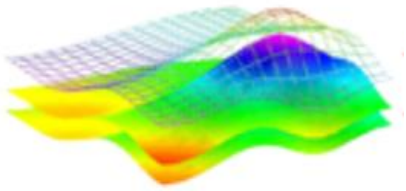
NME 2022



Conference Programme

Venue: Online via MS Teams

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200 JAAR UNIVERSITEIT GENT

5th International Conference on Numerical Modelling in Engineering (NME 2022) August 23-24, 2022, Online via MS Teams

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Prof. Magd Abdel Wahab
Ghent University, Belgium

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Dr. X. Zhuang, Leibniz Unversität Hannover, Germany
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Dr. Filippo Genco, Adolfo Ibáez University, USA
Dr. Denis Benasciutti, University of Ferrara, Italy
Dr. Y.L. Zhou to Xi'an Jiaotong University, China

KEYNOTE LECTURE

Tuesday 23 August 2022

Time: 10:15 am to 11:00 am
Keynote speaker: Professor Timon Rabczuk
Affiliation: Bauhaus Universität Weimar, Chair of Computational Mechanics, Germany
Title: Machine Learning based solutions of Partial Differential Equations

Abstract: Machine learning approaches have been extensively and successfully employed in various areas; most approaches in engineering have been based on data-driven contexts but there are many other applications including the solution of partial differential equations. Indeed, there is the potential that ML techniques will drastically accelerate the design to analysis time and the way modelling and simulation is performed.

The solution of PDEs based on Deep Neural Networks (DNNs) as an option for approximation is the focus of this presentation, where DNNs can be regarded as function approximation machines. There is great flexibility to define their structure and important advances in the architecture and the efficiency of the algorithms to implement them make DNNs a very interesting alternative to approximate the solution of a PDE. One distinguishing feature with regard to PDE approximations is that the smoothness of the solution is directly influenced by the smoothness of the activation functions. In general, higher-order derivatives can be computed easily by automated differentiation techniques built into many machine learning software frameworks such as TensorFlow or PyTorch. Another interesting feature is that the burden of meshing can be greatly reduced since the domain discretization can be (at least in part) obtained as part of the optimization procedure on the network parameters. Therefore, neural networks can be potentially well-suited for dealing with phenomena modeled by higher order PDEs, such as theory of Kirchhoff-Love plates and shells.

For solving a differential equation using ANNs, a loss function must be designed, which determines how well the given neural network representation satisfies the governing equations and boundary conditions. An alternative is an energy approach, in which the loss function is related to the potential energy of the system. The presentation will focus on applications that have an interest for Computational Solid Mechanics including linear elasticity, thin plate analysis, hyperelasticity, strain gradient elasticity and phase field models for fracture to name a few. The approach will be compared to classical approaches and analytical solutions. Also, a brief summary of differences, advantages and drawbacks to ‘classical’ methods such as FEM or IGA will be given along with challenges and potential future directions.

Biographical Sketch: Timon did his PhD at the University of Karlsruhe in January 2002. He worked as postdoctoral fellow at the Fraunhofer Institute in Freiburg, Northwestern University and the University of Munich before being appointed Senior Lecturer at the University of Canterbury, New Zealand. Since February 2009, he is professor at the Bauhaus University Weimar. Timon’s research interest include Computational Mechanics and Computational Materials Science. He develops computational methods for the solution of partial differential equations including IGA formulations and recently machine learning based approaches. He is also active in the area of computational materials design with focus on 2D materials and composites exploiting machine learning interatomic potentials.

CONFERENCE PROGRAM SUMMARY

Tuesday 23 August 2022

Time	Session
10:15 am to 11:00 am	Keynote lecture
11:00 am to 1:40 pm	NMME 1
1:40 pm to 2:00 pm	Break
2:00 pm to 5:20 pm	NMCE 1

Wednesday 24 August 2022

Time	Session
9:10 am to 11:10 am	NMME 2
11:10 am to 11:20 am	Break
11:20 am to 1:20 pm	NMME 3
1:20 pm to 1:30 pm	Conference closing address

NMCE: Numerical Modelling in Civil Engineering
NMME: Numerical Modelling in Mechanical and Materials Engineering

Tuesday 23 August 2022

10:00 am to 10:15 am	**Opening address**: **Prof. Magd Abdel Wahab**, Ghent University, Belgium
10:15 am to 11:00 am	**Keynote lecture**: Machine Learning based solutions of Partial Differential Equations, **Professor Timon Rabczuk**, Bauhaus Universität Weimar, Chair of Computational Mechanics, Germany
	Session NMME 1
	Chair: Dr Hoa Tran
11:00 am to 11:20 am	NME1425: Numerical simulation of shallow water equations by positivity-preserving and well-balanced central DG methods, **Maojun Li**
11:20 am to 11:40 am	NME1408: Updated Lagrangian Curvilinear Beam Element for 2D Large Displacement Analysis, **Christian Iandiorio**
11:40 am to 12:00 pm	NME1417: An effective approach to calibrate numerical modelling of wave interaction with thin perforated plate using data-driven method, **Bao-Loi Dang**
12:00 pm to 12:20 pm	NME1415: Numerical Modelling to Predict Microstructure and Hardness for A Low Carbon Steel WAAM Block by FEM Simulations, **Ling Yong**
12:20 pm to 12:40 pm	NME1409: Modelling and simulation of micro-electro-mechanical systems for energy harvesting of random mechanical vibrations, **Kailing Song**
12:40 pm to 1:00 pm	NME1385: A quasi-static computational model for fracture in multidomain structures with inclusions, **Roman Vodička**
1:00 pm to 1:20 pm	NME1390: Factor of Safety Variations of Residual Soil Slopes under Rainfall Loading, **Alfrendo Satyanaga**
1:40 pm to 2:00 pm	**Break**
	Session NMCE 1
	Chair: Dr Ling Yong
2:00 pm to 2:20 pm	NME1384: Numerical simulation of shear wave propagation through jointed rocks, **Resmi Sebastian**
2:20 pm to 2:40 pm	NME1396: Transient Analysis of Heat Transfer in a Trunk Under a Forest Fire Influence, **Eusébio Zeferino Encarnação da Conceição**
2:40 pm to 3:00 pm	NME1407: Biogeography-Based Optimization of reinforced concrete structures considering aspects such as static soil-structure interaction, **Ivan Negrin**
3:00 pm to 3:20 pm	NME1423: Revisiting a Model that Describes the Process of the Vocal Oscillation During Phonation, **Maria Filomena Teodoro**
3:20 pm to 3:40 pm	NME1419: PCE-Assisted Bayesian Inference of Sensitivity Parameter for Dams, **YiFei Li**
3:40 pm to 4:00 pm	NME1414: A nonlinear approach to investigate the effect of sheet pile toe's embedded length on the lateral displacement derived from the soft clay-deep excavation, **Thanh Sang To**
4:00 pm to 4:20 pm	NME1391: A Hybrid Optimization Algorithm for Structural Health Monitoring, **Hoa Tran**
4:20 pm to 4:40 pm	NME1424: Effect of the incident wave angle on the hydrodynamic performance of a land-based OWC device, **Ayrton Alfonso Medina Rodriguez**
4:40 pm to 5:00 pm	NME1413: The efficiency of algorithm optimizations for uncertain material parameters identification based on finite element model updating, **Minh Hoang-Le**
5:00 pm to 5:20 pm	NME1386: Prediction of bearing capacity of strip foundations on slopes using finite element and genetic programming techniques, **Arindam Dey**

Wednesday 24 August 2022	
	Session NMME 2
	Chair: Dr Long Viet Ho
09:10 am to 09:30 am	NME1429: Mechanical Design and Optimization of Large-Scale Parabolic Trough Solar Collectors for Industrial Applications, Ossama Mokhiamar, Mohammed Siddeq, **Osama Elsamni**
09:30 am to 09:50 am	NME1383: Study on the consistency of a phase field modelling method and the determination of crack width, **Feiyang Wang**
09:50 am to 10:10 am	NME1381: Optimization of ship energy efficiency considering navigational environment and safety, **Min Hyok Jon**
10:10 am to 10:30 am	NME1392: Advanced CFD numerical modelling of ladle furnace under electromagnetic stirring, **Monika Zielińska**
10:30 am to 10:50 am	NME1434: Finite element model for FF considering CRS relaxation under high temperature, **Kaifa Fan**
10:50 am to 11:10 am	NME1433: Finite Element Modeling of Ultrasonic Nanocrystalline Surface Modification Process of Alloy 718, **Chao Li**
11:10 am to 11:20 am	**Break**
	Session NMME 3
	Chair: Prof. Min Hyok Jon
11:20 am to 11:40 am	NME1397: Design of an Auditorium Equipped with an Attached Solar Greenhouse Used to Improve Indoor Environmental Conditions, **Eusébio Zeferino Encarnação da Conceição**
11:40 am to 12:00 pm	NME1432: Investigate the effect of heterogeneity of material on fretting fatigue problem with numerical modeling, **Can Wang**
12:00 pm to 12:20 pm	NME1387: Application of Gorilla troops' social intelligence in damage detection for a girder bridge, **Long Viet Ho**
12:20 pm to 12:40 pm	NME1418: UTC Bridge- Investigation of a lab-scale bridge model for damage assessment techniques, **Ngoc Lan Nguyen**
12:40 pm to 1:00 pm	NME1428: Shear stress and temperature investigation of Inconel 718 during the backward flow forming process using the finite element method, **Acar Can Kocabicak**
1:00 pm to 1:20 pm	NME1437: Contour design and Simulation of Abrasive blasting nozzle, **Tuong Long Nguyen**
1:20 pm to 1:30 pm	**Conference closing address – Prof. M Abdel Wahab**

NME 2022

INSTRUCTIONS TO SPEAKERS

- Your online oral presentation should not exceed **15 minutes**. If your presentation stretches over **15 minutes**, you must end your presentation to ensure strict adherence to the programme.
- Your presentation will be followed by a Question and Answer (Q/A) session not exceeding **5 minutes**.
- Please upload a pre-registered video presentation in your submission system. This pre-registered presentation will be used as backup and for voting for the best oral presentation award.
- All uploaded pre-registered videos will be available on the conference website: http://www.academicconf.com/video?confname=nme2022