Filippos Filippitzis

Dept. of Mechanical Engineering, University of Western Macedonia, Greece

Email: filip_os@outlook.com | Webpage: filip-os.github.io

Current Position

Feb. 2021 – Present — University of Western Macedonia, Kozani, Greece.
Lecturer and Postdoctoral fellow. Department of Mechanical Engineering.

Education

Sept. 2016 – Dec. 2020 — Ph.D., Department of Mechanical and Civil Engineering, California Institute of Technology, USA (GPA 4.1)

Sept. 2016 – June 2018 — Master of Science in Mechanical Engineering, California Institute of Technology, USA (GPA 4.1)

Sept. 2011 – July 2016 — Diploma in Mechanical Engineering, University of Thessaly, Greece (GPA 9.23/10), Ranked 1st.

Research Interests

Structural Health Monitoring; Digital Twin Technology; Bayesian Learning; Finite Element Modeling and Updating; Structural Dynamics; Earthquake Ground Motion Response and Data Processing;

Ph.D. Research Work

My Ph.D. research is focused in the area of structural health monitoring. As a part of my Ph.D. work, I developed a structural damage identification methodology and software that allows detection, localization, and quantification of damage in a structure following a potentially damaging event. The method is based on sparse Bayesian learning and integrates information from nonlinear FEM models with information contained in dense seismic array measurements. Simulated damage scenarios have been studied so far yielding promising results. Future goals include applying the methodology on full scale or shake-table structures and data *(Journal publication [1], under review).*

As a member of Caltech's Community Seismic Network (CSN – csn.caltech.edu), part of my work is associated with data processing, analysis, and visualization following earthquake events recorded by the dense (over 700 active deployed stations) sensor network in the Los Angeles area. Motivated by the occurrence of the recent July 2019 Ridgecrest earthquake sequence I studied the ground motion response in urban Los Angeles during the two largest events (M7.1 and M6.4) of the sequence, examined possible correlations with site parameters, and evaluated the predictive accuracy of 3D finite difference simulations and ground motion prediction equations *(Journal Publications [2-3]).*

Undergraduate Research Work

My undergraduate research work was in the area of modelling aerosol transport and deposition in the respiratory system. A dynamic, single-path model was developed for dry powder transport in the lungs accounting for select particle and patient specific parameters. The assumption of perfect alveolar mixing was explored. Comparison with experimental data was satisfactory and indicative of a perfect mixing mechanism being indeed present in the alveoli. Model updating-parameter estimation and a sensitivity analysis was performed in order to calibrate the model *(Journal Publication [4]).*

Awards and Honours

2017-2020 — The Cecil and Sally Drinkward Graduate Fellowship, Department of Mechanical and Civil Engineering, California Institute of Technology.

2016-2017 — The Allan Acosta Endowed Graduate Fellowship, Department of Mechanical and Civil Engineering, California Institute of Technology.

2011-2016 — State Scholarships Foundation (IKY) Fellowship and award received for 5 years, for ranking 1st during my studies in the Mechanical Engineering Department, University of Thessaly.

Sept. 2011 — State Scholarships Foundation (IKY) Fellowship and award for high ranking during the

National - Panhellenic Examination for admission to Greek Universities.

Sept. 2011 Eurobank Fellowship – Award for ranking first in his Lyceum - Senior High School.

Teaching Experience

Spring 2021 Lecturer. Stress Analysis Methods: Theory, Simulation, Experiment (Graduate Course ADMES23). Department of Mechanical Engineering, University of Western Macedonia, Greece.

Winter 2019 Teaching Assistant (TA). Mechanics of Structures and Solids (Ae/AM/CE/ME 102B). TA to professor John Hall. California Institute of Technology, USA.

Winter 2018 Teaching Assistant. Experiments and Modeling in Mechanical Engineering (ME 050A). TA to instructor Dr. Michael Mello. California Institute of Technology, USA.

Technical Skills

Programming in Matlab, Fortran, Python;
Finite element modeling in SAP2000, Etabs, OpenSees, ANSYS, ANSA;
Computer-aided design in AutoCAD.

Experience/Internships

Summer 2014 (1 ½ months) ETH Zurich, Computational Science and Engineering Laboratory. Project Title: Bayesian Inversion Methods for Parameter Estimation of Models of Objects Falling in a Medium. Supervisor: Panos Angelikopoulos, Postdoctoral Fellow, Chair: Petros Koumoutsakos.

Summer 2012 (2 months) University of Thessaly, System Dynamics Laboratory. Project Title: Configuration and set up of a vibration measurement system consisting of IMOTE2 tri-axial acceleration sensors.

Editorial Experience (Reviewer)

Structural Control and Health Monitoring, Wiley (5 reviews).

Publications

Journal

[1] **Filippitzis, F.**, Kohler, M.D., Heaton, T.H., and Beck J.L., "Sparse Bayesian Learning for Damage Identification using Nonlinear Models: Application in Weld Fractures of Steel-Frame Buildings." *Structural Control and Health Monitoring [Under Review – Revision Submitted]*.

[2] **Filippitzis, F.**, Kohler, M.D., Heaton, T.H., W. Graves, R.W., Clayton, R.W., Guy, G., Bunn, J.J., and Chandy, K.M., 2021. "Ground Motion Response in Urban Los Angeles from the 2019 Ridgecrest Earthquake Sequence." *Earthquake Spectra. DOI: 10.1177/87552930211003916.*

[3] Kohler, M.D., **Filippitzis, F.**, Heaton, T.H., et al., 2020. "2019 Ridgecrest Earthquake Reveals Areas of Los Angeles That Amplify Shaking of High-Rises." *Seismological Research Letters. DOI: 10.1785/0220200170.*

[4] **Filippitzis, F.**, Gourgoulianis, K., Daniil, Z. and Bontozoglou, V., 2020. "The effect of alveolar mixing on particle retention and deposition investigated by a dynamic single-path model." *Aerosol Science and Technology. DOI: 10.1080/02786826.2020.1759775.*

Conference Proceedings and Presentations

[1] **Filippitzis, F.**, Kohler, M.D., Massari, A., Roh B., and Heaton, T.H., 2021. "Spectral Scaling Transfer Function Method for Scenario Ground Motion Simulation with Application to the 2019 Ridgecrest Earthquake Sequence." *2021 SCEC Annual Meeting. Poster Presentation. Abstract accepted.*

[2] Kohler, M.D., **Filippitzis, F.**, Graves, R.W., Massari, A., Heaton, T.H., Clayton, R.W., Guy, R., Bunn, J.J., and Chandy, K.M., 2021. "Variations in Ground Motion Amplification in the Los Angeles Basin due to the 2019 M7.1 Ridgecrest Earthquake: Implications for the Long-Period Response of Infrastructure." *ASCE Lifelines 2021-22 Conference. Abstract accepted.*

[3] **Filippitzis, F.**, Kohler, M.D., Heaton, T.H., Graves, R.W., Clayton, R.W., Guy, R., Bunn, J.J., and Chandy, K.M., 2020. "High-Resolution Site Response Study of the Los Angeles Basin from the 2019 Ridgecrest Earthquake Sequence." 2021 *SSA Annual Meeting. Abstract and Oral Presentation.*

[4] **Filippitzis, F.**, Kohler, M.D., Heaton, T.H., Graves, R.W., Clayton, R.W., Guy, R., Bunn, J.J., and Chandy, K.M., 2020. "Ground Motion in Urban Los Angeles from the 2019 Ridgecrest Earthquakes: Recorded Versus Model-Predicted Response." 2020 *AGU Fall Meeting. Abstract and Oral Presentation.*

[5] **Filippitzis, F.**, Kohler, M.D., Heaton, T.H., Graves, R.W., Clayton, R.W., Guy, R., Bunn, J.J., and Chandy, K.M., 2020. "Ground Motion Response Study of Urban Los Angeles following the 2019 Ridgecrest Earthquake Sequence." *2020 SCEC Annual Meeting. Poster Presentation.*

[6] **Filippitzis, F.**, Kohler, M.D., Heaton, T.H., 2019. "Identification of Sparse Damage in Steel-Frame Buildings Using Dense Seismic Array Measurements." *Structural Health Monitoring 2019. Proceedings of the 12th IWSHM, Stanford. DOI: 10.12783/shm2019/32398. Proceedings paper and Oral Presentation.*

[7] **Filippitzis, F.**, Kohler, M.D., Heaton, T.H., 2019. "Identification of Sparse Damage in Steel Buildings using Community Seismic Network." *ASCE-EMI 2019 Conference, Caltech. Abstract and Oral Presentation.*

Theses

[1] **Filippitzis, F.**, 2020. "Identification of Structural Damage, Ground Motion Response, and the Benefits of Dense Seismic Instrumentation." *Doctoral Dissertation. California Institute of Technology, Pasadena, USA. (defended 30 September 2020)*

[2] **Filippitzis, F.**, 2016. "An Euler model for particle transport and deposition in pulmonary flows." *Diploma Thesis, University of Thessaly, Greece*.

Relevant Coursework at Caltech

AM/CE 151AB:	Dynamics and Vibrations
CDS 110:	Introduction to Feedback Control Systems
CDS 131:	Linear Systems Theory
CS/CNS/EE 156A:	Learning Systems (Machine Learning)
Ae/AM/CE/ME 102ABC:	Mechanics of Structures and Solids
Ae/AM/ME 223:	Plasticity
Ae/CE 165A:	Mechanics of Composite Materials and Structures
ME/Ge/Ae 266AB:	Dynamic Fracture and Frictional Faulting
ACM/EE 106AB:	Introductory Methods of Computational Mathematics
ACM 100 AB:	Introductory Methods of Applied Mathematics for the Physical Sciences
ACM 104:	Applied Linear Algebra