

| | |
|---------|------------|
| CV Date | 09/02/2023 |
|---------|------------|

Part A. PERSONAL INFORMATION

| | | | |
|--|---|---------------|------------|
| First Name | Hamed | | |
| Family Name | Fathnejat | | |
| Sex | Male | Date of Birth | 09/08/1989 |
| ID number Social Security, Passport | Z0075115W | | |
| URL Web | http://www.bcamath.org/es/people/hfathnejat | | |
| Email Address | hfathnejat@bcamath.org | | |
| Open Researcher and Contributor ID (ORCID) | 0000-0002-1146-8384 | | |

A.1. Current position

| | | | |
|---------------------|---|--------------|--|
| Job Title | Postdoctoral Fellow | | |
| Starting date | 2022 | | |
| Institution | ASOC BCAM - BASQUE CENTER FOR APPLIED MATHEMATICS | | |
| Department / Centre | | | |
| Country | | Phone Number | |
| Keywords | | | |

A.2. Previous positions (Research Career breaks included)

| Period | Job Title / Name of Employer / Country |
|-------------|---|
| 2015 - 2022 | Structural Engineering Expert / Shahid Bahonar University of Kerman |

A.3. Education

| Degree/Master/PhD | University / Country | Year |
|---|---|------|
| Programa Oficial de Doctorado en Análisis Estructural | Yazd University | 2022 |
| Graduado o Graduada en Ingeniería Civil | Kerman Graduate University of Advanced Technology | 2014 |
| Machine Learning | STANFORD UNIVERSITY THROUGH COURSERA INC. | 2014 |
| Graduado o Graduada en Ingeniería Civil | Shahid Bahonar University of Kerman | 2012 |

Part B. CV SUMMARY

My previous experience in artificial intelligence (AI) and machine learning taught me how I could efficiently reduce the time of optimization problems in structural health monitoring (SHM) data interpretation approaches. Therefore, I developed an efficient surrogate model for structural damage severity detection based on an optimized neural network. Accordingly, I am especially enthusiastic about the interface of structural damage detection (SDD) and efficient AI methods leading to the practical SDD procedure. Recently, in the context of a data-driven approach, I proposed deep learning (DL)-based model to identify structural damage, and its performance is evaluated on some structural benchmark data under varying environmental conditions.

In applying DL-based models, the model with the best accuracy and relatively appropriate training time and model size, even with varying environmental and operational conditions, is the proper tool for damage identification. In this regard, edge computing-based and internet of things (IoT) devices technologies can use this DL-based model on hardware with a lower capacity which helps create a more applicable SHM system.

As I am very interested in making the SHM research field operational, I am now working as a postdoctoral researcher in the Basque Center for Applied Mathematics (BCAM) for

investigating optimized methods to monitor the health status of wind turbines which are one of the most important renewable energy resources. Also, I have already proposed an operational research project entitled "Intelligent damage detection of concrete water facilities in the operation of Kerman regional water company (A case study of Jiroft dam)" and, now, I am cooperating in this project. Furthermore, I have had preliminary studies on some other fields applied in the SDD area. I am interested in big data analysis, reliability and risk analysis, computational mechanics, and random vibration. My teaching experiences:

, Dynamics of Structure, Faculty of Engineering, Shahid Bahonar University of Kerman. (fall 2012, spring 2013)

- **Teaching Fellow**, Advanced Applied Mathematics, Yazd University, Fall 2018, Fall 2019, Fall 2020

- **Teaching Fellow**, Advanced Applied Mathematics, Azad University of Kerman, Fall 2014

- **Teaching Fellow**, Steel Structures, Sirjan University of Technology, Fall 2020, Spring 2021, Fall 2021

My peer review experiences:

- **Engineering Optimization Journal**, 2019 & 2021 & 2022

- **Transactions on Data Science Journal**, 2019

- **Advances in Civil Engineering**, 2022

- **Shock and Vibration**, 2022

- **Proceedings of Institution of Mechanical Engineers PART C-JOURNAL OF MECHANICAL ENGINEERING SCIENCE**, 2022

B.1. Brief summary of the Undergraduate Thesis (or equivalent) and score obtained

In the first part of my Ph. D. thesis, damage-sensitive features are extracted from raw data resulting from sensors. Accordingly, the extraction of features is done using proper orthogonal decomposition; after that by using a moving window mean square error of extracted features (proper orthogonal modes) damage detection is done in the context of this model-free approach.

In the model-based damage detection approach, I proposed a new optimized surrogate model and I compared its performance with a previously proposed surrogate model. Also, in this approach, a new damage index is proposed and its efficiency is investigated under varying environmental conditions. Furthermore, a modified optimization algorithm based on adaptive objective function is presented in the context of this approach. Theories and results are presented in two journal papers and a conference one.

In the second part of my thesis, deep learning algorithms are applied in the form of a model-free approach to extract features automatically and to solve the SDD as a classification problem, simultaneously. In this regard, I published the journal paper.

B.2. Brief summary of the Master's Thesis and score obtained

I tried to apply advanced Machine Learning methods in this field to create a surrogate model as an efficient alternative for structural analysis model in damage detection process. In order to learn machine learning (ML) concept professionally, I participated the ML course presented by Andrew NG, adjunct professor of Stanford University, in 2014 and I successfully passed this online course. My master's thesis is entitled: "Structural Damage Detection Based on Advanced Soft Computing Methods". In my M. Sc. work, I performed an in-depth study on using several intelligent algorithms and diagnostic tools such as Artificial Neural Networks, Least Square SVM, Fuzzy Logic, as well as signal processing tools such as Wavelet transform, etc. in order to conduct good research work in SHM My M.Sc.

Part C. RELEVANT ACCOMPLISHMENTS

C.1. Most important publications in national or international peer-reviewed journals, books and conferences

AC: corresponding author. (n^o x / n^o y): position / total authors. If applicable, indicate the number of citations

- 1 **Scientific paper.** Hamed Fathnejat; Behrouz Ahmadi-Nedushan; Sahand Hosseininejad; Mohammad Noori; Wael A. Altabey. (1/5). 2023. A data-driven structural damage identification approach using deep convolutional-attention-recurrent neural architecture under temperature variations *Engineering Structures*. Jie Yang. 276. ISSN 0141-0296.
- 2 **Scientific paper.** Behrouz Ahmadi-Nedushan; Hamed Fathnejat. (2/2). 2022. A modified teaching-learning optimization algorithm for structural damage detection using a novel damage index based on modal flexibility and strain energy under environmental variations *Engineering with Computers*. Jessica Zhang. 38-1, pp.847-874. ISSN 0177-0667.
- 3 **Scientific paper.** Hamed Fathnejat; Behrouz Ahmadi-Nedushan. (1/2). 2020. An efficient two-stage approach for structural damage detection using meta-heuristic algorithms and group method of data handling surrogate model *Frontiers of Structural and Civil Engineering*. Junzhi Cui, Jianguo Nie, Surendra P. Shah. 14-4, pp.907-929. ISSN 2095-2430.
- 4 **Scientific paper.** Ramin Ghiasi; Hamed Fathnejat; Peyman Torkzadeh. (2/3). 2018. A three-stage damage detection method for large-scale space structures using forward substructuring approach and enhanced bat optimization algorithm *Engineering with Computers*. Jessica Zhang. 35-3, pp.857-874. ISSN 0177-0667.
- 5 **Scientific paper.** Peyman Torkzadeh; Hamed Fathnejat; Ramin Ghiasi. (2/3). 2016. Damage detection of plate-like structures using intelligent surrogate model *Smart Structures and Systems*. B. F. Spencer, Jr.. 18-6, pp.1233-1250. ISSN 1738-1584.
- 6 **Scientific paper.** Hamed Fathnejat; Peyman Torkzadeh; Eysa Salajegheh; Ramin Ghiasi. (1/4). 2014. Structural damage detection by model updating method based on cascade feed-forward neural network as an efficient approximation mechanism *International Journal of Optimization in Civil Engineering*. PROF. A. KAVEH. 4-4, pp.451-472. ISSN 2228-7558.

C.2. Conferences and meetings

- 1 Hamed Fathnejat; Behrouz Ahmadi-Nedushan. Continuous health monitoring of structures by processing data from sensors using proper orthogonal decomposition. 13th Iranian National Congress on Civil Engineering (13NCCE). Isfahan University of Technology. 2022. Iran. Participatory - oral communication. Conference.
- 2 Hamed Fathnejat; Behrouz Ahmadi-Nedushan. Structural Damage Detection by Sensitivity-based method and Cascade Feed-forward Neural Network Based on Proper Orthogonal Modes. 6th Iranian National and 2nd International Conference on New Materials and Structures in Civil Engineering. Yazd University. 2017. Iran. Participatory - oral communication. Conference.
- 3 Hamed Fathnejat; Peyman Torkzadeh; Ramin Ghiasi. A two stage method for structural damage identification using radial basis neural network and passive congregation particle swarm optimization. 8th Iranian National Congress on Civil Engineering. Babol Noshirvani University of Technology (NIT). 2014. Iran. Participatory - oral communication. Conference.

C.3. Research projects and contracts

- 1 **Project.** Intelligent damage detection of concrete water facilities in the operation of Kerman regional water company (Case study of Jiroft dam). Iran Ministry of Energy. (Shahid Bahonar University of Kerman). 05/12/2022-05/06/2024.