

# Vahid Mohammadi

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Number of publications: 26

Citations: 681

h-index: 13

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## Employment History

- From 2023 ■ **Assistant Professor.** Department of Mathematics, Faculty of Science, Shahid Rajaei Teacher Training University, Tehran, Iran.
- 2021 – 2022 ■ **Postdoctoral researcher.** Department of Applied Mathematics, Faculty of Mathematics and Statistics, University of Isfahan, 81746-73441, Isfahan, Iran.

## Education

- February 2016–March 2021 ■ **Ph.D., Applied Mathematics with Applications in Biology**, Department of Applied Mathematics, Faculty of Mathematics and Computer Sciences, Amirkabir University of Technology, Tehran, Iran  
**Thesis title:** *The numerical simulation and error estimation of biomathematics problems (cancerous tumors growth) via meshless methods*  
**Supervisor:** Prof. Mehdi Dehghan  
**Advisor:** Dr. Davoud Mirzaei  
**GPA:** 18.58/20  
**Thesis score:** 20/20
- September 2012 – February 2015 ■ **M.Sc., Applied Mathematics, Numerical Analysis**, Department of Applied Mathematics, Faculty of Mathematics and Computer Sciences, Amirkabir University of Technology, Tehran, Iran  
**Thesis title:** *The use of radial basis functions for the numerical solution of system of time-dependent partial differential equations.*  
**Supervisor:** Prof. Mehdi Dehghan  
**Advisor:** Dr. Davoud Mirzaei  
**GPA:** 18.11/20  
**Thesis score:** 19.90/20
- September 2008– June 2012 ■ **BSc, Applied Mathematics**, Department of Mathematics, University of Kashan, Kashan, Iran  
**GPA:** 16.13/20

## Research Interests

- Dynamical systems,
- Ordinary differential equations (ODEs)
- Time-dependent partial differential equations (PDEs),
- Functional analysis and its applications

## Research Interests (continued)

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- 📌 Numerical methods,
- 📌 Error analysis in Sobolev spaces,
- 📌 Finite difference schemes,
- 📌 Finite element method (FEM),
- 📌 Meshless methods, theory and applications,
- 📌 Radial basis functions,
- 📌 Moving least squares approximation,
- 📌 Computational fluid dynamics,
- 📌 Incompressible fluid flows,
- 📌 Gas dynamics,
- 📌 Euler equations,
- 📌 Mathematical models in biology,
- 📌 Tumor growth models,
- 📌 Simulation of Epidemic mathematical models,
- 📌 Reaction-Diffusion equations,
- 📌 Phase field mathematical models,
- 📌 Partial differential equations on surfaces (manifolds),
- 📌 Fractional differential equations,
- 📌 Machine learning for solving PDEs problems,
- 📌 Data science.

## Research Publications

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24. Vahid Mohammadi, Mehdi Dehghan and Hamid Mesgarani, The localized RBF interpolation with its modifications for solving the incompressible two-phase fluid flows: A conservative Allen–Cahn–Navier–Stokes system, *Engineering Analysis with Boundary Elements*, 168 (2024) 105908.
23. Niusha Narimani, Mehdi Dehghan and Vahid Mohammadi, A weighted combination of reproducing kernel particle shape functions with cardinal functions of scalable polyharmonic spline radial kernel utilized in Galerkin weak form of a mathematical model related to anti-angiogenic therapy, *Communications in Nonlinear Science and Numerical Simulation*, 135 (2024) 108059.
22. Vahid Mohammadi and Mehdi Dehghan, Error estimates of divergence-free generalized moving least squares (Div-Free GMLS) derivatives approximations in Sobolev spaces, *Applied Numerical Mathematics*, 192 (2023) 373-388.
21. Vahid Mohammadi, The generalized moving least squares technique combined with a Householder transformation for computing the first derivatives on the sphere, *Journal of Discrete Mathematics and Its Applications*, 10 (1) 35-42 (2023).
20. vahid Mohammadi and Mehdi Dehghan, Error estimates of divergence-free generalized moving least squares (Div-Free GMLS) derivatives approximations in Sobolev spaces, *Applied Numerical Mathematics*, 192 (2023) 373-388.
19. Vahid Mohammadi and Mehdi Dehghan, A POD-RBF-FD scheme for simulating chemotaxis models on surfaces, *Engineering Analysis with Boundary Elements*, 143 (2022) 316-330.
18. Vahid Mohammadi, Mehdi Dehghan, Amirreza Khodadadian, Nima Noii and Thomas Wick, An asymptotic analysis and numerical simulation of a prostate tumor growth model via the generalized moving

least squares approximation combined with semi-implicit time integration, *Applied Mathematical Modelling*, 104 (2022) 826–849.

17. Vahid Mohammadi and Mehdi Dehghan, A divergence-free generalized moving least squares approximation with its application, *Applied Numerical Mathematics*, 162 (2021) 374-404.
16. Vahid Mohammadi, Mehdi Dehghan and Stefano De Marchi, Numerical simulation of a prostate tumor growth model by the RBF-FD scheme and a semi-implicit time discretization, *Journal of Computational and Applied Mathematics*, 388 (2021) 113314.
15. Vahid Mohammadi and Mehdi Dehghan, Generalized moving least squares approximation for the solution of local and non-local models of cancer cell invasion of tissue under the effect of adhesion in one- and two-dimensional spaces, *Computers in Biology and Medicine*, 124 (2020) 103803.
14. Mehdi Dehghan and Vahid Mohammadi, The boundary knot method for the solution of two-dimensional advection reaction-diffusion and Brusselator equations, *International Journal of Numerical Methods for Heat & Fluid Flow*, 31 (1) (2020) 106-133.
13. Vahid Mohammadi and Mehdi Dehghan, A meshless technique based on generalized moving least squares combined with the second-order semi-implicit backward differential formula for numerically solving time-dependent phase field models on the spheres, *Applied Numerical Mathematics*, 153 (2020) 248-275.
12. Vahid Mohammadi, Mehdi Dehghan, Amirreza Khodadadian and Thomas Wick, Numerical investigation on the transport equation in spherical coordinates via generalized moving least squares and moving kriging least squares approximations, *Engineering with Computers*, 37 (2021) 1231–1249.
11. Mehdi Dehghan and Vahid Mohammadi, Two-dimensional simulation of the damped Kuramoto-Sivashinsky equation via radial basis function-generated finite difference scheme combined with an exponential time discretization, *Engineering Analysis with Boundary Elements*, 107 (2019) 168-184.
10. Vahid Mohammadi and Mehdi Dehghan, Simulation of the phase field Cahn–Hilliard and tumor growth models via a numerical scheme: Element-free Galerkin method, *Computer Methods in Applied Mechanics and Engineering*, 35 (2019) 919-950.
9. Vahid Mohammadi, Davoud Mirzaei and Mehdi Dehghan, Numerical simulation and error estimation of the time-dependent Allen-Cahn equation on surfaces with radial basis functions, *Journal of Scientific Computing*, 79 (2019) 493-516.
8. Mehdi Dehghan and Vahid Mohammadi, Error analysis of method of lines (MOL) via generalized interpolating moving least squares (GIMLS) approximation, *Journal of Computational and Applied Mathematics* 321 (2017) 540–554.
7. Mehdi Dehghan and Vahid Mohammadi, A numerical scheme based on radial basis function finite difference (RBF-FD) technique for solving the high-dimensional nonlinear Schrödinger equations using an explicit time discretization: Runge–Kutta method, *Computer Physics Communications* 217 (2017) 23–34.
6. Mehdi Dehghan and Vahid Mohammadi, Comparison between two meshless methods based on collocation technique for the numerical solution of four-species tumor growth model, *Communications in Nonlinear Science and Numerical Simulation*, 44 (2017) 204–219.
5. Mehdi Dehghan and Vahid Mohammadi, Two numerical meshless techniques based on radial basis functions (RBFs) and the method of generalized moving least squares (GMLS) for simulation of coupled Klein–Gordon–Schrödinger (KGS) equations, *Computers and Mathematics with Applications* 71 (2016) 892–921.
4. Mehdi Dehghan and Vahid Mohammadi, The numerical simulation of the phase field crystal (PFC) and modified phase field crystal (MPFC) models via global and local meshless methods, *Comput. Methods Appl. Mech. Engrg.* 298 (2016) 453–484.




3. Mehdi Dehghan and Vahid Mohammadi, The method of variably scaled radial kernels for solving two-dimensional magnetohydrodynamic (MHD) equations using two discretizations: The Crank–Nicolson scheme and the method of lines (MOL), *Computers and Mathematics with Applications* 70 (2015) 2292–2315.
2. Mehdi Dehghan and Vahid Mohammadi, The numerical solution of Cahn–Hilliard (CH) equation in one, two and three-dimensions via globally radial basis functions (GRBFs) and RBFs-differential quadrature (RBFs-DQ) methods, *Engineering Analysis with Boundary Elements* 51 (2015) 74–100.
1. Mehdi Dehghan and Vahid Mohammadi, The numerical solution of Fokker–Planck equation with radial basis functions (RBFs) based on the meshless technique of Kansa’s approach and Galerkin method, *Engineering Analysis with Boundary Elements*, 47 (2014) 38–63.

## Conference Papers and Workshops





1. Participant in Workshop on Meshless Methods: Theory, Algorithms, Software and Applications in Finance, **Place:** Allameh Tabataba’i University, Tehran, Iran, **Collaborated with:** Department of Mathematics & Department of Mathematics at Padova University in Italy, January 27-30, 2018.
2. Vahid Mohammadi and Mehdi Dehghan, The method of variably scaled radial kernels for solving magnetohydrodynamic (MHD) equations, 49th Annual Iranian Mathematics Conference, Iran University of Science and Technology, Tehran, Iran, August 23-26, 2018.
3. Participant in 2nd Workshop on Meshless Methods and Applications in Finance, **Place:** Allameh Tabataba’i University, Iran, **Collaborated with:** Department of Mathematics, Department of Mathematics at Padova University in Italy & Uppsala University in Sweden, February 3-5, 2019.
4. Vahid Mohammadi, Mehdi Dehghan, Simulation of a local prostate tumor growth model in two-dimensional tissues, The 1st International and 3rd National Conference on Biomathematics, January 19-21, 2022.
5. Vahid Mohammadi, Simulation of a prostate tumor growth model via the local interpolation based on a scalable polyharmonic spline radial kernel augmented by polynomial, 55th Annual Iranian Mathematics Conference, Ferdowsi University, Mashhad, Iran, 2024.

## Teaching Experiences

### Teaching Assistant

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|-----------|---|
| 2013-2019 |  Teaching Assistant in “Numerical Methods in Linear Algebra” courses at Graduate level, Amirkabir University of Technology, Tehran, Iran.                  |
| 2015-2019 |  Teaching Assistant in “Differential Equations- Calculus (I) & (II)” courses at the undergraduate level, Amirkabir University of Technology, Tehran, Iran. |
| 2009-2011 |  Teaching Assistant in “Differential Equations” course at undergraduate level, University of Kashan, Kashan, Iran.   |

### Experiences

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|-------------|---|
| Fall 2015   |  Teaching Calculus II, Allameh Tabataba’i University.  |
| Winter 2018 |  Teaching Numerical Calculations, Amirkabir University of Technology, Tehran, Iran.                                      |
| Fall 2019   |  Teaching a course on topics in Mathematical Biology, Graduate course, Amirkabir University of Technology, Tehran, Iran. |
| Fall 2021   |  Teaching an online course, Numerical Analysis, Amirkabir University of Technology, Tehran, Iran.                        |

## Teaching Experiences (continued)

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- Teaching an online course, Ordinary Differential Equations, University of Isfahan, Isfahan, Iran.
- Winter 2022 Teaching an online course, Ordinary Differential Equations, University of Isfahan, Isfahan, Iran.
- Winter 2023 Teaching Engineering Mathematics, Shahid Rajaei Teacher Training University, Tehran, Iran.
- Teaching Applied Linear Algebra, Shahid Rajaei Teacher Training University, Tehran, Iran.
- Fall 2023 Teaching Ordinary Differential Equations, Shahid Rajaei Teacher Training University, Tehran, Iran.
- Teaching Calculus II, Shahid Rajaei Teacher Training University, Tehran, Iran.
- Teaching Numerical Methods in Linear Algebra, Graduated course, Shahid Rajaei Teacher Training University, Tehran, Iran.
- Winter 2024 Teaching Engineering Mathematics, Shahid Rajaei Teacher Training University, Tehran, Iran.
- Teaching Numerical Computations, Shahid Rajaei Teacher Training University, Tehran, Iran.
- Teaching Boundary Value Problems, Graduated course (Ph.D course), Shahid Rajaei Teacher Training University, Tehran, Iran.

## Invited to Review

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- International Journal of Nonlinear Sciences and Numerical Simulation,
- Inverse Problems in Science & Engineering,
- Mathematical Methods in the Applied Sciences,
- Composites Part B: Engineering,
- Composite Structures,
- Mathematical Problems in Engineering;
- Computers in Biology and Medicine;
- Computational Methods for Differential Equations;
- Journal of Mathematical Modeling;
- Engineering Analysis with Boundary Elements;
- Applied Numerical Mathematics;
- Mathematics (MDPI);
- 54th Annual Iranian Mathematics Conference, University of Zanjan, Zanjan, Iran;
- Journal of Discrete Mathematics and Its Applications (JDMA);

## Skills

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Languages	📖	Fairly good speaking, good writing, and good reading English, Persian
Coding	📖	MATLAB, Maple, Python, Fortran, IBM DB2, SQL, L <sup>A</sup> T <sub>E</sub> X, WinEdt ...
Others	📖	Microsoft Office (Word, Excel, Access, PowerPoint)

## Honors and Awards

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Fall 2019	📖	Ranked 3rd based on overall GPA among teacher assistants who were teaching Calculus I, Amirkabir University of Technology, Tehran, Iran
2017-2021	📖	Distinguished Ph.D. student of Amirkabir University of Technology, Tehran, Iran
2015	📖	Ranked 4nd based on overall GPA among MSc students of Applied Mathematics, Amirkabir University of Technology, Tehran, Iran
2012	📖	Ranked 4nd based on overall GPA among BSc students of Applied Mathematics, University of Kashan, Kashan, Iran
2016	📖	Received an Academic Award from Iran's National Elites Foundation (INEF).
2017	📖	Received an Academic Award from Iran's National Elites Foundation (INEF).
2018	📖	Received an Academic Award from Iran's National Elites Foundation (INEF).
2019	📖	Received an Academic Award from Iran's National Elites Foundation (INEF).
2021	📖	Received an Award from Amirkabir University of Technology (AUT) for the best Ph.D. project.

## References

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<b>Prof. Mehdi Dehghan</b>	Professor of Department of Applied Mathematics, Faculty of Mathematics and Computer Sciences, Amirkabir University of Technology, Tehran, Iran,
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<b>Prof. Davoud Mirzaei</b>	Associate Professor at Department of Information Technology, Division of Scientific Computing, Uppsala University,
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<b>Prof. Stefano De Marchi</b>	Professor of Numerical Analysis, Department of Mathematics, University of Padova (IT), Italy,
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## References (continued)

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**Prof. Thomas Wick** Professor for Scientific Computing at the Institute of Applied Mathematics (IfAM) of the Leibniz Universität Hannover (LUH) in Germany,

**E-mail Addresses** [thomas.wick@ifam.uni-hannover.de](mailto:thomas.wick@ifam.uni-hannover.de)

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**Prof. Abbas Saadatmandi** Professor of Applied Mathematics, University of Kashan, Kashan, Iran

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**Prof. Ebrahim Reyhani** Associate professor of mathematics education, University of Kashan, Kashan, Iran

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