Dual Three-Phase IPMSM Drives in Heavy-Duty EV Traction

Dongdong Chen, Tianjie Zou, Mengmeng Cui, Andrew Trentin, Dmytro Prystupa, Jacopo Riccio, Michele Degano, Christopher Gerada, University of Nottingham

5 Model-Predictive Direct Flux Vector Control for Synchronous Reluctance Machine

Mengmeng Cui, Jacopo Riccio, Dongdong Chen, Dmytro Prystupa, Michele Degano, University of Nottingham; Emrah Zerdali, Ege University; Marco Rivera, Christopher Gerada, University of Nottingham

Tours

VPPC delegates have the option to take part in one of two tours on the afternoon of Thursday, 10 October 2024. The Spy Museum tour is limited to 30 people, while the Library of Congress tour is limited to 75 people. You must add your name to the sign up sheet at the registration desk in order to take part in a tour.

Thursday, 10 October 2024 14:30

Bond In Motion at the International Spy Museum

International Spy Museum, 700 L'Enfant Plaza, SW Washington DC 20024

This official exhibition of iconic vehicles, all used on-screen by 007 and his many allies and adversaries, features 17 iconic pieces from the EON Productions Archive and the Ian Fleming Foundation. More details at <https://www.spymuseum.org/bond-in-motion/> Limited to 30 places.

Thursday, 10 October 2024 14:30

Library of Congress Tour

Thomas Jefferson Building, 10 First Street SE

This 45 minute Library of Congress Experience is a guided tour of one of the most beautiful buildings in Washington, DC. As you view the main reading room, a portion of Thomas Jefferson's original library, and the Great Hall, learn about the library's history and current operations, and how you can access the resources within its collection. Limited to 75 places.

All visitors must navigate "airport-like" security to enter the Thomas Jefferson Building. We encourage you to limit the number of personal belongings and bags you bring into our facilities as they will be subject to a thorough search. Limiting the items you bring will increase your speed through security checkpoints, helping us all maintain a safe social distance. There is a coat check station available on the Ground Floor of the Thomas Jefferson Building. Backpacks, bags, coats, strollers, and other personal items may be checked at no cost to the visitor.