Minfei Liang, Ph.D.

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WORK

Postdoctoral Researcher, University of Oxford **Oxford, United Kingdom** 10/2024-Present

Department of Physics/ Department of Engineering

- Supervisor: Sonia Contera.
- Research Topic：Zero-Emission Building Materials Enhanced by Artificial Intelligence (Funded by EU Horizon Program)

Postdoctoral Researcher, Delft University of Technology **Delft, The Netherlands** 04/2024-10/2024

Department of Materials, Mechanics, Management & Design, Faculty of Civil Engineering and Geosciences.

- Supervisor: Erik Schlangen, Branko Savija.
- Research Topic：Generative Machine Learning for Synthesizing Microstructure of Cementitious Materials

EDUCATION

PhD Candidate, Delft University of Technology **Delft, The Netherlands** 10/2020-04/2024

Department of Materials, Mechanics, Management & Design, Faculty of Civil Engineering and Geosciences.

- Supervisor: Erik Schlangen, Branko Savija.
- Thesis: Stress evolution in early-age concrete considering autogenous deformation and creep: New experimental and modelling techniques.

MSc Student, Southwest Jiaotong University **Chengdu, China** 09/2017-06/2020

Department of Tunnelling and Underground Engineering, School of Civil Engineering.

- Supervisor: Chuan He, Kun Feng.
- Thesis: Experimental and numerical study on water permeability of tunnel lining concrete.
- Excellent Master Thesis (2020).

BSc Student, Southwest Jiaotong University **Chengdu, China** 09/2013-06/2017

School of Civil Engineering.

RESEARCH EXPERIENCE

Microscale testing of cementitious materials 10/2020-05/2024

- Conducted nano-indentation tests to probe the micro-mechanical properties of cement paste.
- Performed XRD/ ESEM/ MIP for quantifying the hydration products amount and characterizing the microstructural effects on volumetric deformation.

Macroscale testing of the early-age cracking risk 10/2020-05/2024

- Tested the stress evolution using the temperature stress testing machine (TSTM), which was collaborated with the Royal BAM Group for the project of **Fehmarnbelt Tunnel**.
- Developed the Mini-TSTM which enhances testing efficiency.

Multiscale modelling of the early-age cracking risk 10/2020-05/2024

- Developed the finite element method model for simulating the stress evolution in concrete using an exponential algorithm based on rate-type creep law.
- Developed a micro-scale lattice fracture model for simulating creep behavior of cement paste.
- Simulated the stress evolution in early-age concrete under realistic boundary conditions and general mixture parameters using a thermo-chemo-mechanical model.

Machine learning for enhancing the modelling efficiency and accuracy 10/2020-05/2024

- Developed interpretable machine learning models for predicting creep behavior of concrete, which was the **Top-Cited Paper** at *Cement and Concrete Composites* Journal.
- Employed the convolutional neural networks as the predictors of the microscale mechanical properties of cement paste based on microstructure input.
- Constructed an active-learning model to efficient predict the stress evolution in early-age concrete.
- Developed generative machine learning models to generate realistic cementitious microstructures.

ACADEMIC SERVICE

- **Guest Editor** of the special issue “Creep, shrinkage, and durability in cementitious systems” of the journal Construction and Building Materials. 11/2023-06/2024
- **Organizer** of the 12th International Conference of Concrete Creep (Concreep 12) 11/2023-06/2024

- **Reviewer** of the impactful journals Cement and Concrete Composites/ Construction and Building Materials/ Additive Manufacturing/ Journal of Building Engineering/ Developments in Built Environments/ Structural Concrete/ Scientific Reports. 10/2022-05/2024

TEACHING EXPERIENCE

Teaching Assistant at TU Delft – Supervision of Master Thesis on Early-Age Cracking Risk in Reinforced Concrete Components 04/2024-10/2025

*Supervised the **Master Thesis** (by F.N.A. van der Hoeven) using the Mini-TSTM setup developed in my PhD.*

- **Thesis Topic Development & Structuring**: Guided the student in refining the research question, formulating objectives, and structuring the overall framework to ensure coherence and scientific rigor.
- **Experimental Training & Mentorship**: Provided hands-on supervision in laboratory work, including experimental planning, setup operation, data collection, and analysis, ensuring methodological accuracy and research efficiency.
- **Regular Academic Guidance**: Held weekly meetings to discuss research progress, address challenges, and refine methodologies.
- **Thesis Writing & Review**: Assisted in structuring the thesis, improving clarity in writing, and providing detailed feedback on multiple drafts to enhance scientific rigor and coherence.
- **Final Evaluation & Presentation Preparation**: Helped the student prepare for the thesis defense by conducting mock presentations and providing constructive feedback.

Teaching Assistant at TU Delft – Advanced Training in the master course Construction Materials Research CIEM 1210 01/2023-06/2023

*Delivered specialized training in courses of **MSc** in Construction Materials with Prof. Erik Schlangen.*

- **Workshop Leadership**: Designed and conducted a hands-on workshop demonstrating how to build multi-field coupled models to simulate residual stress evolution and early-age cracking risks in concrete structures.
- **Theoretical and Practical Training**: Explained the underlying theories of early-age concrete behavior, numerical modeling approaches, and key simulation techniques.
- **One-on-One Student Support**: Provided personalized guidance to students on their individual modeling challenges, helping them develop and refine their simulation frameworks.
- **Coursework Evaluation & Oral Examination**: Participated as an oral examiner, designing course assessment questions, conducting student evaluations, and grading their performance based on technical accuracy and problem-solving skills.

CONFERENCE

- Presented the work “Thermo-Chemo-Mechanical model and active ensemble learning for early-age stress evolution of concrete” at ICSBM（International Conference of Sustainable Building Materials） 07/2022 Marselle, France
- Presented the work “Bayesian inverse modelling of early-age stress evolution in high-volume GGBFS concrete” at SSCS 2022（Numerical Modelling Strategies for Sustainable Concrete Structures） 10/2023 Wuhan, China

PUBLICATION

[1]. **M Liang**, K Feng, S He, Y Gan, Y Zhang, E Schlangen, B Savija. (2025). Generation of cement paste microstructure using machine learning models. Developments in the Built Environment.

[2]. **M Liang**, G Di Luzio, E Schlangen, B Savija. (2024). Experimentally informed modeling of the early-age stress evolution in cementitious materials using exponential conversion from creep to relaxation. Computer-Aided Civil and Infrastructure Engineering.

[3]. **M Liang**, C Liu, X Liang, Z Chang, E Schlangen, B Savija. (2024). Effects of temperature on autogenous deformation and early-age stress evolution in cement pastes with low water to cement ratio. Construction and Building Materials.

[4]. **M Liang**, J Xie, S He, Y Chen, E Schlangen, B Šavija. (2024). Autogenous deformation-induced stress evolution in cementitious materials considering viscoelastic properties: A review of experiments and models. Developments in the Built Environment.

[5]. **M Liang**, Z Chang, P Holthuizen, Y Chen, S He, E Schlangen, B Šavija. (2024) Efficiently Assessing the Early-Age Cracking Risk of Cementitious Materials with A Mini Temperature Stress Testing Machine. Cement and Concrete Composites.

[6]. **M Liang**, Y Zhang, S He, Y Chen, E Schlangen, B Šavija. (2023). On the chemo-mechanical evolution process of high-volume slag cement paste. Construction and Building Materials.

[7]. **M Liang**, S He, Y Gan, H Zhang, Z Chang, E Schlangen, B Šavija. (2023). Predicting micromechanical properties of cement paste from backscattered electron (BSE) images by computer vision. Materials & Design.

[8]. **M Liang**, Z Chang, Y Zhang, H Cheng, S He, E Schlangen, B Šavija (2023). Autogenous deformation induced-stress evolution in high-volume GGBFS concrete: Macro-scale behavior and micro-scale origin. Construction and Building Materials.
[9]. **M Liang**, Z Chang, S He, Y Chen, Y Gan, E Schlangen, B Šavija. (2022). Predicting early-age stress evolution in restrained concrete by thermo‐chemo‐mechanical model and active ensemble learning. Computer-Aided Civil and Infrastructure Engineering.
[10]. **M Liang**, Y Gan, Z Chang, Z Wan, Schlangen, E., Šavija, B. (2022). Microstructure-informed deep convolutional neural network for predicting short-term creep modulus of cement paste. Cement and Concrete Research.
[11]. **M Liang**, Z Chang, Z Wan, Y Gan, E Schlangen, B Šavija. (2022). Interpretable Ensemble-Machine-Learning Models for Predicting Creep Behavior of Concrete, Cement and Concrete Composites. (**Top-Cited Paper**)
[12]. **M Liang**, Z Li, S He, Z Chang, Y Gan, E Schlangen, B Šavija. (2022). Stress evolution in restrained GGBFS concrete due to autogenous deformation: Bayesian optimization of aging creep, Construction and Building Materials.
[13]. **M Liang**, K Feng, C He, Y Li, L An, W Guo. (2020). A meso-scale model toward concrete water permeability regarding aggregate permeability, Construction and Building Materials.
[14]. H Cheng, **M Liang***. (2024). Real-time monitoring of static elastic modulus evolution in hardening concrete through longitudinal-wave velocity changes retrieved by the stretching technique, Construction and Building Materials.
[15]. Z Chang, **M Liang***, Y Xu, Z Wan, E Schlangen, B Šavija. (2023). Early-age creep of 3D printable mortar: Experiments and analytical modelling, Cement and Concrete Composites.
[16]. Y Chen, **M Liang***, Y Zhang, Z Li, B Šavija, E Schlangen, O Çopuroğlu. (2023) Can superabsorbent polymers be used as rheology modifiers for cementitious materials in the context of 3D concrete printing? Construction and Building Materials.
[17]. Z Chang, **M Liang***, Y Xu, E Schlangen, B Šavija. (2022). 3D concrete printing: Lattice modeling of structural failure considering damage and deformed geometry. Cement and Concrete Composites.
[18]. Y Zhou, **M Liang***, X Yue. （2024）. Deep residual learning for acoustic emission source localization in A steel-concrete composite slab, Construction and Building Materials.
[19]. Y Gan, **M Liang***, E Schlangen, K van Breugel, B Šavija. (2024). Two scale models for fracture behaviours of cementitious materials subjected to static and cyclic loadings, Construction and Building Materials.
[20]. Y Gan, H Zhang, **M Liang***, Y Zhang, E Schlangen, K van Breugel, B Šavija. (2022). Flexural strength and fatigue properties of interfacial transition zone at the microscale. Cement and Concrete Composites.
[21]. Z Chang, H Zhang, **M Liang***, E Schlangen, B Šavija. (2022). Numerical simulation of elastic buckling in 3D concrete printing using the lattice model with geometric nonlinearity. Automation in Construction.
[22]. Z Shi, **M Liang**, Q Su, T Kanstad, L Ferrara. (2024). Tensile behavior of rebar-reinforced coarse aggregate ultra-high performance concrete (R-CA-UHPC) members: Experiments and restrained shrinkage creep effect. Cement and Concrete Composites
[23]. Z Chang, **M Liang**, S He, E Schlangen, B Šavija. (2023). Lattice modelling of early-age creep of 3D printed segments with the consideration of stress history. Materials & Design.
[24]. Z Chang, **M Liang**, Y Chen, E Schlangen, B Šavija. (2023). Does early age creep influence buildability of 3D printed concrete? Insights from numerical simulations. Additive Manufacturing.
[25]. Y Zhang, **M Liang**, Y Gan, O Çopuroğlu. (2022). Effect of MgO content on the quantitative role of hydrotalcite-like phase in a cement-slag system during carbonation. Cement and Concrete Composites
[26]. Y Zhang, **M Liang**, Y Gan, O Çopuroğlu. (2022). Micro-mechanical properties of slag rim formed in cement–slag system evaluated by nanoindentation combined with SEM. Materials.
[27]. C Liu, Y Zhang, **M Liang**, Z Li, G Ye. (2024) Underwater carbonation of alkali-activated slag pastes. Construction and Building Materials.
[28]. S He, Y Chen, **M Liang**, EH Yang, E Schlangen. (2023). Distribution of porosity surrounding a microfiber in cement paste. Cement and Concrete Composites
[29]. Y Gan, H Zhang, **M Liang**, E Schlangen, K van Breugel, B Šavija. (2021) A numerical study of fatigue of hardened cement paste at the microscale. International Journal of Fatigue.
[30]. J Xie, Y Xu, Z Meng, **M Liang**, Z Wan, B Šavija. (2024). Peanut shaped auxetic cementitious cellular composite (ACCC). Construction and Building Materials.
[31]. K Li, Z Yang, DNicolaides, **M Liang**, B Briseghella, G Marano, Yong Zhang. (2024). Autogenous shrinkage and sustainability assessment of alkali-activated slag incorporating steel slag. Construction and Building Materials.

[32]. Z Wan, Y Xu, Z Chang, **M Liang**, B Šavija. (2024). Automatic enhancement of vascular configuration for self-healing concrete through reinforcement learning approach. Construction and Building Materials.
[33]. S He, S Mustafa, Z Chang, **M Liang**, E Schlangen, M Luković. (2023). Ultra-thin Strain Hardening Cementitious Composite (SHCC) layer in reinforced concrete cover zone for crack width control. Engineering Structures.
[34]. Y Chen, Y Zhang, S He, **M Liang**, Y Zhang, E Schlangen, O Çopuroğlu. (2023) Rheology control of limestone calcined clay cement pastes by modifying the content of fine-grained metakaolin. Journal of Sustainable Cement-Based Materials.
[35]. Z Li, X Liang, C Liu, **M Liang**, K van Breugel, G Ye. (2022) Thermal deformation and stress of alkali-activated slag concrete under semi-adiabatic condition: Experiments and simulations. Cement and Concrete Research.
[36]. R Zhang, Q Meng, Q Shui, W He, K Chen, **M Liang**, Z Sun. (2019). Cyclic response of RC composite bridge columns with precast PP-ECC jackets in the region of plastic hinges. Composite Structures

Potential Referee

1. Prof. Sonia Contera, Sonia.AntoranzContera@physics.ox.ac.uk
2. Prof. Erik Schlangen, Erik.Schlangen@tudelft.nl.
3. Dr. Branko Šavija, B.Savija@tudelft.nl
4. Prof. Guang Ye, G.Ye@tudelft.nl