Mohammadjavad (Matin) Einafshar

March 25th, 1989

Education

2015–2021 **Ph.D. in Biomechanics (focus on Bone-screw fixation stability)**, *Biomedical Engineering Faculty, Amirkabir University of Technology, Tehran, Iran*
Thesis title: Mechanical Characterization of orthopedic bone screws using modal analysis and the Correlation with pullout force and insertion torque: In-vitro, In-vivo and In-silico study

2012–2014 **Master of Science (Biomechanics)**, *Biomedical Engineering Faculty, Amirkabir University of Technology, Tehran, Iran*
Thesis title: Enhancement of cortical bone drilling process using bone biomechanics and drilling mechanics

2008-2012 **Bachelor of Engineering (Biomechanics)**, *Biomedical Engineering Faculty, Amirkabir University of Technology, Tehran, Iran*
Thesis title: Biomechanical assessment of spinal stabilization systems in a designed and fabricated physiological chamber simulator during the fatigue test

EMPLOYMENTS

2026–2029 **Assistant Professor in Orthopedic Biomechanics (Design and Manufacturing of Active knee prosthesis (SPARK and MathKOA))**., *Department of Material and Production, Aalborg University, Aalborg, Denmark.*

2022–2026 **Postdoc in Orthopedic Biomechanics (Design and Manufacturing of Active knee prosthesis (SPARK and MathKOA))**., *Department of Material and Production, Aalborg University, Aalborg, Denmark.*

2021–2022 **Research Assistant (Remotely)**, *Massachussetts General Hospital, Harvard Medical School, MA, Boston, USA.*

2012–2019 **Biomechanical Lab Specialist**, *Biomedical Engineering Faculty, Amirkabir University of Technolgy, Tehran, Iran.*

2016–2019 **Design Manager and Manufacturing consultant**, *Sogand Company, Tehran, Iran.*

2014–2015 **Design Engineer**, *Kimia Company, Tehran, Iran.*

2012–2014 **Medical Device Importer consultant**, *Apadana Tajhiz Gostar, Tehran, Iran.*

2008–2012: **Design Engineer**, *Pars Fanavaran Chista (Chista Tech), Tehran, Iran.*

Research visit abroad

2019–2021 **Ph.D. visiting researcher**, *Biomechanics section, Department of Mechanical Engineering, KU Leuven University, Leuven, Belgium*

Selected recent awards and honours

2025 **Travel grants of 60,000 DKK**, (Reinholdt W. Jorck og Hustrus Fond, Myhrwolds FOND and OTTO MØNSTEDS FOND, Denmark).

2023 **Best Poster Presentation in 8th International Iranian Conference on Biomedical Engineering**, (ICBME 2023).

2021 **Ranked 1st student in PhD of Biomedical Engineering (Biomechanics)**, (Amirkabir University of Technology, Tehran, Iran).

2018 **Travel grants of 6200 Euros for PhD visiting Research.**, (Ministry of Science and Technology, Tehran, Iran).

2017 **PhD Project grants of 10000 Euros.**, (Iran National Science Foundation (INSF), Tehran, Iran).

2015 **PhD entrance ranked amongst the top 1 percent of the participants at the nationwide entrance exam for the PhD program**, (Ministry of Science and Technology, Tehran, Iran).

2015 **Selected as one of the top 50 ideas among more than 2200 ideas**, *11th National Festival of Rooyesh, Tehran, Iran.*

Publication and patents

• Total number of Peer-reviewed Journal Articles: 14 • Total number of Peer-reviewed conference Articles published in conference proceedings: 36 • Patents: 1 • Number of Book Chapters: 2 • Total refereed International journal articles: 51 • H-Index: 7 • Total Number of Citations: 155. • Number of co-authors: 29.

Supervision of graduate students

2015-present: **Supervision and co-supervision of master and PhD student (19), Aalborg University, Amirkabir University of Technology, Tehran University, TU Viena, IOWA State University, Iranian Science and Technology University, Sharif University, University of New South Wales.**

Scientific focus areas

• Finite element analysis, • Design and manufacturing of medical devices. • computational biomechanics. • Musculoskeletal modeling. • knee orthopaedics. • Bone drilling. • Bone-implant interaction. • Biomechanical evaluation methods

Selected national and international collaborators

• Orthopaedic Research Laboratory, Radboud University Medical Center, Nijmegen, NL. • Department of Health Science and Technology, Aalborg University, DK. • Department of Mechanical Engineering, KU Leven, BE. • Orthopaedic Surgery Research Unit, Aalborg University Hospital, DK. • AnyBody Technology A/S, DK. • Department of Neurosurgery and Orthopaedic Surgery, Harvard Medical School, Harvard, USA. • Boston InSilico Medical Solution LLC, USA. • Institute for Orthopaedic Research and Training, KU Leuven, Be.

Reviewing Activities

Reviewing for **• Journal of Biomechanics • Journal of Computer Methods and Programs in Biomedicine • Spine • Scientific Reports • Journal of Biomechanical Engineering • Archive of Bone and Joint Surgery • BMC Musculoskeletal Disorders • Journal of Orthopaedic Surgery and Research • Journal of Frontiers in Bioengineering and Biotechnology • International Journal for Multiscale Computational Engineering • Discover Applied Sciences.**

Teaching experiences

2025-present **Lecturer of "Biomaterials and Design of Medical Devices" for MScs**, *Department of Material and Production, Aalborg University, Aalborg, DK.*

2023, 2024 and 2025 **Teaching Assistant of "Theory of Optimization" for MScs**, *Department of Material and Production, Aalborg University, Aalborg, DK.*

2020 **Teaching Assistant of "Advanced Study Topics in Musculoskeletal Biomechanics" for MScs**, *Biomechanic Section, Department of Mechanical Engineering, KU Leuven, Belgium*

2012-2019 **Lecturer of "Strength Material Laboratory in Biomechanics" for BScs**, *Biomedical Engineering Faculty, Amirkabir University of Technology, Tehran, Iran*

2017-2019 **Lecturer of "Computer Aided Design and Engineering in Biomechanics" for BScs**, *Bio-Engineering Faculty, Amirkabir University of Technology, Tehran, Iran*

2018 **Lecturer of "Fluid Mechanics" for BScs**, *Biomedical Science Faculty, Azad University Medical Branch, Tehran, Iran*

2017 **Lecturer of "Solid Mechanics" for BScs**, *Biomedical Science Faculty, Azad University Medical Branch, Tehran, Iran*

PEER-REVIEWED JOURNAL ARTICLES

[14] M. Hassanpour, **MJ. Einafshar,** E. Massad, M. Haghpanahi, A. Kiapour, "Machine Learning Applications for Predicting Fracture of the Adjacent Vertebra after Vertebroplasty", *Intelligence-Based Medicine, (2025)(Impact factor: **2.3**)*

[13] A. Rouyin, **MJ. Einafshar,** N. Arjmand, "A novel personalized homogenous finite element model to predict the pull-out strength of cancellous bone screws", *Journal of Orthopedic Surgery and Research, (2024)(Impact factor: **2.8**)*

[12] A. Rouyin,H. Nazemi, N. Arjmand **MJ. Einafshar**, "Effect of spinal pedicle screw misplacement on pull-out strength: A personalized finite element analysis", *Computers in Biology and Medicine, (2024)(Impact factor: **7.0**)*

[11] **MJ. Einafshar,** M. Najafidoust, F. Bastami, E. Massad, A. Hashemi, "Nondestructive acoustic modal analysis for assessing bone screw stability: An ex vivo animal study", *Journal of Orthopedic Research, (2024)(Impact factor: **2.1**)*

[10] **MJ. Einafshar,** M. Rajaeirad, AB. Ghazijahani, MS. Andersen, "On the importance of precision in cortical bone drilling: Integrating experimental validation and computational modeling", *Journal of Orthopedics, (2024)(Impact factor: **1.5**)*

[9] N. Alimoradi, **MJ. Einafshar,** A. Hashemi, "Is Acoustic modal analysis a reliable substitution for Osstell® device in dental implant stability assessment? An experimental and finite element analysis study", *Medicina Oral, Patología Oral y Cirugía Bucal, (2024)(Impact factor: **1.8**)*

[8] **MJ. Einafshar,** Hashemi, A, Kiapour, A, "Evaluation of the efficacy of modal analysis in predicting the pullout strength of fixation bone screws", *Journal of Orthopedic Research Spine, (2022)(Impact factor: **3.4**)*

[7] F. Noori, **MJ. Einafshar,** A. Hashemi, F. Akhlaghi, "Biomechanical stability of two different maxillofacial screws in a rabbit model", *Journal of Regeneration, Reconstruction and Restoration (Triple R), (2022)(Impact factor: NA)*

[6] **MJ. Einafshar** A. Hashemi, GH. van Lenthe, "Replacement of Destructive Pull-out Test with Modal Analysis in Primary Fixation Stability Assessment of Spinal Pedicle Screw", *Archive of Bone and Joint Surgery*, (2022)(Impact factor: 1.24)

[5] **MJ. Einafshar** A. Hashemi, "New biomechanical approach for evaluation of spinal pedicle screw fixation stability", *Journal of Medical and Biological Engineering*, (2021)(Impact factor: **2.213**)

[4] **MJ. Einafshar** A. Hashemi, GH. van Lenthe, "Homogenized finite element models can accurately predict screw pull-out in continuum materials, but not in porous materials", *Journal of Computer Methods and Program in Biomedicine*, (2021)(Impact factor: **4.9**)

[3] **MJ. Einafshar** A. Hashemi, P. Mojgani, "Evaluation of primary stability of spinal pedicle screws using modal analysis and conventional methods", *Iranian Journal of Biomedical Engineering*, (2020)(Impact factor: NA)

[2] **MJ. Einafshar** M. Shahrezaee, MH. Shahrezaee, R. Sharifzadeh, "Biomechanical evaluation of temperature rising and applied force in controlled cortical bone drilling", *Archive of Bone and Joint Surgery*, (2020)(Impact factor: 1.24)

[1] **MJ. Einafshar** GR. Rouhi, M. Aghighi, SMJ. Mortazavi, "Alteration of the thrust force versus number of drill bit usage in cortical bone drilling", *Archive of Bone and Joint Surgery*, (2016)(Impact factor: NA)

Chapter Books

[1] M. Rajaeirad, **MJ. Einafshar,** M. Karimpour, N. Jamshidi, "Advanced Biomedical Composites: Materials, Design, Manufacturing: Patient-specific implant (PSI) design", *Walter de Gruyter GmbH & Co KG (2025)*

[2] **MJ. Einafshar,** M. Rajaeirad, MS. Andersen, "Advanced Biomedical Composites: Materials, Design, Manufacturing: Patient-specific implant (PSI) by additive manufacturing", *Walter de Gruyter GmbH & Co KG (2025)*

PHD THESIS

MJ. Einafshar (2021), "Mechanical Characterization of orthopedic bone screws using modal analysis and the correlation with pullout force and insertion torque: In-vitro, In-vivo and In-silico study", *Department of Biomedical Engineering, Amirkabir University of Technology, Tehran, Iran*

PEER-REVIEWED CONFERENCE ARTICLES PUBLISHED IN CONFERENCE PROCEEDINGS

[36] R. Yazdani **MJ. Einafshar** A. Ghoochani, N. Jamshidi , "Finite Element Analysis of Lumbar Spine Biomechanics Following Cement Augmentation with Different PMMA Volumes: A Comparison with Intact Spine", *32nd National and 10th International Iranian Conference on Biomedical Engineering (ICBME 2025)*

[35] A. Babazadeh **MJ. Einafshar** A. Hashemi , "The Influence of Insertion-Induced Prestress and Viscoelastic Properties in Fixational Stability of Pedicle Screws in UHWMPE block: a Finite Element Study ", *32nd National and 10th International Iranian Conference on Biomedical Engineering (ICBME 2025)*

[34] F. Wayzani **MJ. Einafshar** A. Hashemi , "Vibration-Based Assessment of Dental Implants: A Finite Element Study on Bone Quality and Boundary Conditions", *32nd National and 10th International Iranian Conference on Biomedical Engineering (ICBME 2025)*

[33] AH. Saveh, SA. Niknam, SM. Kazemi, S. Haji **MJ. Einafshar** A. Kiapour , "Patient-Specific Instrument Design and Application in Open-Wedge High Tibial Osteotomy", *Orthopedic Research Society (ORS 2025).*

[32] AH. Saveh, SA. Niknam, A. Sadeghi, AS. Seddighi **MJ. Einafshar** A. Kiapour , "Innovative Design and Validation of Patient-Specific Instruments for Enhanced Trajectory Precision in Posterior Spinal Fusion Surgery", *Orthopedic Research Society (ORS 2025).*

[31] A. Kiapour, M. Yoshida, M. Greenberg, M. Alonso **MJ. Einafshar** R. Bergman, TP. Schaer , "Development of 3D-Printed Interbody Fusion Devices to Enhance Biomechanical Stability and Reduce Post Surgical Complications in Canine Lumbosacral Disease", *Orthopedic Research Society (ORS 2025).*

[30] A. Kiapour, Kh. Khazaee, M. Greenberg, M. Alonso **MJ. Einafshar** S. Lozano-Caldron, TP. Schaer , "A Computationally-Designed 3D Printed Segmental Defect Implant for Optimized Mechanobiologic Performance Under Simulated Physiological Loads Using Sheep Model ", *Orthopedic Research Society (ORS 2025).*

[29] A. Babazadeh, M. Rajaeirad, A. Rouyin, A. Kiapour, MS. Andersen **MJ. Einafshar** , "Biomechanical Assessment of Pilot Hole Under Sizing on the Viscoelastic Behavior of Trabecular Bone A Finite Element Study ", *Orthopedic Research Society (ORS 2025).*

[28] Hamid Zamanlou, Filiz Karabudak, **MJ. Einafshar** , "A Review of Advances in Noninvasive Brain-machine Interface for Robotic-assisted Rehabilitation ", *International Liberty Interdisciplinary Studies Conference (USA 2024).*

[27] Ch. Williams, A. Lee, A. Tolah, **MJ. Einafshar,** E. Massaad, A. Kiapour , "Mobile-Enabled Prosthetic System with Machine Learning Support", *2024 IEEE International Conference on E-health Networking, Application and Services (HealthCom 2024).*

[26] M. Hosseinzadeh, Z. Kamal, M. Rajaeirad, **MJ. Einafshar,** N. Jamshidi , "Computational Simulation of Adolescent Idiopathic Scoliosis in the Spine ", *31st National and 9th International Iranian Conference on Biomedical Engineering (ICBME 2024).*

[25] A. Babazadeh, M. Rajaeirad, A. Rouyin, A. Kiapour, MS. Andersen **MJ. Einafshar** , "The Effect of Time-Dependent Prestresses at the Bone-Screw Interface under Bending Load", *31st National and 9th International Iranian Conference on Biomedical Engineering (ICBME 2024).*

[24] A. Kiapour, **MJ. Einafshar,** E. Maassad, "Biomechanical Assessment of a Novel Pedicle Screw System Using Finite Element Analysis", *32nd annual meeting of European Orthopaedic Research Society (EORS 2024).*

[23] M. Hassanpour, **MJ. Einafshar,** M. Haghpanahi, "Predicting Fractures in Adjacent Vertebrae Post-Vertebroplasty Using a Machine Learning Approac"h, *32nd annual meeting of European Orthopaedic Research Society (EORS 2024).*

[22] **MJ. Einafshar,** M. Rajaeirad, S. Khodabakhshi, A. Hashemi, MS, Andersen, "Osseointegration Evaluation Can Be Quantified by Mechanical Non-Destructive Acoustic Modal Analysis in an In-Vivo Study", *30th National and 8th International Iranian Conference on Biomedical Engineering (ICBME 2023).*

[21] **MJ. Einafshar,** M. Rajaeirad, S. Khodabakhshi, A. Hashemi, MS, Andersen, "Computational Prediction of Varied Feed Rates in Controlled Cortical Bone Drilling: A Bovine Animal Study", *30th National and 8th International Iranian Conference on Biomedical Engineering (ICBME 2023).*

[20] A. Babazadeh, **MJ. Einafshar,** A. Hashemi, "Long Cracks Can Alter Failure Mechanism of Meniscus in Radial Direction: An In-Vitro Study Using Animal Tissue", *30th National and 8th International Iranian Conference on Biomedical Engineering (ICBME 2023).*

[19] **MJ. Einafshar,** F. Bastami ,A. Kiapour ,A. Hashemi, " Acoustic Modal Analysis Can Quantify Bone Screw Stability in an In-vivo Animal Study", *28th Congress of the European Society of Biomechanics, Maastricht, Netherlands, ESB2023.*

[18] **MJ. Einafshar,** A. Kiapour, E. Massaad, J. Shin, "Biomechanical Stability of Lumbar Spine Instrumented with Interbody Fixation: Which Construct Provides Better Stability?", *28th Congress of the European Society of Biomechanics, Maastricht, Netherlands, ESB2023.*

[17] **MJ. Einafshar,** F. Bastami, A. Hashemi,A. Kiapour, " Bone Screw Stability Using Acoustic Modal Analysis and Conventional methods: An Animal in-vivo Study", *Danish Society of Biomechanics, Copenhagen, Denmark, DSB2022, Oral Presentation.*

[16] **MJ. Einafshar,** F. Bastami, A. Hashemi, "Biomechanical Evaluation of Bone Screw Stability Using Acoustic Modal Analysis and Conventional Pull-out: An Animal Study", *European Solid Mechanics Conference, Galway, Ireland, ESMC 2022, Oral Presentation.*

[15] **MJ. Einafshar,** M. Najafi, F. Noori, F. Bastami, F. Akhlaghi, A. Hashemi, A. Kiapour, "Biomechanical Evaluation of Maxillofacial Bone Screw Stability Using Modal Analysis and Conventional Pull-out and Insertion Torque Tests: An Animal Study", *World Congress of Biomechanics, Taipei, Taiwan,WCB 2022, Oral Presentation.*

[14] A. Kiapour, **MJ. Einafshar,** , "Effect of Implant Endplate Surface Topology on Subsidence Resistance in Cervical Interbody Fixation: Comparison of two 3D Printed Titanium Cervical Spine Fixation Devices", *World Congress of Biomechanics, Taipei, Taiwan, WCB 2022, Oral Presentation.*

[13] A. Kiapour, **MJ. Einafshar,** P. Tompsett, K. Genc, S. Lozano-Calderon, "Assessment of Biomechanics of a 3D Printed Patient Specific Hemipelvectomy Implant Used for Treatment of Pelvic Chondrosarcoma: A Computational Analysis", *Orthopedic Research Society, Tampa, FL, USA, ORS 2022, Oral Presentation.*

[12] A. Kiapour, **MJ. Einafshar,** P. Tompsett, K. Genc, S. Lozano-Calderon, "Assessment of Biomechanics of a 3D Printed Patient Specific Hemipelvectomy Implant Used for Treatment of Pelvic Chondrosarcoma: A Computational Analysis", *Orthopedic Research Society, Tampa, FL, USA, ORS 2022, Poster Presentation.*

[11] A. Kiapour, **MJ. Einafshar,** P. Tompsett, K. Genc, S. Lozano-Calderon, "Biomechanical evaluation of a patient specific 3D printed HemiPelvic implant used for surgical treatment of Pelvic chondrosarcoma: A finite element analysis", *European Muscolo-Skeltal Oncology Society, Graz, Austria, EMSOS 2021.*

[10] **MJ. Einafshar,** A. Hashemi, GH. van Lenthe, "The role of interface stresses on implant stability. An experimental-computational approach", *European Society of Biomechanics conference, Milan, Italy, ESB 2021.*

[9] **MJ. Einafshar,** A. Hashemi, GH. van Lenthe, " Can periotest® quantify spinal pedicle screw stability in agreement with pull-out test and acoustic modal analysis?", *European Society of Biomechanics conference, Milan, Italy, ESB 2021.*

[8] **MJ. Einafshar,** P. Mojgani, M. Kazemi, A. Hashemi, "Initial stability analysis of spine pedicular screws using modal analysis method", *The Biennial International Conference on Experimental Solid Mechanics (XMech), Tehran, Iran, 2020.*

[7] **MJ. Einafshar,** A. Hashemi, GH. van Lenthe, "Pull-out strength of bone screws in high density polyethylene; experimental and finite element modeling" , *18th Belgian National Day on Biomedical Engineering. Leuven, Belgium, 2019.*

[6] **MJ. Einafshar,** A. Hashemi, GH. van Lenthe, "A new method for biomechanical investigation of an orthopedic bone screw with modal analysis" , *European Society of Biomechanics conference, Vienna, Austria, ESB 2019.*

[5] A. Hooshiar, **MJ. Einafshar,** N. Mohammadi, J. Dargahi, "Bending of lumbar posterior fixation systems in tension: a large database of bending stiffness for ASTM F1717", *Orthopedic Research Society Conference, USA, ORS 2017.*

[4] S. Samsami, S. Saberi, N. Bagheri, N. Daneshvar, **MJ. Einafshar,** GR. Rouhi, "Experimental investigations on three fixation methods (css, dhs+ds, and pflp) of femoral neck fractures in young adults" , *Orthopedic Research Society Conference, USA, ORS 2015.*

[3] E. Sadeghian, SA. Hooshiar, M. Dehghan, M. Solati-Hashjin, **MJ. Einafshar**, "Biomechanical analysis of in vivo performance of a novel hydroxyapatite-based bone scaffold under low amplitude-high frequency vibrational condition" , *World Biomaterial Congress, China, WBC 2015.*

[2] HR. Ghorban, **MJ. Einafshar**, "Failure of Spinal Implants: review poster", *17th congress of spinal surgeons, Esfahan, Iran, 2012.*

[1] HR. Ghorban, **MJ. Einafshar**, "The Evolution of Material Used In Spinal Implants: review poster", *17th congress of spinal surgeons, Esfahan, Iran, 2012.*