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Computer Programming


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About Me

I am a computational scientist and Associate Professor at Antalya Bilim University, where I currently serve as Head of the Department of Computer Technologies and hold a cross-appointment in the Faculty of Engineering and Natural Sciences and Faculty of Economics, Administrative and Social Sciences. My research focuses on stabilized finite element methods, numerical and asymptotic techniques in computational mathematics and mechanics, and their applications to (convection-dominated) flow problems in fluid dynamics, heat and mass transfer, and engineering simulations. I have also conducted postdoctoral research at Rice University (Mechanical Engineering), and recently I have concentrated on integrating advanced numerical methods with machine learning approaches to develop innovative solutions for complex, real-world challenges.


Employment History

- 09.2023 – Present
- ◇ **Assistant Professor**, Computer Programming, Department of Computer Technologies, Antalya Bilim University, 07190 Antalya, Turkey.
 - ◇ **Assistant Professor (affiliated faculty)**, College of Business, Antalya Bilim University, Antalya 07190, Turkey.
- 03.2022 – 09.2023
- ◇ **Dr. Lecturer**, Computer Programming, Department of Computer Technologies, Antalya Bilim University, Antalya 07190, Turkey.
 - ◇ **Dr. Lecturer (affiliated faculty)**, College of Business, Antalya Bilim University, Antalya 07190, Turkey.
- 12.2017 – 03.2022
- ◇ **Lecturer**, Computer Programming, Department of Computer Technologies, Antalya Bilim University, Antalya 07190, Turkey.
 - ◇ **Lecturer (affiliated faculty)**, College of Business, Antalya Bilim University, Antalya 07190, Turkey.
- 09.2014 – 12.2017
- ◇ **Research Assistant**, Department of Economics, Antalya Bilim University, Antalya 07190, Turkey.




Administrative

- 12.2023 – ...
- ◇ **Head of Department**, Department of Computer Technologies (Computer Programming), Vocational School, Antalya Bilim University.  [web-page](#) (in Turkish)

Education

- 2014 – 2022 ♦ **Ph.D. – Scientific Computing**, Institute of Applied Mathematics, Middle East Technical University, 06800 Ankara, Turkey
Thesis title: *Stabilized Finite Element Simulations of Multispecies Inviscid Hypersonic Flows in Thermochemical Nonequilibrium*  [thesis-link](#)
Advisors: Prof. Ömür Uğur & Prof. Tayfun E. Tezduyar
- 2012 – 2014 ♦ **M.Sc. – Mathematics**, Applied Mathematics, Graduate School of Natural and Applied Sciences, Nevsehir Haci Bektas Veli University, 50300 Nevsehir, Turkey
Special student in Engineering Sciences at Middle East Technical University
Thesis title: *Asymptotic Analysis of Singular Perturbation Problems*
Advisors: Dr. Aytekin Eryilmaz & Dr. M. Tarık Atay
- 2008 – 2012 ♦ **B.Sc. – Mathematics**, Department of Mathematics, Niğde Ömer Halisdemir University, 51240 Niğde, Turkey
Graduation project: *Dual Spaces*.

Academic Facilities

- 9.2024 – 9.2025
(postponed) ♦ **Postdoctoral research associate**, Mathematical Institute, University of Oxford, Oxford OX2 6GG, UK.
Advisor: Prof. Patrick E. Farrell  [web-page](#)
- 3.2022 – 9.2022 ♦ **Postdoctoral research associate**, Mechanical Engineering, Rice University, Houston, TX 77005, US.
Advisor: Prof. Tayfun E. Tezduyar  [web-page](#)
- May 2017 ♦ **Erasmus+ visiting staff**, The Interdisciplinary Center for Scientific Computing (IWR), Ruprecht-Karls University of Heidelberg, 69120 Heidelberg, Germany.
Advisor: Prof. Anna Marciniak-Czochra  [web-page](#)

Research

Research Interests

- ♦ My research interests cover many computational areas associated with engineering sciences and mathematics, including the following (in alphabetical order):
 - Aerodynamics & High-speed Flow Computations
 - Asymptotic Methods
 - Computational Fluid Dynamics (CFD)
 - Computational Heat and Mass Transfer
 - Computational Physics & Biology
 - Differential Equations (ODE & PDE)
 - Engineering Simulations
 - (Stabilized) Finite Element Methods (FEM)
 - High-performance Computing (HPC)
 - Numerical Analysis
 - Scientific Computing & Programming
 - Scientific Machine Learning (SciML)

Journal Publications

- ♦ **Cengizci S.** Öztö H. F., Atay M. T. SUPS-based computational investigation of heat transfer in a nanofluid-filled cubic enclosure with a spherical obstacle, *Journal of Thermal Analysis and Calorimetry*, **2025**. doi: <https://doi.org/10.1007/s10973-025-14702-x>.

Research (continued)

- ◇ **Cengizci S.** A SUPS formulation for simulating natural/mixed heat convection in square cavities under intense magnetic effects, *The European Physical Journal Plus*, 139:713, **2024**. doi: <https://doi.org/10.1140/epjp/s13360-024-05481-9>.
- ◇ **Cengizci S., Uğur Ö.** A computational study for simulating MHD duct flows at high Hartmann numbers using a stabilized finite element formulation with shock-capturing, *Journal of Computational Science*, 81:102381, **2024**. doi: <https://doi.org/10.1016/j.jocs.2024.102381>.
- ◇ **Cengizci S., Uğur Ö.** A computational study for pricing European- and American-type options under Heston's stochastic volatility model: application of the SUPG- $YZ\beta$ formulation, *Computational Economics*, **2024**. doi: <https://doi.org/10.1007/s10614-024-10704-3>.
- ◇ **Cengizci S., Öztıp H. F., Mülayim G.** Natural convection in nanofluid-filled quadrantal cavities under magnetic field: Application of the SUPS formulation, *Numerical Heat Transfer, Part B: Fundamentals*, **2024**. doi: <https://doi.org/10.1080/10407790.2024.2370515>.
- ◇ **Cengizci S., Öztıp H. F., Mülayim G.** Stabilized finite element simulation of natural convection in square cavities filled with nanofluids under different temperature boundary conditions, *International Communications in Heat and Mass Transfer*, 156:107655, **2024**. doi: <https://doi.org/10.1016/j.icheatmasstransfer.2024.107655>.
- ◇ **Cengizci S., Uğur Ö., Natesan S.** SUPG-based stabilized finite element computations of convection-dominated 3D elliptic PDEs using shock-capturing, *Journal of Computational and Applied Mathematics*, 451:116022, **2024**. doi: <https://doi.org/10.1016/j.cam.2024.116022>.
- ◇ **Cengizci S., Uğur Ö., Natesan S.** Stabilized finite element method for convection-dominated problems with time-fractional derivatives, *Journal of Computational Science*, 76:102214, **2024**. doi: <https://doi.org/10.1016/j.jocs.2024.102214>.
- ◇ **Cengizci S., Uğur Ö.** A comparative and illustrative study for solving singularly perturbed problems with two parameters, *TWMS Journal of Applied and Engineering Mathematics*, 14(2):520–536, **2024**. <https://jaem.isikun.edu.tr/web/images/articles/vol.14.no.2/07.pdf>.
- ◇ **Cengizci S.** An enhanced SUPG-stabilized finite element formulation for simulating natural phenomena governed by coupled system of reaction-convection-diffusion equations, *Mathematical Modelling and Numerical Simulation with Applications*, 3(4):297–317, **2023**. doi: <http://dx.doi.org/10.53391/mmnsa.1387125>
- ◇ **Cengizci S., Natesan S.** Hybridized successive complementary expansions for solving convection-dominated 2D elliptic PDEs with boundary layers, *Computational and Applied Mathematics*, 42(6):273, **2023**. doi: <https://doi.org/10.1007/s40314-023-02411-w>.
- ◇ **Cengizci S., Uğur Ö., Natesan S.** A SUPG formulation augmented with shock-capturing for solving convection-dominated reaction-convection-diffusion equations, *Computational and Applied Mathematics*, 42(5):235, **2023**. doi: <https://doi.org/10.1007/s40314-023-02370-2>.
- ◇ **Cengizci S., Uğur Ö.** SUPG formulation augmented with $YZ\beta$ shock-capturing for computing shallow-water equations, *ZAMM–Zeitschrift für Angewandte Mathematik und Mechanik*, **2023**. doi: <https://doi.org/10.1002/zamm.202200232>.
- ◇ **Cengizci S., Uğur Ö.** A stabilized FEM formulation with discontinuity-capturing for solving Burgers'-type equations at high Reynolds numbers, *Applied Mathematics and Computation*, 442:127705, **2023**. doi: <https://doi.org/10.1016/j.amc.2022.127705>.
- ◇ **Cengizci S., Kumar D., Atay M. T.** A semi-analytic method for solving singularly perturbed twin-layer problems with a turning point, *Mathematical Modelling and Analysis*, 28(1):102–117, **2023**. doi: <https://doi.org/10.3846/mma.2023.14953>.
- ◇ **Cengizci S., Uğur Ö., Natesan S.** SUPG- $YZ\beta$ computation of chemically reactive convection-dominated non-linear models, *International Journal of Computer Mathematics*, 100(2):283–303, **2023**. doi: <https://doi.org/10.1080/00207160.2022.2114794>.
- ◇ **Cengizci S., Dursun Cengizci A., Uğur Ö.** A mathematical model for human-to-human transmission of COVID-19: a case study for Turkey's data, *Mathematical Biosciences and Engineering*, 18(6):9787–9805, **2021**. doi: <https://doi.org/10.3934/mbe.2021480>.

Research (continued)

- ◇ **Cengizci S.** A comparison between MMAE and SCEM for solving singularly perturbed linear boundary layer problems, *Filomat*, 33(7):2135–2148, **2019**. doi: <https://doi.org/10.2298/FIL1907135C>.
- ◇ **Cengizci S.**, Natesan S., Atay M. T. An asymptotic-numerical hybrid method for singularly perturbed system of two-point reaction-diffusion boundary-value problems, *Turkish Journal of Mathematics*, 43(1):460–472, **2019**. doi: <https://doi.org/10.3906/mat-1807-195>.
- ◇ **Cengizci S.** An asymptotic-numerical hybrid method for solving singularly perturbed linear delay differential equations. *International Journal of Differential Equations*, **2017**, Article ID 7269450, 2017. doi: <https://doi.org/10.1155/2017/7269450>.
- ◇ Atay M. T., **Cengizci S.**, Eryilmaz, A. SCEM approach for singularly perturbed linear turning mid-point problems with an interior layer, *New Trends in Mathematical Sciences*, 4(1):115–124, **2016**. doi: <https://doi.org/10.20852/ntmsci.2016115661>.
- ◇ **Cengizci S.**, Atay M.T., Eryilmaz A. A uniformly valid approximation algorithm for nonlinear ordinary singular perturbation problems with boundary layer solutions, *SpringerPlus*, 5(280), **2016**. doi: <https://doi.org/10.1186/s40064-016-1865-6>.
- ◇ **Cengizci S.**, Eryilmaz A. Successive complementary expansion method for solving Troesch's problem as a singular perturbation problem, *International Journal of Engineering Mathematics*, Article ID 949463, **2015**. doi: <https://doi.org/10.1155/2015/949463>.

Articles in review & on-going work

- ◇ **Cengizci S.**, Uğur Ö. Natesan S. A PINN-enhanced SUPG-stabilized hybrid finite element framework with shock-capturing for computing steady convection-dominated flows, **2025** (under review).
- ◇ **Cengizci S.**, Öztö H. F., Natesan S. A discontinuity-capturing SUPG finite element framework for simulating haptotaxis-driven cancer invasion, **2025** (under review).
- ◇ **Cengizci S.**, Uğur Ö. Stabilized finite element computation of non-reacting inviscid high-speed flows around a cylinder using $YZ\beta$ shock-capturing, **2024** (in progress).
- ◇ **Cengizci S.**, Uğur Ö. SUPG finite element computation of high-speed inviscid flows around a cylinder using $YZ\beta$ shock-capturing: II. Thermochemical nonequilibrium flows, **2024** (in progress).

Up-coming research

- ◇ Stabilized finite element computation of Onsager–Stefan–Maxwell equations
- ◇ Numerical solution of various tumor invasion models under convection dominance
- ◇ Numerical solution of partial integro-differential equations with convective terms
- ◇ Reservoir modeling within porous media
- ◇ Computational fluid dynamics simulations for urban planning
- ◇ Numerical solution of drift-diffusion equations arising in semiconductor theory
- ◇ Asymptotic and numerical methods for computational optics/photonics
- ◇ Computational Peridynamics
- ◇ Machine learning (ML) methods for computational science
- ◇ Artificial intelligence (AI) for science

Conference Presentations

- ◇ **Cengizci S.**, Uğur, Ö., Natesan S. A hybrid machine learning framework for solving convection-dominated steady-state transport problems. UNCG Virtual PDE Conference 2025, October 10–12, **2025**, Greensboro, NC. <https://mathstats.uncg.edu/pde-conference/>.

Research (continued)

- ◇ **Cengizci S.** Finite element analysis of natural convection phenomena occurring within nanofluid-filled 3D cavities. The 7th International Conference on Mathematical Modelling, Applied Analysis and Computation (ICMMAAC-24), April 18–20, **2024**, Beirut, Lebanon. <https://soas.lau.edu.lb/conferences/icmmaac-24/>.
- ◇ **Cengizci S.** Applications of the SUPG-YZ/ β finite element formulation: from mussel-algae interactions to Schnakenberg reaction models. The Eighth International Conference on Computational Mathematics and Engineering Sciences (CMES-2024), May 17–19, **2024**, Sanliurfa, Turkey. <https://www.cmescongress.org/>.
- ◇ **Cengizci S., Öztö H. F. Mülâyim G.** An application of the SUPG/PSPG finite element formulation for simulating natural convection heat transfer inside nanoliquid-filled 2D cavities. International Conference on Applied Mathematics in Engineering (ICAME'24), June 26–28, **2024**, Balıkesir, Turkey. <https://icame.balikesir.edu.tr/>.
- ◇ **Cengizci S., Uğur Ö.** Pricing European- and American-type options under stochastic volatility: a computational study. Fifth Romanian Itinerant Seminar on Mathematical Analysis and its Applications, May 26–28, **2023**, Craiova, Romania. <http://rismaa.ucv.ro/>.
- ◇ **Cengizci S.** Stabilized finite element simulations of dam-break problems. International E-Conference on Mathematical and Statistical Sciences: A Selçuk Meeting, October 20–22, **2023**, Selçuk University, Konya, Turkey. <https://icomss22.selcuk.edu.tr/>.
- ◇ **Cengizci S.** Stabilized finite element computations augmented with shock-capturing: 3D convection-diffusion equations. International Conference on Analysis and Applied Mathematics (ICAAM), October 31–November 6, **2022**, Antalya, Turkey. <http://icaam-online.org/>.
- ◇ **Cengizci S., Uğur Ö., Natesan S.** Stabilized finite element simulations for Burgers'-type equations, International Conference on Analysis and Its Applications (ICAA NEPAL 2021), April 9–11, **2021**, Kathmandu University, Dhulikhel, Nepal. <http://icaa2021.ku.edu.np/>.
- ◇ **Cengizci S., Uğur Ö., Tezduyar T.E.** Stabilized numerical simulations of hypersonic flows in thermochemical nonequilibrium with FEniCS, FEniCS2021, 22–26 March **2021**, University of Cambridge, Virtual Conference. <https://fenics2021.com/talks/cengizci.html>.
- ◇ **Cengizci S., Uğur Ö.** SUPG-stabilized finite element formulation of shallow-water equations. International Conference of Young Mathematicians, June 3–5, **2021**, Institute of Mathematics of NAS of Ukraine, Kyiv, Ukraine. <https://www.imath.kiev.ua/~young/youngconf2021/index.php?lang=en>.
- ◇ **Cengizci S., Uğur Ö., Takizawa K., Tezduyar T.E.** A streamline-upwind/Petrov–Galerkin formulation for supersonic and hypersonic flow simulations, The 20th Biennial Computational Techniques and Applications Conference (CTAC2020), 30th Aug–2nd Sep **2020**, Sydney, NSW, Australia. <https://www.ctac2020.unsw.edu.au/>.
- ◇ **Cengizci S., Uğur Ö., Natesan S.** A stabilized finite element formulation for numerical simulation of convection-dominated reactive models, Advances in Differential Equations and Numerical Analysis (ADENA), October 12–14, **2020**, Indian Institute of Technology Guwahati, India. <https://www.iitg.ac.in/maths/ext/adena2020/>.
- ◇ **Cengizci S.** Some numerical experiments on singularly perturbed problems with multi-parameters, 8th International Eurasian Conference on Mathematical Sciences and Applications (IECMSA-2019), August 27–30, **2019**, Baku, Azerbaijan. <http://www.iecmsa.org/2019/>.
- ◇ **Cengizci S.** Some comparisons between MMAE and SCEM for solving singularly perturbed linear problems, The Third International Conference on Computational Mathematics and Engineering Sciences (CMES2018), May 4–6, **2018**, Girne, Cyprus.
- ◇ **Cengizci S., Eryilmaz A.,** “A hybrid approach for solving singularly perturbed turning point problems exhibiting dual layers”, International Conference on Mathematics and Mathematics Education (ICMME-2016), May 12–14, **2016**, Firat University, Elazığ, Turkey. <http://theicmme.org/2016/Default.aspx>.
- ◇ **Cengizci S., Atay M.T., Eryilmaz A.** A uniformly valid approximation algorithm for singularly perturbed two-point boundary value problems in nonlinear ordinary differential equations, International Conference on Advancements in Mathematical Sciences, November 5–7, **2015**, Antalya, Turkey.

Research (continued)

Research Projects

- ◇ **September 2025 — TÜBİTAK-1002:** *Stabilized Finite Element Simulations of Haptotactic Tumor Invasion in Convection-Dominated Environments*. A Short Term Support Module by the Scientific and Technological Research Council of Turkey. **Principal Investigator**. Duration: 12 Months. Budget: more than EUR 2,200.
- ◇ **March 2023 — TÜBİTAK-2219:** *Stabilized finite element methods for simulating convection-dominated multi-component transport phenomena*. International Postdoctoral Research Fellowship Program for Turkish Citizens by the Scientific and Technological Research Council of Turkey. **Research Fellow**. Duration: 2023-2024. Budget: more than EUR 28,200.

Teaching

- ◇ **The courses I have been teaching since 2017 as a Lecturer/Asst. Prof. at Antalya Bilim University:**
 - Calculus for Social Sciences I–II (Dept. of Business Adm.) ×6
 - Mathematics I–II (Dept. of Economics) ×3
 - Introduction to Linear Algebra (Dept. of Business Adm.) ×7
 - Professional English (Dept. of Computer Tech.) ×1
 - Computer Hardware (Dept. of Computer Tech.) ×3
 - Information Technologies (Faculty of Adm. and Soc. Sci.) ×2
 - Business Analytics (Dept. of Business Adm.) ×1
 - Numerical Analysis for Engineers (Faculty of Engineering) ×3
 - Advanced Engineering Mathematics (Dept. of Mechanical Eng.) ×1
 - Data Mining (Dept. of Computer Tech.) ×1
 - Differential Equations (Faculty of Engineering) ×5
 - Artificial Intelligence (Dept. of Computer Tech.) ×1
 - Statistics for Social Sciences (Dept. of Political Sciences) ×5
 - Decision Analysis Techniques (Faculty of Adm. and Soc. Sci.) ×1
 - Computer Security (Dept. of Computer Tech.) ×1
 - Technical Mathematics (Dept. of Architecture) ×3
 - Introduction to Programming II (Dept. of Computer Tech.) ×2
 - Fluid Mechanics I (Dept. of Mechanical Eng.) ×1
 - Introduction to Numerical Methods (Dept. of Business Adm.) ×1
 - Introduction to Computational Fluid Dynamics (Dept. of Mechanical Eng.) ×1
- ◇ **The courses I assisted between 2014–2017 as a Teaching Assistant at Antalya Bilim University:**
 - Calculus for Social Sciences I–II (Dept. of Economics) ×2
 - Introduction to Linear Algebra (Dept. of Business Adm.) ×2
 - Mathematical Economics (Dept. of Economics) ×1
 - Microeconomics (Dept. of Economics) ×1

Skills

Languages ◇ Turkish, English, German (beginner)

Coding & Software ◇ Python (coding), C++ (coding), Matlab (computing), \LaTeX , Linux (Ubuntu) (OS), FEniCS (computing), Firedrake (beginner) (computing), SU2 (beginner) (computing), Pointwise (meshing)

Miscellaneous

Referee/Reviewer

International journals (indexed in WoS) I have been reviewing for:

- Numerical Algorithms
- International Journal for Numerical Methods in Engineering
- Computational and Applied Mathematics
- Zeitschrift für angewandte Mathematik und Physik (ZAMP)
- Rocky Mountain Journal of Mathematics
- Journal of the Brazilian Society of Mechanical Sciences and Engineering
- IEEE Transactions on Signal Processing
- Journal of Nonlinear Modeling and Analysis
- Mathematical Sciences
- Nanotechnology Reviews
- Heliyon
- Zeitschrift für Angewandte Mathematik und Mechanik (ZAMM)
- Mathematical Methods in the Applied Sciences
- Gazi University Journal of Science
- Computational Economics
- Journal of Porous Media
- Journal of Nonlinear Modeling and Analysis
- Engineering Applications of Computational Fluid Mechanics
- Physics of Fluids
- Numerical Heat Transfer, Part A: Applications
- Journal of Computational and Applied Mathematics
- Acta Mechanica Sinica
- Communications in Statistics - Simulation and Computation
- International Journal of Computer Mathematics
- Journal of Computational Design and Engineering
- Neural Processing Letters
- Mathematical Modelling and Analysis
- Differential Equations and Dynamical Systems
- Journal of Applied Mathematics
- Hacettepe Journal of Mathematics and Statistics
- Applied Mathematics-A Journal of Chinese Universities

Other Teaching Experience

- 2019–2021 ♦ **International Baccalaureate Math Teacher**, Antalya Yusuf Ziya Öner High School for Science, Antalya 07192, Turkey.

Certification

- 2019 ♦ **Educator** – Mathematics for the International Baccalaureate (IB) Diploma: Higher Level. Awarded by the IB).
- 2014 ♦ **Educator** – Mathematics for High Schools. Awarded by Faculty of Education, Akdeniz University, Antalya 07058, Turkey.

Panelist

- 2019 ♦ **Observer Panelist**, Mathematics and Physics Research Group, The Scientific and Technological Research Council of Turkey (TÜBİTAK), 18.09.2020.


Academic Awards


- ♦ **Doctoral thesis award**, Middle East Technical University, 2023. [Link](#)
- ♦ **Academic publication encouragement award**, Antalya Bilim University (×3)


Miscellaneous (continued)


- ◆ **Publication encouragement award**, The Scientific and Technological Research Council of Turkey (TUBITAK) UBYT ($\times 7$)

References

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