International VDI Conference

Automotive CAE

November 9-10, 2021, Dusseldorf, Germany

- Applications and Perspectives of Machine Learning & AI
- Crash Simulation and Modeling
- Simulation of Electric Vehicles and Batteries
- Solutions for Aero & Fluid Dynamics

+ Out of the Box Presentation
+ Outcomes of the EU Horizon Project UPSCALE

Will take place on site or online

Meet international Experts from:

Applus⁺ IDIADA · AVL · BATEMO · engys · esi get it right · FCA · GM · Fraunhofer SCAI

HEXAGON · NAVASTO · NEURAL CONCEPT · Research Institute Future Transport and Cities | Coventry University · SIEMENS Ingenuity for life · TECOSIM

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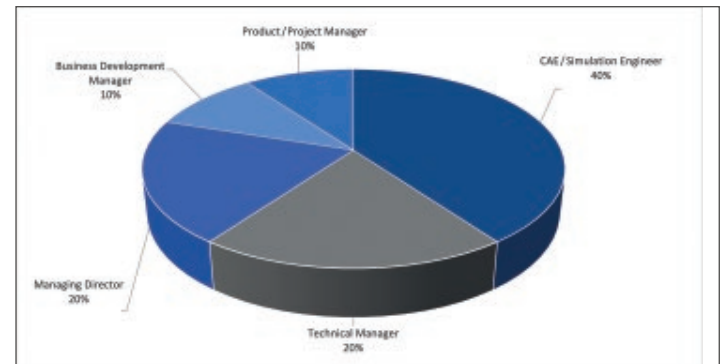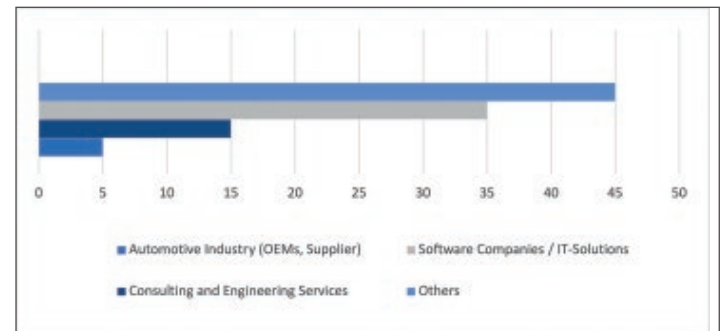www.vdi-international.com/ 01KO509021

About us

VDI

The Association of German Engineers (VDI) is one of the largest technical-scientific associations in Europe. Throughout the years, the VDI has successfully expanded its activities nationally and internationally to foster and impart knowledge about technology related issues. As a financially independent, politically unaffiliated and non-profit organization the VDI is recognized as the key representative of engineers both within the profession and in public.

Expected Participants according to Functions

Product / Project Manager
10%

Business Development Manager
10%

CAE / Simulation Engineer
40%

Managing Director
20%

Technical Manager
20%

Expected Participants according to Industries

0   5   10   15   20   25   30   35   40   45   50

■ Automotive Industry (OEMs, Supplier)   ■ Software Companies / IT-Solutions
■ Consulting and Engineering Services   ■ Others

Reasons to attend

Meet international experts from the industry and expand your professional network

Discuss current developments in the area of computer-aided engineering

Learn how the use of artificial intelligence and machine learning can drive vehicle development in the automotive industry forward

Benefit from practical reports related to specific industrial applications

Hear about results and findings from international projects

09:00 Registration & Welcome Coffee

09:45 Chair's Welcome and Opening Address

Dr. Lars Greve, Simulation Methods, CAE Engineer, Volkswagen Group Innovation, Germany

I. Machine Learning and Artificial Intelligence for CAE/ Simulation

10:00 Better Understanding of Simulation Models by Machine Learning
- Dealing with simulation models of high complexity
- Automatic evaluation of expert knowledge
- Machine learning meta models in multidisciplinary optimization

Opening Keynote

Dr. André Backes, Technical Manager, TECOSIM Technische Simulation GmbH, Germany

10:30 3D Deep-Learning to Shortcut High-Fidelity Simulation Pipelines
- Deep-Learning is unlocking the possibilities of CAE, and making high-fidelity simulations accessible to a vast audience of engineers
- Predictive models can learn from the data that engineers anyway produce every day
- Neural Concept Shape (NCS) is a software platform that lets engineering teams, and companies, implement these new workflows efficiently

Dr. Pierre Baque, CEO, Neural Concept, Switzerland

11:00 AI/ML/ROM Technology: A New Set of Tools for Automotive Engineering Design and Optimization
- Model Reduction techniques and reduced complexity optimization
- Learning from data – Application Use cases
- Learning from images– Application Use cases

Dr. Kambiz Kayvantash, Senior Director of AI/ML Applications for Design and Engineering, Hexagon Manufacturing Intelligence, France

11:30 Networking & Coffee Break

12:00 Machine Learning for Anomaly Detection in Simulations
- Semi-automatic workflow for anomaly detection
- Treating pairs of simulations as well as bundles of simulations
- Intuitive visualisation of analysis results

Prof. Dr. Jochen Garcke, Department Head, Fraunhofer SCAI, Germany

12:30 Physics-Constrained Deep Learning for Nonlinear Mechanics and Dynamics Simulations
- Solving physics-based equations by neural networks
- Reduction of neural networks complexity (low-rank and sparse approximations)
- Incorporation of experts knowledge in neural networks
- Reduction of training data set

Prof. Dr.-Ing. Bojana Rosic, Professor, University of Twente, The Netherlands

13:00 Lunch

II. Crash Modeling and Simulation

14:30 Efficient and Reliable Crash Simulation by Combining Physics-Based and Data-Driven Advanced Approaches
- Advanced model order reduction allows solving and then exploring the parametric space in real time
- Data (coming from simulations or experiments) and manipulated by using advanced physics-informed artificial intelligence techniques will enrich physics based models and speed-up analyses
- New technologies for speeding-up pre-designs will be consiered for addressing the structure as a composition of parametric components
- Passive security will be addressed

Prof. Dr. Francisco Chinesta, Professor at A&M Institute of Technology & Director of ESI group scientific department, France, Co-Author: Dr. Jean Louis Duval, Director of the Innovation at ESI Group, France

15:00 Interactive Crash Simulation
- Parametric solution models for efficient real-time crash simulation evaluation
- Point set registration methods for handling non-constant mesh topologies
- Model order reduction methods
- Advanced time series prediction via recurrent neural networks

Dr. Lars Greve, Simulation Methods, CAE Engineer, Volkswagen Group Innovation, Germany & Bram van de Weg, Simulation Methods, PhD Candidate, Volkswagen Group Innovation, Germany

15:30 Networking & Coffee Break

16:00 Application in UPSCALE H2020 Project of AI Enhanced Methods for the Prediction of Battery Short Circuit in Crash Scenarios
- Multi-scale problem for battery Crashworthiness simulation
- AI of cell short circuit and stiffness behavior
- First applications on battery pack loading case

Alexandre Dumon, Lightweight Pre-Certification, ESI Group, France

16:30 A Generic Mathematical Trauma Formulation to Assess Pedestrian Brain Injuries
- Deterministic method able to compute soft tissue injuries
- Method can compute AIS severity as well as trauma location within the brain

Out of the Box

- Method is generic and can be used in any Human Body Models

Dr Christophe Bastien, Associate Professor. Institute for Future Transport and Cities. Transport Safety and Simulations Research Group. Coventry University, UK, Co-Author: Prof Clive Neal-Sturgess & Dr Huw Davies

17:00 End Conference Day One

17:15 Get-together:
Relaxed and informal atmosphere for in-depth conversations

08:30   Registration & Welcome Coffee

09:15   Chair's Opening

III. Simulation of Electric Vehicles and Batteries

09:30   SmartLoad - New Methods to Increase Reliability of Highly Automated Electric Vehicle
- Highly Automated Driving
- End-to-end tool chain for verification and validation
- Connected test benches

Dr.-Ing. Christian Schyr, Project Manager, Advanced Solution Lab Karlsruhe, AVL Deutschland GmbH, Germany, Co-Author: Moritz Wäschle, M.Sc., IPEK - Institut für Produktentwicklung, Karlsruher Institut für Technologie, Germany

10:00   Keep it Cool! - A Thermal Simulation Study of the TESLA Model 3 Cell
- Get to know the TESLA Model 3 battery cell and see a high-precision, validated cell model
- Learn about a straight-forward strategy on how to model thermal cell interactions and boundary conditions in a module
- Understand what limits the fast-charging capability of the TESLA Model 3 cell
- See how different operation strategies influence the fast-charging performance of a module

Dr.-Ing. Michael Schönleber, CTO, Batemo GmbH, Germany, Co-Author: Dr.-Ing. Jan Richter, CEO, Batemo GmbH, Germany

10:30   Multi-Scale Modelling of Lithium-Ion Batteries: from Transport Phenomena to Virtual Safety Assessment
- Multi-scale and multi-domain battery modelling framework
- It enables more consistent virtual representation of the electrode topology
- It supports intertwined treatment of main and side reactions as well as of the heat generation phenomena
- Main and side reaction driven heat transfer cross-talk between the anode and the cathode
- Modelling the entire chain of mechanisms leading to outbreak of the thermal runaway

Prof. Dr. Tomaž Katrašnik , Faculty of Mechanical Engineering/ Professor and Head of Laboratory for Internal Combustion Engines and Electromobility, University of Ljubljana, Slovenia, Co-Authors: Igor Mele, PhD student & Dr. Klemen Zelič, Post-Doc, both: Faculty of Mechanical EngineeringUniversity of Ljubljana, Slovenia

11:00   Networking & Coffee Break

11:30   A Detailed Layer Model of the Li-Ion Pouch Cell – and Approaches to Reduce Calculation-Efforts
- FEM as a conditionally stable method in numerical models for crash-analysis
- SafeBattery project: One model that allows a layer-by-layer failure analysis and is still computationally efficient and robust. Second simplified model that can further reduce the computational effort significantly
- Difference of the proposed modelling techniques & results from characterization and validation experiments

Dipl.-Ing. Alexander Schmid, Research Associate, Vehicle Safety Institute, Graz University of Technology, Austria

IV. Aero & Fluid Dynamics

12:00   Interactive Design Space Exploration and How to Make it Happen
- Real-time CFD
- Interactive Design
- Reduced Order Modelling
- Adaptive sampling & Mesh morphing

Dr. Matthias Bauer, Managing director, NAVASTO GmbH, Germany, Co-Authors: Dr. Jakob Lohse & Dr. Anton Melnyk, both: Method Delevopment, NAVASTO GmbH, Germany

12:30   🍽 Lunch

13:45   UPSCALE - AI Accelerated Aerodynamic Development for E-Mobility
- Introduction of UPSCALE

Enric Aramburu, Fluid Engineering Product Manager, IDIADA, Spain
- Machine learning enhanced simulation tools

Eugene de Villiers, Managing Director, ENGYS, UK
- AI based design for aerodynamics

Luca Miretti, Virtual Analysis Engineer, Aerothermal & HVAC, CRF/Stellantis, Italy, (TBC)
- Multi-scale BEV aero-thermal design demonstrator

Guglielmo Minelli, Senior Analysis Engineer, Aerodynamics, Volvo Cars, Sweden

EU Project

15:00   Networking & Coffee Break

15:30   How Machine Learning Can Augment CFD Workflows and General Capabilities
- Foundational concepts and practices for using CFD data with machine learning
- Use cases for CFD-ML workflows as surrogates
- Using machine learning for CFD field predictions, generative design with autoencoders, and uncertainty

Justin Hodges, AI/ML Technical Specialist, Siemens Digital Industries Software, USA

16:00   Conference Chair's Closing Remarks

16:15   End of Conference

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VDI Wissensforum service package: The conference package includes the conference documents (online), beverages during breaks, lunch and the get-together on November 9, 2021.

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