

# Nikolaos Karathanasopoulos

## Curriculum Vitae

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### Professional Experience

- 09/2017 - **Research Associate**, *ETH Zurich, Chair of Computational Science*, Data-driven and physics based multiscale tendon modeling: from molecules to tissues,, Advisor:Prof. Dr. Petros Koumoutsakos.
- 06-2018
- 04/2017 - **PostDoc**, *University of Lorraine, France*, , Two-dimensional metamaterials of controlled static and dynamic properties,, Advisor:Prof. Dr. J.F. Ganghoffer.
  - 08/2017
    - Wave propagation analysis of architected materials
    - Discrete and continuous homogenization methods.
- 09/2015 - **Software developer, Modeller and Consultant**, *Software Engineering Cubus AG, Zurich Switzerland*,
  - 03/2017 Responsible: Dr. Herbert Elmer.
    - Engineering software development for static analysis of frame structures
    - Development of dynamic analysis tools using time-history and response-spectrum methods
    - Modeling and consulting in structural analysis and dimensioning
- 2008-2010 **Project engineer**, *Construction and design office, Charitos Papadopoulos AG*.
  - Static and dynamic analysis and design of residential buildings.
  - Dimensioning of concrete, steel and wood made constructions.
  - Cost analysis and project planning

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### Research projects

- Data-driven and physics based multiscale tendon modeling: from molecules to tissues, ETH Zurich, (*September 2017 -* )
- Designing two-dimensional metamaterials of tunable static and dynamic properties, France, University of Lorraine, (*April 2017- August 2017*)
- A New Planar Finite-Element Representation Scheme for Helical Structures, ETH Zurich, Switzerland (*July 2012 - August 2015*)
- Seismic isolation design of civil engineering structures, Berkeley, California, USA, (*January 2012 - May 2012*)
- Use of innovative materials in the retrofitting of structures, Patras, Greece, (*September 2010 - June 2011*)

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### Academic Studies

- Dr. of Science **ETH Zurich, Department of Mechanical and Process Engineering (MAVT)**, *July 2012 - August 2015*, *Thesis*: "On the Analysis, Simulation and Structural Design of Helical Constructions", Viva-voce/defence: 28 August 2015, *Advisor*: Edoardo Mazza.
- Ms.Sc. **University of California, Berkeley, USA**, *August 2011 - May 2012*, *Structural Engineering, Mechanics and Materials (SEMM)*, *GPA:3.85/4.00* , (upper 5%), *Thesis*: "Isolation system design for a five story reinforced concrete building", *Advisor*: Sanjay Govindjee.
- Diploma **University of Patras, Greece, Department of Civil and Environmental Engineering**, *September 2006 - July 2011*, *GPA:9.0/10.0*, ranked 1<sup>st</sup>, *Thesis*: "Use of high strength carbon materials in column seismic retrofitting", *Advisor*: Thanasis Triantafyllou.
- Lyceum **3<sup>rd</sup> state Lyceum of Agrinio, Greece**, *September 2004 - June 2006*, *GPA: 19.7/20.0*, highest GPA

**Fields of Expertise**: Linear and non-linear structural analysis, Continuum mechanics, Dynamics, Earthquake engineering, Finite element analysis, Uncertainty Quantification.

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## ***Teaching experience***

- Teaching assistant: "Structural Analysis" (*UC Berkeley Spring Semester 2012*)
- Teaching assistant: "Non-linear Continuum Mechanics" (*ETHZ Spring Semester 2013 and Spring Semester 2014*)
- Teaching assistant: "Continuum Mechanics" (*ETHZ Fall Semester 2014*)
- Laboratory responsible: "Experimental Mechanics" -Wave propagation and Dynamic resonance - (*ETHZ Fall Semester 2013, Spring-Fall Semester 2014*)
- Lecturer: Computational Science: Method of Finite Elements II (*ETHZ Fall Semester 2016*)
- Teaching assistant: Models, Algorithms and Data (MAD): Introduction to Computing (*ETHZ Spring Semester 2018*)

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## ***Prizes/Awards/Fellowships/Funding***

- 2018 ◦ Marie-Curie Seal of Excellence
- 2017 ◦ Freenovation Competition Grant  
(<https://www.novartis.ch/de/unsere-medizin/forschungsfoerderung/freenovation/freenovation-gewinner-2017>)
- 2017 ◦ Foundation "Empirikion"
- 2012 ◦ UC Berkeley exceptional teaching assistant award
- 2012 ◦ Foundation "Gerondelis" USA, (*exceptional master thesis award*)
- 2011-2012 ◦ Foundation "Andreas Mentzelopoulos" (*exceptional diploma award*)
- 2006-2011 ◦ State Scholarships Foundation (*highest ranking in class*)

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## ***Recognised Reviewer***

- *International Journal of Solids and Structures*
- *International Journal of Mechanical Sciences*
- *Construction and Building materials*

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## ***Computer skills***

- Editors Office, Latex
- Coding C++, Fortran, Python, Delphi, Matlab, R, SciPy
- Symbolics Mathematica, Mathcad, Maple
- Drawing Autocad 2D and 3D, CorelDraw, Photoshop
- Simulations Ansys APDL Mechanical, Sap2000 CSI, FEMAP, Cubus

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## ***Language skills***

- Greek Mother language
- English Perfect working proficiency **C2**
- German Perfect working proficiency **C2**
- Italian Limited working proficiency **B2**
- French Intermediate knowledge **B1**

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## ***Major scientific achievements***

### ***Book chapters***

- "Advances in Mechanics of Microstructured Media and Structures, Chapter 16: Mechanics of Metamaterials, an Overview of Recent Developments", H. Reda, N. Karathanasopoulos, K. Elnady, J.F. Ganghoffer, H. Lakiss, Springer, (2018), pp:273-296, isbn="978-3-319-73694-5", issn="1869-8433", DOI:10.1007/978-3-319-73694-5
- "Nonlinear wave propagation analysis in hyperelastic network materials in Generalized Models and Non-classical Approaches in Complex Materials 2", H. Reda, K. ElNady, J.F. Ganghoffer, N. Karathanasopoulos, Y. Rahali, H. Lakiss, Springer, ISBN 978-3-319-77503-6, in press (2018), DOI:10.1007/978-3-319-77504-3

### ***Peer-reviewed publications***

- "Wave propagation characteristics of periodic structures accounting for the effect of their higher order inner material kinematics ", H. Reda, N. Karathanasopoulos, J.F. Ganghoffer, H. Lakiss, *Journal of Sound and Vibration*, (2018), Volume: 431, pp:265-275, <https://doi.org/10.1016/j.jsv.2018.06.006>
- "Influence of first to second gradient coupling energy terms on the wave propagation of three-dimensional non-centrosymmetric architected materials ", H. Reda, N. Karathanasopoulos, Y. Rahali, J.F. Ganghoffer, H. Lakiss, *International Journal of Engineering Science*, (2018), Volume: 128, pp:151-164, <https://doi.org/10.1016/j.ijengsci.2018.03.014>

- "The role of anisotropy on the static and wave propagation characteristics of architected media", H. Reda, N. Karathanasopoulos, K. Elnady, J-F. Ganghoffer, H. Lakiss, *Materials & Design*, (2018), Volume: 147, pp:134-145, <https://doi.org/10.1016/j.matdes.2018.03.039>
- "Finite element modeling of the elastoplastic axial-torsional response of helical constructions to traction loads", N. Karathanasopoulos, H. Reda, J.F. Ganghoffer, *International Journal of Mechanical Sciences* (2017), Volume 133, pp:368-375, doi:10.1016/j.ijmecsci.2017.09.002
- "Designing two-dimensional metamaterials of controlled static and dynamic properties", N. Karathanasopoulos, H. Reda, J.F. Ganghoffer, *Computational Material Science* (2017), Vol:138, pp:323-332, doi:10.1016/j.commatsci.2017.06.035
- "Bayesian characterization of the tendon fascicle's structural composition using finite element models for helical geometries", N. Karathanasopoulos, P. Angelikopoulos, C. Papadimitriou, P. Koumoutsakos, *Computer Methods in Applied Mechanics and Engineering* (2017), Vol:313, pp:744-758, doi: 10.1016/j.cma.2016.10.024
- "Two dimensional modeling of helical structures, an application to simple strands", N. Karathanasopoulos and G. Kress, *Computers and Structures* (2016), Vol:194, pp.79-84, doi:10.1016/j.compstruc.2015.08.016
- "Optimal structural arrangements of multilayer helical assemblies", N. Karathanasopoulos, P. Angelikopoulos, *International Journal of Solids and Structures* (2016), Vol:78-79, pp.1-8, doi:10.1016/j.ijsolstr.2015.09.023
- "Analytical closed-form expressions for the structural response of helical constructions to thermal loads", N. Karathanasopoulos, J.F. Ganghoffer, K.O. Papailiou, *International Journal of Mechanical Sciences* (2016), Vol:117, pp.258-264, doi:10.1016/j.ijmecsci.2016.08.010
- "Numerical characterization of the structural response of helical constructions to radial and thermal loads", N. Karathanasopoulos, *Journal of Computational Methods in Sciences and Engineering* (2016), Vol. 16, pp.787-800, doi:10.3233/JCM-160691
- "Torsional stiffness bounds of helical structures under the influence of kinematic constraints", N. Karathanasopoulos, *Structures* (2015), Vol:3, pp.244-265, doi:10.1016/j.istruc.2015.05.004
- "Mechanical response of a helical body to axial, torsional and radial strain", N. Karathanasopoulos and G. Kress, *International Journal of Mechanical Sciences* (2015), Vol:94-95, pp.260-265, doi: 10.1016/j.ijmecsci.2015.02.022

### **Peer-reviewed mini-symposia**

- "HPUQ I: Current Challenges in Uncertainty Quantification for Mechanistic Models - Theory, Methods and Tools", PASC 2018, Basel, 02-04/07/2018

### **Peer-reviewed conference contributions**

- "A planar finite element model for axial straining of helical structures", N. Karathanasopoulos and G. Kress, *Proceedings of the Twelfth International Conference on Computational Structures Technology*, Civil-Comp Press, Stirlingshire, UK, Paper 202, 2014
- "Mechanical modeling of helical assemblies in two dimensions, computational merits and applications", N. Karathanasopoulos, *8th GRACM International Congress on Computational Mechanics*, Volos, Greece, Juli 2015
- "Planar finite element modeling of hollow and locked-coil helical constructions", N. Karathanasopoulos, *SciCADE 2015: 2015 International Conference on Scientific Computation and Differential Equations*, Potsdam, Germany, September 2015
- "Planar finite element modeling of hollow and locked-coil helical constructions", N. Karathanasopoulos, *SciCADE 2015: 2015 International Conference on Scientific Computation and Differential Equations*, Potsdam, Germany, September 2015
- "Reverse engineering of tendons: The data conundrum and current computing challenges", N. Karathanasopoulos *PASC*, Basel, Switzerland, July 2018

### **Datasets**

- "Complete dataset of optimal structural arrangements of helical assemblies with up to five helical layers", N. Karathanasopoulos, P. Angelikopoulos, *International Journal of Solids and Structures* (2016), doi:10.1016/j.ijsolstr.2015.09.023

### **Software**

- "A 2D finite element model for the simulation of the helix structural response to axial, torsional, radial and thermal loads", N. Karathanasopoulos, *MAVT* (2015)
- "Construction of a dedicated tendon fascicle finite element model", N. Karathanasopoulos, *Chair of Computational Science, ETH* (2016)

### **Works Submitted/Under Preparation**

- "Unravelling the viscoelastic, buffer-like mechanical behavior of tendons: A quantitative study at the fibril-fiber scale", N. Karathanasopoulos, G. Arampatzis, J-F. Ganghoffer, Under Review
- "A high-performance numerical scheme for the computation of the relaxation response of helical tendon subunits", N. Karathanasopoulos, P. Hadjidoukas, H. Reda, J.F. Ganghoffer, Under Review
- "Unravelling the effective bulk and normal to shear properties of common two-dimensional architected materials", N. Karathanasopoulos, F.D. Reis, H. Reda, J.F. Ganghoffer, Under Review

## ***Students***

- Timothe Nerlith, *Switzerland* (2014)
- Jean-Philippe Dubois, *France* (2017)
- Hilal Reda, *France* (2017)