34th Annual Conference & Exhibition on
NON DESTRUCTIVE EVALUATION & ENABLING TECHNOLOGIES

DEC 12-14, 2024 • CHENNAI

PRE-CONFERENCE TUTORIALS

Date **11th DECEMBER 2024**
Time **8:30 am onwards**

2 PARALLEL SESSIONS

VENUE
Hotel Ramada Plaza by Wyndham Chennai,
36, Sardar Patel Rd, Little Mount, Guindy, Chennai,
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PEAK NDT

PRE-CONFERENCE TUTORIAL (1)

11th December 2024

Indo-German Pre-conference Tutorial on
Advanced NDT & E for Civil Infrastructure

Several infrastructural assets (bridges, offshore structures, dams, power /petrochemical plants, refineries etc.) are steadily aging and deteriorating, and many of them are beyond their design life. Due to shortage of resources to replace them, it is now necessary to extend their design life without compromising the underlying human risk or incurring unnecessary financial burden. Further, in spite of extremely rigorous and stringent time-based maintenance regimes, and the most advanced analysis based design principles followed in the critical/life-line structures, catastrophic failures continue to take place claiming invaluable lives and critical engineering assets. In the last decade and half, there has been an overwhelming interest throughout the engineering communities, to address this issue. Apart from preventing catastrophic failure, a robust NDT & E strategy can provide several other benefits such as significant reduction in the downtime and enhancement of structural integrity, and increase in operating life of the structures. This Indo-German PCT will provide the audience an overview of the advanced and emerging NDT & E technologies, with a special emphasis on real-world challenges being posed by different types of critical structures. The relevant subject experts have been invited to provide the overview of the efficient technologies and also share their experience in addressing the challenges in in-service structures. The primary focus of the present Indo-German PCT to make the practitioners being acquainted with the technologies, their strength and limitations, and the prospects in future. The PCT will also provide a unique opportunity to the participants to learn from the domain experts from both India and Germany, and also interact one to one.

The broad topics covered in this Indo-German PCT include:
* Emerging Non-destructive technologies for inspection and monitoring of Civil infrastructure
* Innovations in instrumentation for NDT&E
* Ultrasonic 3D Tomography
* Distributed sensing for SHM of civil structures
* NDT of underwater structures
* Qualification and Certification – NDT for Structures

Course Directors (1)

P.D. Dr. Ernst Niederleithinger

Ernst Niederleithinger is a geophysicist. He graduated from the TU Berlin, received his doctorate from the University of Potsdam and habilitated at the RWTH Aachen. After 11 years in an engineering firm, he joined BAM, the Federal Institute for Materials Research and Testing, in 2001. Since then, he has been involved in national and international research projects dealing with various aspects of non-destructive testing in civil engineering, mostly with sonic or ultrasonic methods. He is currently head of the division 8.2 'Nondestructive Testing Methods for Civil Engineering', an interdisciplinary group of about 30 scientists, engineers, technicians, and students. He is a member of various committees and boards dealing with standards and regulations for nondestructive testing in civil engineering. He is also a private lecturer in engineering geophysics at RWTH Aachen University and has been a guest at the Colorado School of Mines, the University of Ljubljana, the University of Technology Sydney, VTT in Espoo and the University of Glasgow.

Prof. Dr. Ing. Saptarshi Sasmal

SaptarshiSasmal is a Chief Scientist and Head of Special and Multi-functional Structures Laboratory (SMSL) at CSIR-SERC, Chennai, India. He is also serving as Professor in Academy of Scientific and Innovative Research (AcSIR), an Institution of National Importance. He received his Under-Graduate degree (with distinction) and Post-Graduate degree (with Gold Medal for securing top-most rank) from Jadavpur University, Kolkata. He carried out his doctoral studies from University of Stuttgart, Germany and was awarded the PhD degree with the academic honour of "Summa cum laude". He is elected as the Fellow of Indian National Academy of Engineering (INAE). He is the Associate Editor of ASME J. Nondestructive Evaluation, Trans. of INAE, J Structural Engineering (Madras). His research interests include Nonlinear Ultrasonics, Acoustic Emission, Structural Health Monitoring, wave propagation in heterogeneous medium, Nano/Micro mechanics,Smart and Multi-functional Materials.

Indo-German Pre-conference Tutorial on Advanced NDT& E for Civil Infrastructure

Current use of NDT-CE for infrastructure inspection and monitoring in Germany

NDT Qualification and Certification in Germany

New trends in the ultrasonic pulse-echo tomography of concrete structures

SPEAKER

Dr. Ernst Niederleithinger

Head of Non-destructive Testing Methods for

Civil Engineering

Federal Institute for Materials Research and Testing (BAM), Berlin, Germany

SPEAKER

Dr. Alexander Bachmann

Leiter der DPZ / Head of Certification Body

German Society for Non-Destructive Testing e.V. (DGZfP), Berlin, Germany

SPEAKER

Dr. Andrey Bulavinov

CEO - ACS Solutions GmbH Saarbrücken, Germany

Indo-German Pre-conference Tutorial on Advanced NDT& E for Civil Infrastructure

Distributed sensing for SHM of civil structures

SPEAKER

Prof. Pradipta Banerji

Professor
IIT Bombay

Former Director,
IIT Roorkee

Ultrasonic 3D Tomography for concrete structures - prospects and issues

SPEAKER

Mr. Senthilkumaran M S

Senior Manager
Instrumentation,
L&T Construction,
Chennai, India

NDE of underwater structures using seismic tomography and parallel seismic

SPEAKER

Dr. Sanjay Rana

Managing Director,
Parsan Overseas (P) Limited

PRE-CONFERENCE TUTORIAL ② 2

11th December 2024

'Data Engineering & Phased Arrays'

This tutorial is aimed at NDE Professionals working at the interface of experimental technologies such as phased arrays and data engineering, encompassing aspects of generation, storage, retrieval and manipulation of sensory information benefiting analytics and prognostics. Practitioners working on advanced NDE techniques who wish to deepen skills in data management will benefit from this tutorial, which delves deep into automation, coded excitations, sensory information fusion, machine learning, array ultrasonics and generative AI.

David Gilbert

David Gilbert, BSc (Hons) CEng FInstNDT MIET, Chief Executive Officer
David joined the British Institute of Nondestructive Testing (BINDT) in 1993 as Editor of the Institute's journal. He became the Institute's CEO on 1 January 2018. As head of the Secretariat, he is responsible for all aspects of the running of the Secretariat, the efficient conduct of the Institute and the cost-effective provision of services to the members, as well as medium- and long-term planning for the Institute. As Chief Executive Officer and Company Secretary he is responsible for ensuring that the Institute meets its statutory obligations. David Gilbert has been a professional technical editor for more than 25 years. He graduated from the University of Leeds with a degree in Electrical and Electronic Engineering and, after a spell in industry, he went on to become Editor of Vector, Southern Africa's largest electrical engineering journal. He joined BINDT in 1993, working his way up to become the CEO. He is a Chartered Engineer and Member of the British Institute of Non-Destructive Testing and the Institute of Engineering & Technology.

Prof Prabhu Rajagopal

Trained at IIT Madras (BTech & DD MTech) and Imperial College London (PhD, Postdoc), Prof. Prabhu Rajagopal has expertise in Nondestructive Evaluation (NDE) and Structural Health Monitoring (SHM), co-leading the Center for NDE. With over 30 funded projects, 200+ technical articles and 33 granted IPs, he is widely recognised for his pioneering work on remote inspection technologies for digital transformation in the industrial (energy and mobility) and social (water, health and sanitation) contexts. He is recipient of India's most prestigious award for mid-career scientists, the Shanti Swarup Bhatnagar prize under the category of Technology and Innovation (2024). Prof Prabhu's research is collaborative, cross-disciplinary and international, with ongoing engagements with industry and academic institutions across the world; particularly the UK and Kenya. At IIT Madras he is also a founding member of the Centers of Excellence in Quantum Information Communication & Computing , Cybersecurity, Trust & Reliability, and Space Manufacturing, as well as the one on Research on Startups & Risk Financing.

Machine learning for NDE

This tutorial focuses on the application of machine learning to automation of NDE. We will initially explore what the motivation is for automation of NDE. We will then go on to look at the major challenges for machine learning in NDE. The lecture will then go through a breakdown of the problem types into two broad classes, those with accurate defect data and those with limited defect data, through case studies relevant to those specific issues. The first being an imaging example with a lot of real data including damage. We will go through how machine learning may be employed and then how it may be confirmed that it is bringing meaningful benefits. The second case study will explore a case with no defect data and sentencing must be physics based, as seen in many safety critical applications. The final case study will explore how systems with insufficient defect data may be developed to automate detection. Finally we will present a series of axioms to support the application of machine learning techniques. automation of NDE data processing.
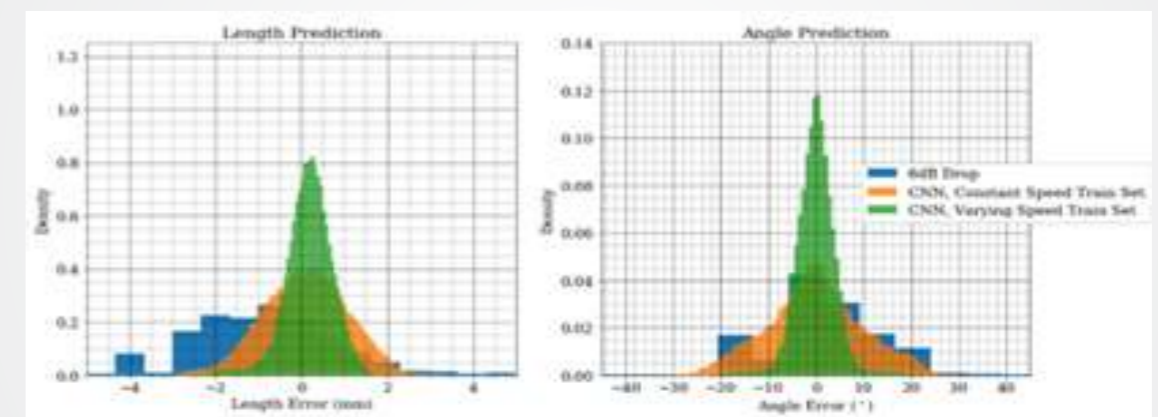
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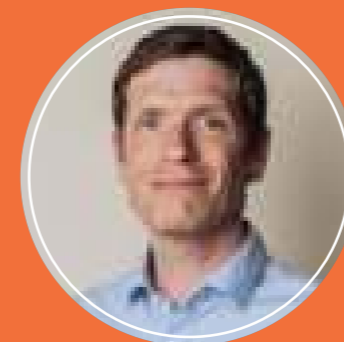
Dr AJ Croxford
University of Bristol
A.J.Croxford@bristol.ac.uk

Anthony Croxford is Professor of Ultrasonics and Dynamics at the University of Bristol and has published over 60 refereed journal papers, over 80 conference papers and has 7 granted patents. His expertise is in the use of sensor arrays for defect detection and characterisation, structural health monitoring, nonlinear ultrasonics and the application of data science and machine learning to NDE. He is Programme Director for the Future Innovation in NDE Centre for Doctoral Training (FIND CDT) Career highlights include: over 10 EPSRC and InnovateUK grants; Prestigious UK government EPSRC Research Fellowship (2015-20); Turing Fellow (2021-22) editorial board member for Ultrasonics and Journal of NDE. He is also director and co-founder (2015) of spin-out company Inductosense Ltd. that is commercialising permanently-installed, inductively-coupled ultrasonic sensors.

Advancing NDE and SHM technology from the bottom up

This talk will present a range of research projects that are trying to push the boundaries of what is conventionally possible by exploring a particular type of measurement technology. In particular it will focus on 3 different techniques: 1) Coded Excitation, 2) Fusion of two measurements (use of additional information) to overcome environmental and operation effects and 3) selective excitation of a particular guided wave mode to improve sensitivity to degradation. The This talk will present a range of research projects that are trying to push the boundaries of what is conventionally possible by exploring a particular type of measurement technology. In particular it will focus on 3 different techniques: 1) Coded Excitation, 2) Fusion of two measurements (use of additional information) to overcome environmental and operation effects and 3) selective excitation of a particular guided wave mode to improve sensitivity to degradation. The physical limitations of conventional techniques will be explained, along with how the new techniques try to overcome these existing limitations, and examples will be demonstrated of how the techniques can be practically implemented and assessed. Further required work will be discussed so that these methodologies can be used more widely.

SPEAKER

Frederic Cegla is Reader in the Department of Mechanical Engineering at Imperial College London. Dr Cegla leads many of the activities of the NDE research group at Imperial, focused on experimental measurements, monitoring of defects and structural properties of engineering components. He holds a prestigious EPSRC funded fellowship on non-destructive monitoring of engineering infrastructure and leads Imperial's input into the £36million ORCA hub for robotics and AI in harsh environments. He was co-founder of Permasense Ltd which is today a leading provider of ultrasonic corrosion monitoring systems to the oil and gas industry across the world.

Dr Frederic Cegla
Imperial College London
f.cegla@imperial.ac.uk

Improving imaging of challenging components through access to low-level programming of cutting-edge ultrasonic instruments

command language, including examples of directly programming the LTPA (Phased array instrument), demonstrating the effect of changing the gain and voltage with the command language on a sample test piece, examples of the number of elements with Simulus videos, and examples of focused and unfocused indications in a test piece. Additionally, we will illustrate ArrayGen commands being sent to the instrument, provide LabView examples of programming the instrument, and show Matlab examples illustrating TFM/PCI. We will also highlight examples of research undertaken at the University of Strathclyde and demonstrate operating the instrument with commercial software such as Utex Scientific's Inspectionware.
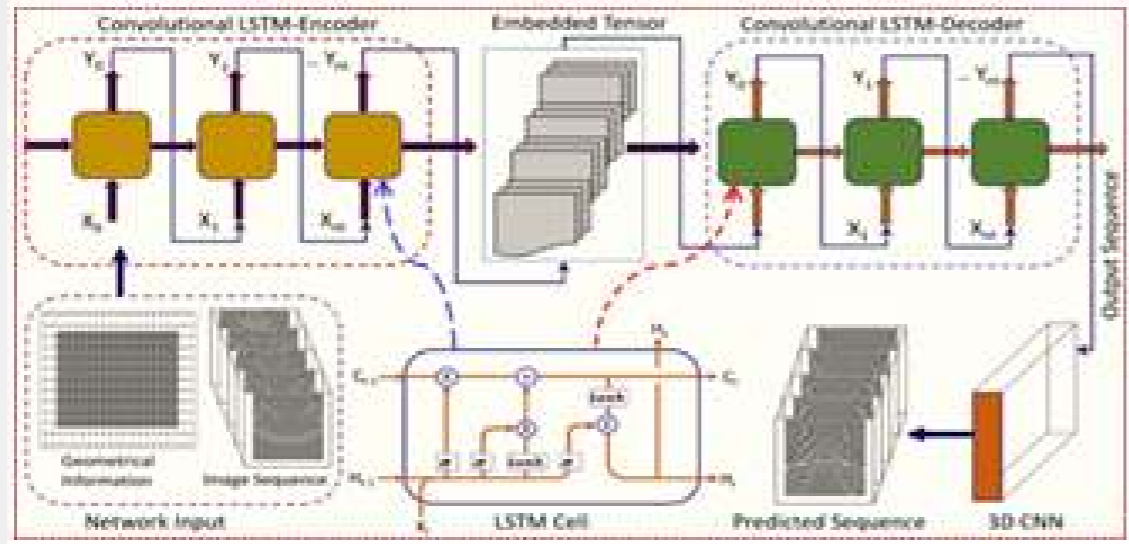
SPEAKER

Sumana is an NDT Research Specialist at PEAK NDT Ltd, UK. Her Ph.D. research focused on Total Focusing Method (TFM) based phased array ultrasonic techniques for inspecting thick and attenuating components. Her thesis aimed to enhance sensitivity and resolution in advanced phased array ultrasonic methods and to develop new methodologies such as angle beam Full Matrix Capture-Total Focusing Method (FMC-TFM) and Angle Beam Virtual Source (ABVS) FMC-TFM for thick and highly attenuating materials. Additionally, Sumana worked as a Knowledge Transfer Partnership (KTP) Associate at the University of Strathclyde and PEAK NDT Ltd. This project contributed to the development of new focal law generators for optimal ultrasonic wave transmission and reception in current and future advanced ultrasonic inspection techniques, integrating with PEAK NDT Ltd hardware. The project also involved creating next-generation ultrasonic imaging software tools for increased commercial deployment, delivering PAUT inspections with high defect detection and sizing accuracy, and enabling real-time inspections of planar or complex structures.

Dr. Sumana
simon.parke@peakndt.com
sumana@peakndt.com

Development of ML-based Automated Defect Recognition and Visualization Methods

This talk will provide a broad overview of AI techniques for simulating elastic waves. The necessary fundamental Machine Learning theory and practical use cases will be covered in the first half of the talk, followed by the use of AI-based surrogate data for large-scale dataset generation will be discussed, with relevance to phased array ultrasonics

SPEAKER

Dr. Thulsiram Gantala

IIT Hyderabad
thulsiramg@mae.iith.ac.in

Thulsiram Gantala is an Assistant Professor in the Mechanical & Aerospace Engineering Department at IIT, Hyderabad. His PhD studies on AI models for virtual source phased array ultrasound imaging. The thesis studies include the development of a novel phased array ultrasonic imaging technique, a Generative AI model for generating synthetic phased array imaging, and simulating ultrasonic wave propagation in solids with defects, which have won wide acclaim, including the Best Thesis Award in Data Science at IIT Madras. He also received a Prime Minister fellowship for doctoral research during his PhD studies. He has contributed to developing AI techniques in both classical and quantum forms. His research interests include Nondestructive Evaluation, Materials Characterization, Wave Propagation, Ultrasonic Imaging, and Applied Machine Learning.

Registration Details

Category	Registration Fees*
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PCT + Conference (ISNT Member)	₹ 20,060
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Indian Society for Non-destructive Testing (ISNT)
Modules 60 & 61, 3rd floor, Garment Complex, SIDCO
Industrial Estate, Guindy, Chennai 600 032, Tamil Nadu, India
044-2250 0412 / 4203 8175
info@isntnde.in

Conference Manager

Mr. Praveen Kumar Kokne
Elbon Conference & Events Pvt.Ltd.
+91 88262 66168
info@isntnde.in