# Vahid Arbabi



#### **Personal information**

Vahid Arbabi, Ph. D

Assistant Professor,

Orthopaedic-Biomechanics Research Group, Department of Mechanical Engineering, University of Birjand, Birjand, Iran

Department of Orthopedics, University Medical Center Utrecht, Utrecht University, Utrecht, the Netherlands

Guest researcher, Department of Biomechanical Engineering, Delft University of Technology

Visiting addresses:

- Office: Orthopaedic-Biomechanics Research Group | University of Birjand | Avini Blvd. | Birjand | Iran
- Office: Q.02.4.23 | Heidelberglaan 100 | 3584 CX Utrecht | the Netherlands

- Office: 34 E.3.300 | Mekelweg 2 | Delft 2628 CD | the Netherlands

Email: v.arbabi@umcutrecht.nl | v.arbabi@birjand.ac.ir |

E-mail: v.arbabi@birjand.ac.ir, v.arbabi@umcutrecht.nl, v.arbabi@tudelft.nl,

## **Summary of qualifications**

- Artificial Intelligence (Machine Learning and Deep Learning)
- Statistical shape and appearance models
- Extensive experience in finite element software such as ABAQUS, FEBio, ANSYS and COMSOL
- ABAQUS user subroutine
- Simulation of tissue as a viscoelastic, biphasic, biphasic-solute and multiphasic material
- Image Processing expertise: Mimics, Mimics 20 Python scripting, 3-matic, ImageJ, 3D slicer and MITK-GEM
- Scalismo (Scalable Image Analysis and Shape Modelling)
- Programming in Matlab, C++, Python, Fortran, Scala and Maple
- Experienced in Artificial Neural Networks
- Confocal Raman spectromicroscopy
- Nanoindentation testing
- Scanning Electron Microscopy
- Experimental design
- Multi-tasking
- Teamwork

### **Education & Work**

April 2018 - Present	Assistant Professor, Department of Mechanical
	Orthopedics, UMC Utrecht, the Netherlands
December 2015 – April 2019	<b>Postdoctoral Researcher</b> , Department of Orthopedics,
	UMC Utrecht & Department of Biomechanics, Delft
	University of Technology, the Netherlands.
	Research topic: Artificial Intelligence in Medical Imaging
	and Statistical shape and appearance models of bones
May 2012 – September 2016	Doctor of Philosophy, Department of Biomechanical
	Engineering, Delft University of Technology, Delft, The
	Netherlands
	cartilage for estimation of its mechanical and physical
	properties
	Supervisor: Prof. Harrie Weinans and Dr. Amir A. Zadpoor
September 2003- February	Master of Science in Mechanical Engineering (Applied
2006	Design), Yazd University, Yazd, Iran
	impact with a flat rigid anvil'
	Supervisor: Dr. A. Shafiei, Thesis grade: 18.95 out of 20
September 1998- May 2003	Bachelor of Science in Mechanical Engineering (Solid
	Design), University of Sistan and Baluchestan, Zahedan,
	Iran Project: Study of Comber Coster Toe in Jout and Kingpin
	Angels and Their Effects on Car Steering'
	Project grade: 19.5 out of 20
Work experiences	
April 2006 – May 2012	<b>Instructor and scientific researcher</b> , Department of Mechanical Engineering, University of Zabol, Zabol, Iran
Ueneuro & emende	
Honours & awards	European Society of Biomechanics, Runner up Prize.
Honours & awards 2017	European Society of Biomechanics, Runner up Prize, Best Doctoral Thesis Award (2017)
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2009	Collaboration on installation of the first wind turbine in
2008	Sistan region of Iran. Administrator and member of Scientific Committee,
	First National Congress on Wind Energy and its Applications, Zabol, Iran
2006 - 2012	<b>Member of Renewable Energies Committee</b> of University of Zabol

#### Internship

During my Bachelor study	M.S.T Group, Industrial complex, Mashhad, Iran
Selected courses	
2016	Confocal Raman Spectromicroscopy (Kavli Nano-lab
	TUDelft) and Scanning Electron Microscopy
2015	Time Management, first things first
2015	Effective negotiation: win-win communication
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2015	Operating Electropulse E10000 (Elitear-Torsion Floor Test
	Instrument includes load frame, patented linear
	motor/torsion actuator, displacement & force transducer
	set), use of software Console and Wavematrix
2015	Participation in work consultation with research partners
2014	Summer school on biomechanics: Trends in modelling and simulation
2013	How to become effective in a network conversation
2013	How to manage your research information
2012	Training course for nanoindentation testing
and more	-

#### **Teaching experience**

2018-present	University of Biriand
2010-present	<ul> <li>Selected topics in orthopaedic and Biomechanics</li> </ul>
	<ul> <li>Dvnamic of Machinery</li> </ul>
	<ul> <li>Theory of Vibrations</li> </ul>
2012-2018	Delft University of Technology
	<ul> <li>Tissue Biomechanics of Bone, Cartilage and</li> </ul>
	Tendon
2006-2012	University of Zabol & Azad university of Zabol, Iran
	<ul> <li>Engineering statics and Dynamics, Strength of</li> </ul>
	Materials, Machine Element Design, Mechanical
	Vibrations, Hydraulic & Pneumatics
Languages	English (fluent), Dutch (Basic), Persian (Native)

### Peer reviewed/submitted/to be submitted selected journal publication

- Hirvasniemi J, Gielis WP, Arbabi S, Agricola R, van Spil WE, Arbabi V, Weinans H. Bone Texture Analysis for Prediction of Incident Radio-graphic Hip Osteoarthritis Using Machine Learning: Data from the Cohort Hip and Cohort Knee (CHECK) study. Osteoarthritis Cartilage. 2019 Feb 28. pii: S1063-4584(19)30863-5. doi: 10.1016/j.joca.2019.02.796
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- **Arbabi V**., Pouran B., Weinans H., Zadpoor A.A., *Multiphysics computational modeling in cartilage biomechanics: estimation of mechanical and physical properties.* (invited book chapter: Academic Press, in progress)

- Mirahmadi F, Koolstra JH, Fazaeli S, Lobbezoo F, van Lenthe GH, Snabel J, Stoop R, **Arbabi V**, Weinans H, Everts V. *Aging does not change the compressive stiffness of mandibular condylar cartilage in horses*. Osteoarthritis Cartilage. 2018 Dec;26(12):1744-1752. doi: 10.1016/j.joca.2018.08.007.
- Tümer N., Arbabi V., Gielis W.P., de Jong P.A., Weinans H., Tuijthof M.J., Zadpoor A.A. Three-dimensional analysis of shape variations and symmetry of the fibula, tibia, calcaneus and talus. Journal of Anatomy, 2019. 234(1):p. 132-144. doi: 10.1111/joa.12900.
- Pouran B, Arbabi V, Bajpayee AG, van Tiel J, Töyräs J, Jurvelin JS, Malda J, Zadpoor AA, Weinans H. Multi-scale imaging techniques to investigate solute transport across articular cartilage. J Biomech. 2018 Sep 10;78:10-20. doi: 10.1016/j.jbiomech.2018.06.012. doi: 10.1016/j.jbiomech.2018.06.012.
- Pouran B, Moshtagh PR, Arbabi V, Snabel J, Stoop R, Ruberti J, Malda J, Zadpoor AA, Weinans H. Non-enzymatic cross-linking of collagen type II fibrils is tuned via osmolality switch. J Orthop Res. 2018 Jul;36(7):1929-1936. doi: 10.1002/jor.23857.
- Arbabi V., Pouran B., Zadpoor A.A., Weinans H., *Experimental and finite element* protocol to investigate transport of charged and neutral solutes across articular cartilage. J Vis Exp. 2017 Apr 23;(122). doi: 10.3791/54984.
- Pouran B., Arbabi V., Zadpoor A.A., Weinans H., Solute transport at the inter-face of cartilage and sub-chondral bone plate: effect of micro-architecture., J Biomech. 2017 Feb 8;52:148-154. doi: 10.1016/j.jbiomech.2016.12.025.
- **Arbabi V**., Pouran B., Weinans H., Zadpoor A.A., *Neutral solute transport across osteochondral interface: a finite element approach.* Journal of Biomechanics, 2016. 49, 3833-3839. doi: 10.1016/j.jbiomech.2016.10.015.
- Pouran B., Arbabi V., Weinans H., Zadpoor A.A., Application of multiphysics models to efficient design of experiments of solute transport across articular cartilage. Comput. Biol. Med., 78 (2016) 91-96. doi: 10.1016/j.compbiomed.2016.09.014.
- Pouran B., Arbabi V., Zadpoor A.A., Weinans H., Isolated effects of external bath osmolality, solute concentration, and electrical charge on solute transport across articular cartilage. Medical Engineering and Physics, 2016. Medical Engineering and Physics 38 (2016) 1399–1407. doi: 10.1016/j.medengphy.2016.09.003.
- Arbabi V., Pouran B., Weinans H., Zadpoor A.A., Combined inverse-forward artificial neural networks for fast and accurate estimation of the diffusion coefficients of cartilage based on multiphysics models. Journal of Biomechanics, 2016. 49, 2799-2805. doi: 10.1016/j.jbiomech.2016.06.019.
- Arbabi V., Pouran B., Weinans H., Zadpoor A.A., Multiphasic modeling of charged solute transport across articular cartilage: Application of multi-zone finite-bath model. Journal of Biomechanics, 2016. 49(9): p. 1510-7. doi: 10.1016/j.jbiomech.2016.03.024.
- **Arbabi V**., Pouran B., Campoli G., Weinans H., Zadpoor A.A., *Determination of the mechanical and physical properties of cartilage by coupling poroelastic-based finite element models of indentation with artificial neural networks*. Journal of Biomechanics, 2016. 49(5): p. 631-637. doi: 10.1016/j.jbiomech.2015.12.014.

- **Arbabi V**., Pouran B., Weinans H., Zadpoor A.A., *Transport of Neutral Solute Across Articular Cartilage: The Role of Zonal Diffusivities*. Journal of Biomechanical Engineering, 2015. 137(7): p. 071001-071001. doi: 10.1115/1.4030070.
- Moshtagh P.R., Pouran B., van Tiel J., Rauker J., Zuiddam M.R., Arbabi V., Korthagen N.M., Weinans H., Zadpoor A.A., *Micro- and nano-mechanics of osteoarthritic cartilage: The effects of tonicity and disease severity.* Journal of the Mechanical Behavior of Biomedical Materials, 2016. 59: p. 561-571. doi: 10.1016/j.jmbbm.2016.03.009.
- Keikha M.M., Safari M., Heisiattalab S., Arbabi V., An investigation into the effect of die temperature and heat treatment on A360 properties produced by the semi-solid forming and cooling slope method. Journal of Engineering Manufacture, 2011;Volume 225, Number 3: 377-383. doi:10.1177/09544054JEM1942.
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- Arbabi V., Ebrahimzadeh I., Effects of Wall Thickness on Microstructures and Properties of α/β Brasses Pipes Produced by Horizontal Continuous Casting. International Journal of Cast Metal Research, 2010; 23(3): 150-57. https://doi.org/10.1177/09544054JEM1942.
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- and more ...

**Selected conference Publications** 

- Gudde A., **Arbabi V**., Pouran B., Brink R., Bleys R., Castelein R., Weinans H. Orientational functionality of vertebral trabecular trajectories: a finite element approach. 8th World Congress of Biomechanics, Dublin, Ireland.
- Pouran B., Gudde A., Arbabi V., Brink R., Bleys R., Castelein R., Weinans H. Structural anisotropy in the human vertebral body: implications of loading direction. 8th World Congress of Biomechanics, Dublin, Ireland.
- **Arbabi V**., Pouran B., Weinans H., Zadpoor A.A., *Transport of neutral solute across articular cartilage and subchondral plate.* 22nd Congress of the European Society of Biomechanics, Lyon, France, 2016.
- **Arbabi V**., Pouran B., Weinans H., Zadpoor A.A., *Combined artificial neural networks for robust estimation of the diffusion coefficients across cartilage.* 22nd Congress of the European Society of Biomechanics, Lyon, France, 2016.
- Pouran B., Arbabi V., Zadpoor A.A., Weinans H., *Eeffects of bath attributes on the transport of solute across articular cartilage.* 22nd Congress of the European Society of Biomechanics, Lyon, France, 2016.
- **Arbabi V**., Pouran B., Weinans H., Zadpoor A.A., *Application of a biphasic-solute model in predicting diffusive properties of osteochondral interface.* International Workshop on Osteoarthritis Imaging (IWOAI), Oulo, Finland, 2016.
- Pouran B., Arbabi V., Zadpoor A.A., Weinans H., Mechanical condition of articular cartilage regulates ezymatic activity. International Workshop on Osteoarthritis Imaging (IWOAI), Oulo, Finland, 2016.
- **Arbabi V**., Pouran B., Weinans H., Zadpoor A.A., *Multiphasic finite element models* enable determining fixed charge density and the diffusion coefficient of charged solutes in articular cartilage. Orthopaedic Research Society Annual Meeting, Orlando, Florida, 2016.

- Pouran B., Arbabi V., Zadpoor A.A., Weinans H., *Micro-features affect the transport* of solutes at the interface of cartilage and subchondral plate. Orthopaedic Research Society 2016 Annual Meeting, Orlando, Florida, 2016.
- Pouran B., **Arbabi V**., Zadpoor A.A., Weinans H., *Micro-architecture affects the transport of solutes at the interface of cartilage and bone*. Osteoarthritis and Cartilage, 2016.
- **Arbabi V**., Pouran B., Weinans H., Zadpoor A.A., *Coupled finite element modelartificial neural networks can predict mechanical properties of articular cartilage.* Orthopaedic Research Society Annual Meeting, Las Vegas, Nevada, 2015.
- Pouran B., **Arbabi V**., Villamar J., Zadpoor A.A., Weinans H. Contrast agent's transport across healthy articular cartilage under various bath conditions. Orthopaedic Research Society Annual Meeting, Las Vegas, Nevada, 2015.
- **Arbabi V**., Campoli G., Weinans H., Zadpoor A.A., *Estimation of cartilage properties using indentation tests, finite element models, and artificial neural networks.* 11th World Congress on Computational Mechanics & 5th European Conference on Computational Mechanics, Barcelona, Spain, 2014.
- **Arbabi V**., Campoli G., Weinans H., Zadpoor A.A., *Nanoindentation-based estimation of cartilage properties using artificial neural networks trained with finite element data.* Simulia BENELUX Regional User Meetings, Hoeven, The Netherlands (invited speaker), 2013.
- Heisiyattalab S., Shakeri M., Arbabi V., Keikha M.M., Study of Ethanol Fuel Cell Performance. The First Iranian Conference on Renewable Energies and Distributed Generation, Birjand, Iran, March 2010. (in Persian)
- Ebrahimzade I., Arbabi V., Rakhshani H.A., Effect of Heat Treatment on Microstructure and Property of CuZn<sub>4</sub>OAl<sub>11</sub> Alloy. Regional Conference on Mechanical Engineering, Shiraz, Iran, December 2009. (in Persian)
- Arbabi V., Shafiei A.R. Mashaie A., Calculation of Dynamic Yield Stress of Ductile Porous Materials with a Relative Density by Using a Linear Function of Compressive Strain. 17th Annual (International) Conference on Mechanical Engineering, Tehran University, Tehran, Iran, May 2009. (in Persian)
- Arbabi V., Zahedi S.A., *Theoretical Study of Tearing in Hydro forming Deep Drawing Process.* Recent Advances in Engineering Mechanics, Structures and Engineering Geology, Greece. 2009; 100-104. (ISSN: 1790-2769, ISBN: 978-960-474-101-4)
- Arbabi V., Zahedi S.A., *Analytical Investigation of Nonlinear KdV Equation*. Recent Advances in Engineering Mechanics, Structures and Engineering Geology, Greece. 2009; 95-99. (ISSN: 1790-2769, ISBN: 978-960-474-101-4)
- Jamalizadeh M.R., Moghaddamnia A., Piri J., Arbabi V., Homayounifar M., Shahryari A., Dust Storm Prediction Using ANNs Technique (A Case Study: Zabol City).
   5th International Conference on Climate Change and Global Warming. Heidelberg, Germany. 2008; 33:529-537. (ISSN 2070-3740)
- and more ...