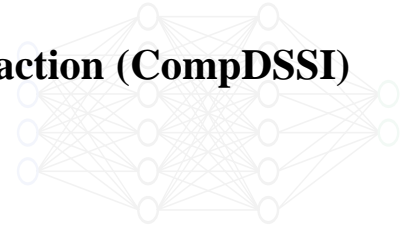# International Workshop
Computational Dynamic Soil-Structure Interaction (CompDSSI)
11-13 September 2024

Motivation and goal

Advances in the field of soil-structure interaction are impacting design, retrofitting and protection of civil engineering structures against natural hazards. CompDSSI is an in-person International Workshop devoted to new-generation numerical approaches for the dynamic analysis of soil-structure systems of strong practical relevance, investigating critical issues and high-fidelity methods applicable from local to regional scale.

A meeting point to share knowledge, in which researchers and designers of Structural & Geotechnical Engineering will promote solutions for a safer and more efficient urban fabric. The co-presence of Academia and Industry is a key element of CompDSSI, for better orienting new lines of research and implementing them in real cases.

CompDSSI takes place over two and a half days. It is composed of five sessions in which high impact subjects are largely discussed in a purposeful and heterogeneous environment. Each session is made up of a Keynote Lecture and oral presentations.

Organising committee

Dr. Davide Noè Gorini
Sapienza University of Rome, Italy

Prof. Pedro Arduino
University of Washington, US

Dr. Domenico Gallese
ARUP, UK

Scientific committee

Prof. Anastasios Sextos (University of Bristol, UK), **Prof. Shideh Dashti** (University of Colorado at Boulder, US), **Prof. Guido Camata** (University of Pescara G. d'Annunzio, Italy), **Prof. Christopher McGann** (University of Canterbury, New Zealand), **Prof. Francesca Dezi** (University of Camerino, Italy), **Prof. Nikos Gerolymos** (National Technical University of Athens, Greece), **Dr. Federico Pisanò** (Norwegian Geotechnical Institute, US), **Prof. Ertugrul Taciroglu** (University of California, Los Angeles, US), **Prof. Claudio Tamagnini** (University of Perugia, Italy), **Prof. José A. Abell** (University of the Andes, Chile), **Prof. Stefania Sica** (University of Sannio, Italy), **Prof. James Ricles** (University of Lehigh, US), **Prof. Domniki Asimaki** (California Institute of Technology, US), **Prof. Paolo Franchin** (Sapienza University of Rome, Italy), **Dr. Yu-Wei Hwang** (National Yang Ming Chiao Tung University, Taiwan), **Dr. Massimo Petracca** (ASDEA Software Technology, Italy), **Prof. Stavroula Kontoe** (University of Patras, Greece), **Prof. Youssef M. A. Hashash** (University of Illinois Urbana-Champaign, US), **Prof. Boris Jeremic** (University of California, Davis, US), **Dr. Domenico Gallese** (ARUP, UK), **Prof. Pedro Arduino** (University of Washington, US), **Dr. Davide Noè Gorini** (Sapienza University of Rome, Italy)
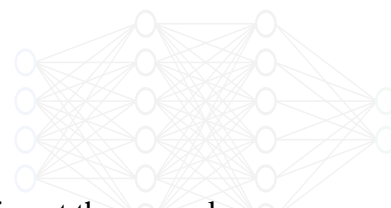
Keynote Speakers

Session 1 - Large soil-structure systems (Part 1)

Dr. David McCallen

Lawrence Berkeley National Laboratory, United States

"Applications of emerging GPU-accelerated computing at the exascale – exploration of fault-to-structure simulations with regional-scale 3D physics-based models"
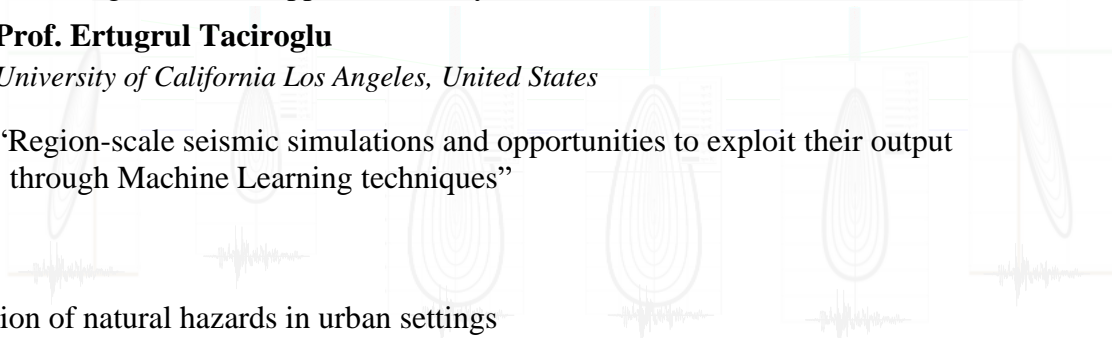
Session 2 - Artificial Intelligence-based approaches to dynamic soil-structure interaction

Prof. Ertugrul Taciroglu

University of California Los Angeles, United States

"Region-scale seismic simulations and opportunities to exploit their output through Machine Learning techniques"

Session 3 - Mitigation of natural hazards in urban settings

Prof. Shideh Dashti

University of Colorado at Boulder, United States

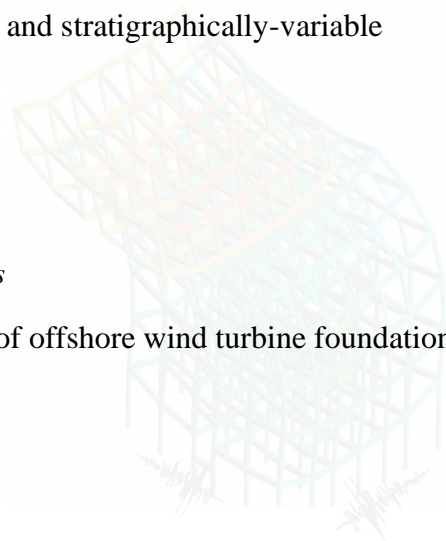"Mitigation of seismic liquefaction in urban and stratigraphically-variable environments"

Session 4 - Large soil-structure systems (Part 2)

Dr. Federico Pisanò

Norwegian Geotechnical Institute, United States

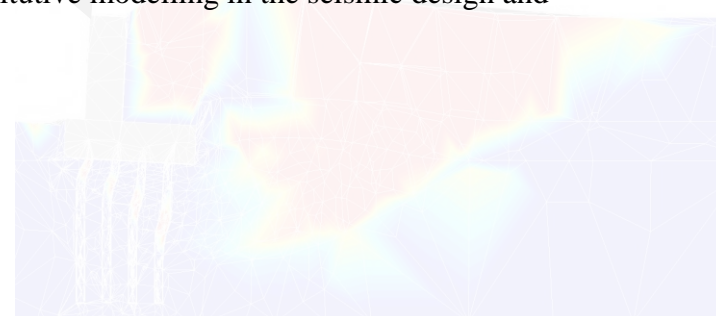"Trends and gaps in the numerical analysis of offshore wind turbine foundations"
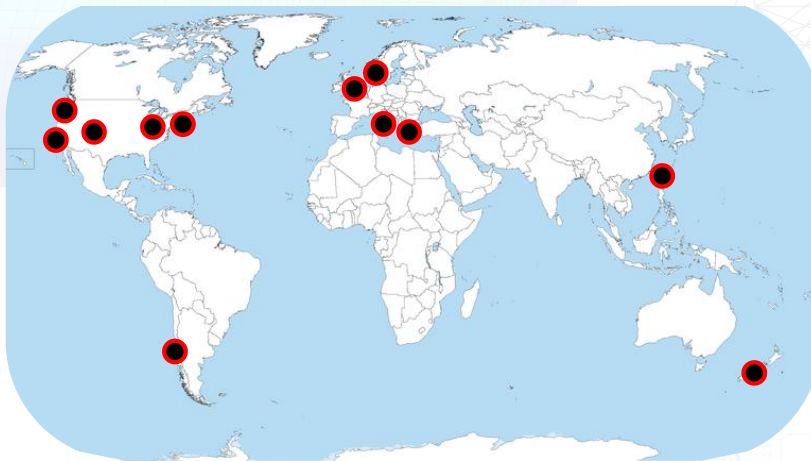
Session 5 - Underground structures

Prof. Daniela Boldini

Sapienza University of Rome, Italy

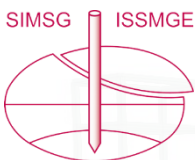"The role of numerical and constitutive modelling in the seismic design and retrofitting of tunnels"

Geographical affiliations (red circles) of the Scientific Committee and Keynote Speakers

With the support of

SIMSG ⌷ ISSMGE

- Technical Committee 203 *Earthquake Geotechnical Engineering and Associated Problems* of the International Society for Soil Mechanics and Geotechnical Engineering ([website](#))

- Technical Committee 204 *Geotechnical Aspects of Underground Construction in Soft Ground* of the International Society for Soil Mechanics and Geotechnical Engineering ([website](#))

- Technical Committee 209 *Offshore Geotechnics* of the International Society for Soil Mechanics and Geotechnical Engineering ([website](#))

- Technical Committee 309 *Machine Learning and Big Data* of the International Society for Soil Mechanics and Geotechnical Engineering ([website](#))

ASDEA SOFTWARE

- ASDEA Software Technology ([website](#))

NHERI SimCenter
Center for Computational Modeling & Simulation

- NHERI SimCenter – Center for Computation Modeling & Simulation ([website](#))

AGI Associazione Geotecnica Italiana

- Associazione Geotecnica Italiana ([website](#))

2024 International Workshop CompDSSI - website: https://compdssi.altervista.org/

- DESIGNSAFE-CI (website)

- Associazione Nazionale Italiana di Ingegneria Sismica (website)

- NHERI Lehigh Facility (website)

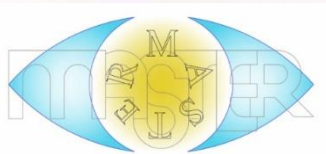- Advanced Technology for Large Structural Systems Engineering Research Center (website)

- Event organised in collaboration with Ordine degli Ingegneri della Provincia di Perugia (website)

- MASTER Association – Materials and Structures Testing and Research (website)

Venue and accomodation

CompDSSI will be held at Hotel Domus Pacis (https://domuspacis.it/), which has a privileged location in the heart of Umbria (centre of Italy). It is located 900 m from Assisi railway station S. Maria degli Angeli and 3 kilometres from the famous historical town of Assisi, which can be reached by shuttle bus or via a 30-minute walk.

Hotel Domus Pacis provides full board service at € 88 or 73 per day for the single or shared room, respectively. People interested in reserving a room at Hotel Domus Pacis are kindly invited communicate it to compdssi2024@gmail.com, with a copy to davideno.gorini@uniroma1.it (please, consider that rooms are subject to availability).

An additional fee will be required to people not staying at Hotel Domus Pacis to take part in the lunches/dinners (€ 25 per meal) during the Workshop's Days.

How to get to Assisi

By plane

The closest major airports to Assisi are: Umbria International Airport S. Francesco d'Assisi (Perugia), Peretola Airport (Florence), Fiumicino Airport Leonardo da Vinci (Rome), Galileo Galilei Airport (Pisa). All these airports are roughly the same distance away, but the transport links from Rome and Florence (via train) will be the easiest.

By train

Assisi railway station is located in S. Maria degli Angeli, from which Hotel Domus Pacis can be straightforwardly reached on foot or via a local bus service (line C) running from outside the railway station.

Ticket Office Hours: 1:00 p.m. to 7:35 p.m.

Website of the Italian Railways (FS): http://www.trenitalia.com/

By car

Coming from the North

a) Highway 14 – Autostrada Adriatica: exit at Cesena (150 km from Assisi) and continue to Perugia (E45) until Assisi exit.

b) Highway Autostrada del Sole A1: Exit Valdichiana until you reach Perugia, continue towards Cesena (E45) until Assisi exit.

Coming from the South

a) Highway 14 – Autostrada Adriatica: exit Civitanova Marche towards Foligno – Perugia until the Assisi exit.

b) Highway Autostrada del Sole A1: exit Orte, continue on the E45 towards Perugia – Cesena until the Assisi exit.

By bus

Bus service: Bus Italia, website http://www.fsbusitalia.it, office phone +39.075 9637637, e-mail clienti.perugia@fsbusitalia.it

Registration and fees

Registration to the Workshop is mandatory through this *form*. The payment of the fees can be made after the acceptance of registration through bank transfer (bank coordinates are communicated upon acceptance). Fees include Workshop attendance, coffee breaks and the submission of one paper.

Workshop fees		
payment	Delegate	Student
by June 30, 2024	350 euros	280 euros
from July 1 on	410 euros	330 euros

Programme overview

Day 1 - Wednesday, September 11

14.00-15.00   **Registration**

14.45-15.15   **Opening**

Session 1 – Large soil-structure systems (Part 1)

The goal is to explore new trends in the analysis of civil engineering structures profoundly interacting with soil under dynamic loading. The focus is on advanced modelling of large soil-structure systems as well as on novel approaches for practical purposes. Studies promoting the connection of practice-oriented analysis tools to advanced numerical frameworks for structural analysis under different/combined natural hazards are also discussed. The scale of interest is from the one of the single infrastructure to regional assessment.

15.15-16.00   **Keynote lecture:** David McCallen, Lawrence Berkeley National Laboratory (30 mins + 15 mins for Q&A)

16.00-16.40   Presentation of the contributions (2 lectures, 15 mins + 5 mins for Q&A each)

16.40-17.25   **Coffee break**

17.25-18.05   Presentation of the contributions (2 lectures, 15 mins + 5 mins for Q&A each)

Day 2 - Thursday, September 12

Session 2 – Artificial Intelligence-based approaches to dynamic soil-structure interaction

Artificial Intelligence is becoming increasingly popular as a powerful approach to face soil-structure interaction problems and the relative uncertainties. The use of AI through different frameworks to manage big data and make systematic predictions of dynamic soil-structure interaction is the key point of this session. Also, emerging methods on how mechanistic modelling can be combined with AI-based approaches is part of the discussion.

9.15-10.00   **Keynote lecture:** Ertugrul Taciroglu, University of California Los Angeles (30 mins + 15 mins for Q&A)

10.00-10.40   Presentation of the contributions (2 lectures, 15 mins + 5 mins for Q&A each)

10.40-11.25   **Coffee break**

Session 3 – Large soil-structure systems (Part 2)

11.25-12.45   Presentation of the contributions (4 lectures, 15 mins + 5 mins for Q&A each)

12.45-14.00   **Lunch**

14.00-14.45   **Keynote lecture:** Federico Pisanò, Norwegian Geotechnical Institute (30 mins + 15 mins for Q&A)

14.45-15.45   Presentation of the contributions (3 lectures, 15 mins + 5 mins for Q&A each)

15.45-16.30   **Coffee break**

16.30-17.50   Presentation of the contributions (4 lectures, 15 mins + 5 mins for Q&A each)

20.00   **Gala Dinner**

Day 3 - Friday, September 13

Session 4 – Mitigation of natural hazards in urban settings

In this session, soil-structure interaction is regarded as an opportunity to design safer and more sustainable structures against natural hazards. Room is dedicated to the conception, numerical assessment and validation of protection solutions for foundation systems or having a close interaction with soil. Studies highlighting the practical implications of mitigation techniques are discussed, as well as procedures for the optimized design of hazard resistant systems.

9.30-10.15	**Keynote lecture:** Shideh Dashti, University of Colorado at Boulder (30 mins + 15 mins for Q&A)
10.15-11.15	Presentation of the contributions (3 lectures, 15 mins + 5 mins for Q&A each)
11.15-12.00	**Coffee break**
12.00-13.00	Presentation of the contributions (3 lectures, 15 mins + 5 mins for Q&A each)
13.00-14.15	**Lunch**

Session 5 – Underground structures

Tunnels, buried pipelines and underground stations are some of the structural typologies that are discussed, as systems undergoing an increasing development for their efficient use of the underground space. This session aims to investigate the dynamic performance of these structural typologies, the interaction mechanisms occurring between underground and above-ground structures under natural hazards, and practice-oriented numerical procedures.

14.15-15.00	**Keynote lecture:** Daniela Boldini, Sapienza University of Rome (30 mins + 15 mins for Q&A)
15.00-16.20	Presentation of the contributions (4 lectures, 15 mins + 5 mins for Q&A each)
16.20	**Closing**

Detailed programme

Affiliations relating to the first Authors.

Day 1 - Wednesday, September 11

Session 1 – Large soil-structure systems (Part 1)

15.15-16.00   **Keynote lecture:** David McCallen (Lawrence Berkeley National Laboratory)
Applications of emerging GPU-accelerated computing at the exascale – exploration of fault-to-structure simulations with regional-scale 3D physics-based models

16.00-16.20   *Leveraging structure-soil-structure interaction for enhanced seismic resilience in nuclear power plants* (Kanellopoulos and Stojadinovic, ETH Zurich)

16.20-16.40   *Advancing seismic risk assessment: coupled 3D large-scale simulations for a more accurate structural response* (Korres et al., Electricité de France)

16.40-17.25   **Coffee break**

17.25-17.45   *Analysis of soil-abutment interaction in a frame bridge* (Martini et al., Università Politecnica delle Marche)

17.45-18.05   *Workflow for high-fidelity dynamic analysis of structures with pile foundation* (Pakzad and Arduino, University of Washington)

Day 2 - Thursday, September 12

Session 2 – Artificial Intelligence-based approaches to dynamic soil-structure interaction

9.15-10.00   **Keynote lecture:** Ertugrul Taciroglu (University of California Los Angeles)
Region-scale seismic simulations and opportunities to exploit their output through Machine Learning techniques

10.00-10.20   *Neural network-aided multi-directional Real-Time Hybrid Simulations of soil-structure systems: the case of a multi-story MRF-DBF frame* (Malik et al., University of Lehigh)

10.20-10.40   *Data-driven offshore monopile design and safety assessment* (Kato, Shenzhen University)

10.40-11.25   **Coffee break**

Session 3 – Large soil-structure systems (Part 2)

11.25-11.45   *3D modelling of masonry tower soil-structure interaction in OpenSees using mixed implicit-explicit material integration* (Akan et al., University School for Advanced Studies IUSS Pavia)

11.45-12.05   *Dynamic soil-structure interaction for an enhanced vision of civil engineering structures* (Gorini D.N., Sapienza University of Rome)

12.05-12.25   *Nonlinear 3D soil-structure dynamic interaction modelling for railway tracks* (Varandas Ferreira J.N., Universidade NOVA de Lisboa)

12.25-12.45   *Assessment of soil constitutive models for predicting seismic response of sheet pile walls: a LEAP-2022 project Study* (Pakzad and Arduino, University of Washington)

12.45-14.00   **Lunch**

14.00-14.45	**Keynote lecture:** Federico Pisanò (Norwegian Geotechnical Institute) *Trends and gaps in the numerical analysis of offshore wind turbine foundations*
14.45-15.05	*Modeling soil-foundation response of offshore wind turbines under realistic dynamic loading using the Thermodynamic Inertial Macroelement* (Ricles et al., Lehigh University)
15.05-15.25	*Towards practice-oriented procedures for analysing monopile-supported offshore wind turbines* (Gallese et al., ARUP)
15.25-15.45	*Seismic response of large shallow buried water reservoirs - Centrifuge testing and numerical modeling* (Hashash et al., University of Illinois Urbana-Champaign)
15.45-16.30	**Coffee break**
16.30-16.50	*Use of the capacity curve in the seismic analysis of geotechnical systems* (Gallese et al., ARUP)
16.50-17.10	*Kinematic interaction considering the interplay between neighboring foundations* (Zeolla et al., University of Sannio)
17.10-17.30	*Soil structure interaction solution in liquefiable soils: direct method vs substructure method* (Batuhan Kocak et al., Istanbul Technical University)
17.30-17.50	*FLAC2D simulation of a bulkhead wall in liquefiable soil subject to earthquake excitation* (Goswami et al., Langan Engineering and Environmental Services)
20.00	**Gala Dinner**

Day 3 - Friday, September 13

Session 4 – Mitigation of natural hazards in urban settings	
9.30-10.15	**Keynote lecture:** Shideh Dashti (University of Colorado at Boulder) *Mitigation of seismic liquefaction in urban and stratigraphically-variable environments*
10.15-10.35	*Assessment of the attenuation of 3D basin ground motions by a rigid inclusion system* (Lopez-Caballero and Soto Moncada, Université Paris-Saclay)
10.35-10.55	*Numerical analyses for the assessment of the isolation effects by a gravel-rubber mixture layer at the base of a building* (Abate et al., University of Catania)
10.55-11.15	*Soil-structure interaction as a means for optimising hazard resistant solutions: the case of Tuned Mass Dampers* (Gorini et al., Sapienza University of Rome)
11.15-12.00	**Coffee break**
12.00-12.20	*Modelling liquefaction effects – From lateral spreading to soil-structure interaction* (Ghofrani and Arduino, Google)
12.20-12.40	*Different strategies to account for soil-structure interaction on the seismic response of a pre-stressed concrete bridge* (Ambrosino and Sica, University of Sannio)
12.40-13.00	*Assessing and increasing resilience of soil-structure systems for seismic loads* (Jeremic, University of California, Davis)
13.00-14.15	**Lunch**

Session 5 – Underground structures	
14.15-15.00	**Keynote lecture:** Daniela Boldini (Sapienza University of Rome) *The role of numerical and constitutive modelling in the seismic design and retrofitting of tunnels*

15.00-15.20 *State of practice for seismic structure-soil-structure interaction analysis in California* (Ellison et al., ARUP)

15.20-15.40 *Evaluation of the seismic behavior of the underground facilities hosting CMS experiment at the Large Hadron Collider at CERN using Real − ESSI Simulator* (Carmando et al., University of Napoli Federico II)

15.40-16.00 *Simplified approach for assessing the risk of buried pipelines threatened by displacements induced by groundwater fluctuations* (Tawalo et al., Scuola Superiore Meridionale)

16.00-16.20 *Nonlinear static analysis for the seismic design of shallow tunnels* (Lombardi et al., Sapienza University of Rome)

16.20 **Closing**

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