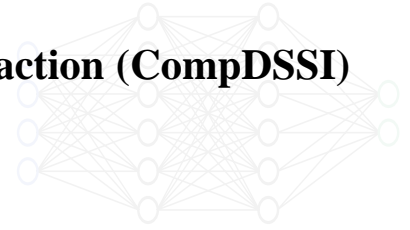


# International Workshop Computational Dynamic Soil-Structure Interaction (CompDSSI) 11-13 September 2024



## 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

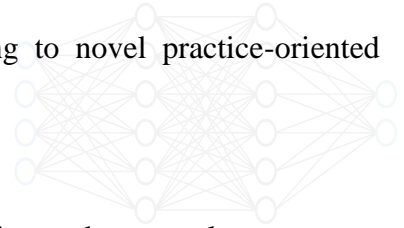
**Session 1** - Large soil-structure systems: from advanced modelling to novel practice-oriented approaches



**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”



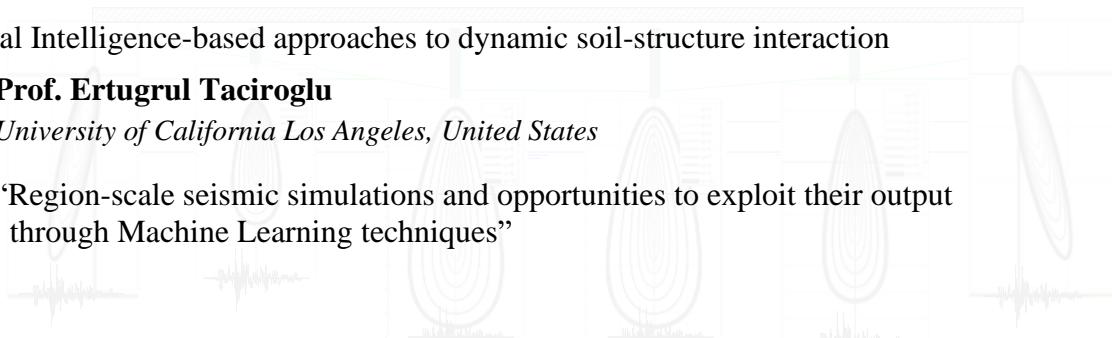
**Session 2** - Artificial Intelligence-based approaches to dynamic soil-structure interaction



**Prof. Ertugrul Taciroglu**

*University of California Los Angeles, United States*

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



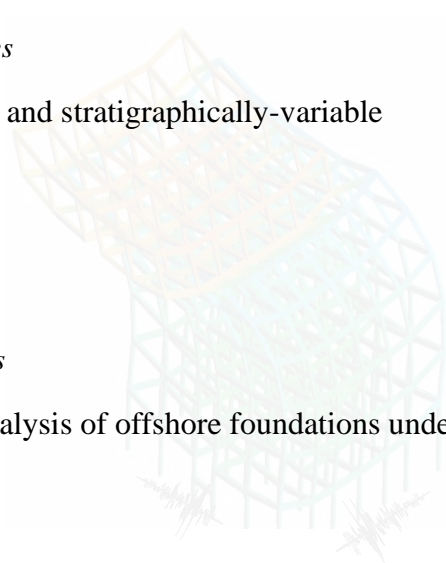
**Session 3** - Mitigation of natural hazards in urban settings and optimised design of protection solutions



**Prof. Shideh Dashti**

*University of Colorado at Boulder, United States*

“Mitigation of seismic liquefaction in urban and stratigraphically-variable environments”



**Session 4** - Offshore infrastructures under complex loading



**Dr. Federico Pisanò**

*Norwegian Geotechnical Institute, United States*

“Recent trends and gaps in the numerical analysis of offshore foundations under environmental loads”

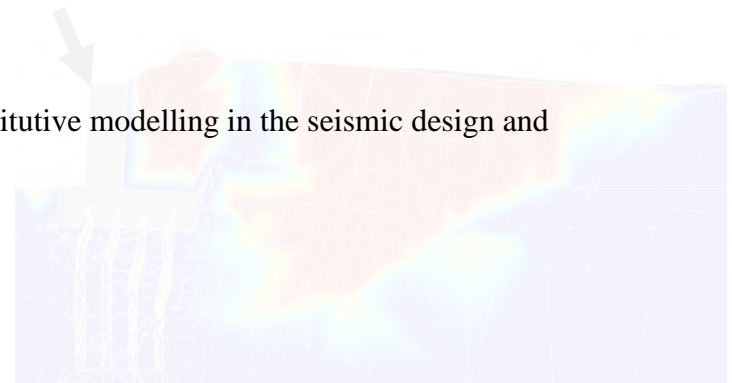
**Session 5** - Underground structures, and their interaction with the urban fabric



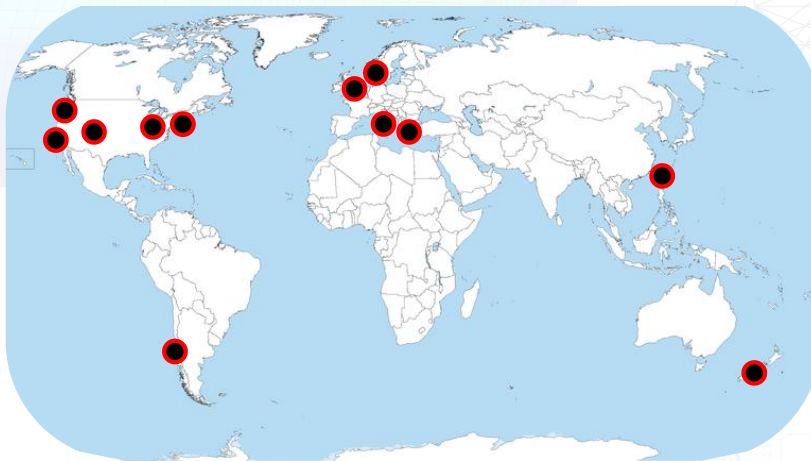
**Prof. Daniela Boldini**

*Sapienza University of Rome, Italy*

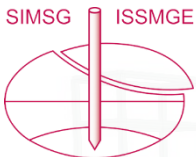
“The role of numerical and constitutive modelling in the seismic design and retrofitting of tunnels”



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



### With the support of



- 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 Technology ([website](#))



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



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



- DESIGNSAFE-CI ([website](#))



- Associazione Nazionale Italiana di Ingegneria Sismica ([website](#))



- NHERI Lehigh Facility ([website](#))



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



ORDINE DEGLI  
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FONDAZIONE  
Ordine Ingegneri Perugia

- Event organised in collaboration with Ordine degli Ingegneri della Provincia di Perugia ([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](mailto:compdssi2024@gmail.com), with a copy to [davideno.gorini@uniroma1.it](mailto: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](mailto: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 and, however, within the period April 15-July 31 through bank transfer (bank coordinates are communicated upon acceptance). Fees include Workshop attendance, coffee breaks and the submission of one paper.

### **Workshop fees**

<b>payment</b>	<b>Delegate</b>	<b>Student</b>
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 (3 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, from machine learning to neural networks, 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**

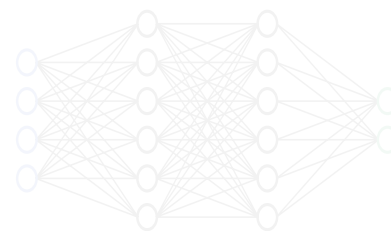
14.00-14.45 **Keynote lecture:** Federico Pisanò, Norwegian Geotechnical Institute (30 mins + 15 mins for Q&A)

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**
- 12.00-13.20 Presentation of the contributions (4 lectures, 15 mins + 5 mins for Q&A each)
- 13.20-14.30 **Lunch**

### **Session 5 – Underground structures**

*Shallow tunnels, buried pipelines, underground stations and parking 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, as well as practice-oriented numerical procedures coping with these problems and their application to real cases.*

- 14.30-15.15 **Keynote lecture:** Daniela Boldini, Sapienza University of Rome (30 mins + 15 mins for Q&A)
- 15.15-16.15 Presentation of the contributions (3 lectures, 15 mins + 5 mins for Q&A each)
- 16.15-16.45 **Coffee break**
- 16.45-17.45 Presentation of the contributions (3 lectures, 15 mins + 5 mins for Q&A each)
- 17.45-18.00 **Closing**

## Detailed programme

### Day 1 - Wednesday, September 11

Affiliations relating to the first Authors.

#### 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 *Dynamic soil-structure interaction for an enhanced vision of civil engineering structures* (Gorini, Sapienza University of Rome)

### 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 *Soil structure interaction solution in liquefiable Soils: direct method vs substructure method* (Batuhan Kocak et al., Istanbul Technical University)
- 11.45-12.05 *Modelling liquefaction effects – From lateral spreading to soil-structure interaction* (Ghofrani and Arduino, Google)
- 12.05-12.25 *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)
- 12.25-12.45 *Numerical validation of an integrated approach to design foundation and structure* (Lusi et al., University of Naples Federico II)
- 12.45-14.00 **Lunch**
- 14.00-14.45 **Keynote lecture:** Federico Pisanò (Norwegian Geotechnical Institute)  
*Recent trends and gaps in the numerical analysis of offshore foundations under environmental loads*



- 14.45-15.05 *Modeling soil-foundation response of offshore wind turbines under realistic dynamic loading using the Thermodynamic Inertial Macroelement* (Gorini et al., Sapienza University of Rome)
- 15.05-15.25 *Towards practice-oriented procedures for analysing monopile-supported offshore wind turbines* (Gallese et al., ARUP)
- 15.25-15.45 *Workflow for high-fidelity dynamic analysis of structures with pile foundation* (Pakzad and Arduino, University of Washington)
- 15.45-16.30 **Coffee break**
- 16.30-16.50 *A new seismic design method accounting for nonlinear soil-foundation-superstructure interaction* (Gerolymos and Chatzakis, National Technical University of Athens)
- 16.50-17.10 *Use of the capacity curve in the seismic analysis of geotechnical systems* (Gallese et al., ARUP)
- 17.10-17.30 *FLAC2D simulation of a bulkhead wall in liquefiable soil subject to earthquake excitation* (Goswami et al., Langan Engineering and Environmental Services)
- 17.30-17.50 *Assessment of soil constitutive models for predicting seismic response of sheet pile walls: a LEAP-2022 project Study* (Pakzad and Arduino, University of Washington)
- 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 *Assessing and increasing resilience of soil-structure systems for seismic loads* (Jeremic, University of California, Davis)
- 12.20-12.40 *Kinematic interaction considering the interplay between neighboring foundations* (Zeolla et al., University of Sannio)
- 12.40-13.00 *The impact of ground motion characteristics on mitigation effectiveness for structures on interlayered liquefiable deposits* (Bessette et al., University of Colorado Boulder)
- 13.00-13.20 *Different strategies to account for soil-structure interaction on the seismic response of a pre-stressed concrete bridge* (Ambrosino and Sica, University of Sannio)
- 13.20-14.30 **Lunch**

## **Session 5 – Underground structures**

- 14.30-15.15 **Keynote lecture:** Daniela Boldini (Sapienza University of Rome)  
*The role of numerical and constitutive modelling in the seismic design and retrofitting of tunnels*
- 15.15-15.35 *Seismic response of large shallow buried water reservoirs - Centrifuge testing and numerical modeling* (Hashash et al., University of Illinois Urbana-Champaign)
- 15.35-15.55 *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)
- 15.55-16.15 *State of practice for seismic structure-soil-structure interaction analysis in California* (Ellison et al., ARUP)
- 16.15-16.45 **Coffee break**
- 16.45-17.05 *Simplified approach for assessing the risk of buried pipelines threatened by displacements induced by groundwater fluctuations* (Tawalo et al., Scuola Superiore Meridionale)
- 17.05-17.25 *Nonlinear static analysis for the seismic design of shallow tunnels* (Lombardi et al., Sapienza University of Rome)
- 17.25-17.45 *Analysis model for the connection of two existing tunnels with new bypasses* (Stellati et al., TEAM Engineering SpA)
- 17.45-18.00 **Closing**

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