Birgul Koc

Cirriculum Vitae

IFP Energies Nouvelles (IFPEN)
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Academic Position

June 2022 – May 2023 **Postdoctoral researcher**, *IFPEN, France*.
- *Project : Transport Problem on the Porous Media*
- *colloborate with Guillaume Enchéry (IFPEN), Angelo Iollo (INRIA), and Tommaso Taddei (INRIA)*

May 2021 – April 2022 **Postdoctoral research fellow**, *Institute of Mathematics of the University of Seville (IMUS), University of Seville, Seville, Spain*.
- *Project : Reduced Order Modeling of sub-mesh components in Variational Multiscale methods*
- *work with Professor Tomás Chacón Rebollo*

Fall 2016 – Spring 2021 **Research/Teaching Assistant**, *Virginia Tech, Blacksburg, VA, USA*.

Education

August 2016 – May 2021 **Virginia Tech, Blacksburg, USA**, *Ph.D. Mathematics*.
- *Advisor : Professor Traian Iliescu*
- *Dissertation : Numerical Analysis for Data-Driven Reduced Order Model Closures*
- *GPA : 3.58/4.00*

August 2016 – December 2018 **Virginia Tech, Blacksburg, USA**, *M.S. Mathematics*.
- *Advisor : Professor Traian Iliescu*
- *Thesis : Commutation Error in Reduced Order Modeling*
- *GPA : 3.58/4.00*

September 2009 – June 2014 **Middle East Technical University, Ankara, Turkey**, *B.S. Mathematics*.
- *GPA : 3.24/4.00*

Research Interests

Applied mathematics, numerical analysis, turbulent flows, reduced order modeling (ROM), closure modeling, data-driven modeling, variational multiscale methods, transport problem, and porous media.

Awards & Achievements

2021 Poster judging at SIAM (CSE21) conference.

2021 SIAM Student Travel Award to attend SIAM Conference on Computational Science and Engineering (CSE21))

2020 SIAM Student Travel Award to attend The Second Joint SIAM/CAIMS Annual Meeting (AN20)

2020 Travel Award to attend SIAM-SEAS 2020

Publications

Koc. B., Rubino, S., Schneier, M., Singler, J. R., & Iliescu, T. (2021). *On optimal pointwise in time error bounds and difference quotients for the proper orthogonal decomposition.* SIAM Journal on Numerical Analysis, 59(4), 2163-2196.

Mou, C., Koc, B., San, O., Rebholz, L.G., & Iliescu, T., 2021. *Data-driven variational multiscale reduced order models*. Computer Methods in Applied Mechanics and Engineering, 373, p.113470.

LC Berselli, T Iliescu, B Koc, & R Lewandowski. *Long-time Reynolds averaging of reduced order models for fluid flows: Preliminary results.* Mathematics in Engineering 2 (1), 1-25, 2020.

Koc, B., Mohebujjaman, M., Mou, C., and Iliescu, T. (2019). *Commutation error in reduced order modeling of fluid flows*. Advances in Computational Mathematics, 45(5-6):2587–2621.

Koc, B. (2021). *Numerical analysis for data-driven reduced order model closures (Ph.D's thesis)*. https://vtechworks.lib.vt.edu/handle/10919/103202.

Koc, B. (2018). *Commutation Error in Reduced Order Modeling (Master's thesis)*. http://hdl.handle.net/10919/87537.

Preprints

Koc, B., Rebollo, T. C., & Iliescu, T. (2022). *Residual Data-Driven Variational Multiscale Reduced Order Models for Parameter Dependent Problems*. arXiv preprint arXiv :2208.00059.

Koc, B., Rebollo, T. C., & Rubino, S. (2022). *Uniform Bounds with Difference Quotients for Proper Orthogonal Decomposition Reduced Order Models of the Burgers Equation*. arXiv preprint arXiv :2206.03589.

Koc, B., Mou, C., Liu, H., Wang, Z., Rozza, G., & Iliescu, T. (2021). Verifiability of the data-driven variational multiscale reduced order model. arXiv preprint arXiv:2108.04982.

Peer Reviewer

2022 Journal of Computational Physics (JOCMP), ISSN:0021-9991.

2022 Frontiers in Physics, ISSN:2296-424X.

Conferences

2022 **XXVII Congress of Differential Equations and Applications (CEDYA2022)**, *University of Zaragoza*, Title: Residual-Based Data-Driven Variational Multiscale Reduced Order Model (D2-VMS-ROM).

2022 **Young Researchers Workshop on Probability and PDEs**, *Institute of Mathematics of Granada (IMAG)*, Poster Title: Coefficient-Based Data-Driven Variational Multiscale Reduced Order Model (D2-VMS-ROM).

2021 **Midwest Numerical Analysis Day (MWNAD21)**, *Missouri Science and Technology, virtual*, Title: Verifiability of the Data-Driven Variational Multiscale Reduced Order Model.

2021 **Computational Science and Engineering (CSE21)**, *virtual*, Title: Verifiability and Limit consistency of the Data-Driven Variational Multiscale Reduced Order Model.

2020 **Center for Mathematics and Artificial Intelligence (CMAI)**, *George Mason University, virtual*, Title: Data-Driven Variational Multiscale Reduced Order Models, https://cmai.gmu.edu/index.php/events/#colloquium.

2020 **The Second Joint SIAM/CAIMS Annual Meeting (AN20)**, *Canada, virtual*, Title: Data-Driven Variational Multiscale Reduced OrderModels, https://meetings.siam.org/sess/dsp_programsess.cfm?SESSIONCODE=68897.

2019 **Finite Element Circus**, *Virginia Tech*, Title: Variational Multiscale Data-Driven Closure Reduced Order Model, https://www.math.vt.edu/math-news/news-2019/news-circus.html.

2019 **SIAM Southeastern Atlantic Section Meeting**, *Tennessee*, Title: Data-Driven Variational Multiscale Reduced Order Model (DD-VMS-ROM).

2019 **SIAM Conference on Computational Science and Engineering**, *Washington*, Title: The Commutation Error for Large Eddy Simulation Reduced Order Models (LES-ROMs), https://www.siam.org/Portals/0/Conferences/cse19/CSE19_Program_with_abstracts.pdf.

2018 **Fall Fluid Mechanics Symposium**, *Virginia Tech*, Title: Commutation Error in Reduced Order Modeling.

2018 **9th Annual Graduate Student Mini-conference in Computational Mathematics**, *South Carolina*, Title: Large Eddy Simulation Reduced Order Modeling, http://imi.cas.sc.edu/events/9th-computational-mathematics/program/.

2017 **Conference on Classical and Geophysical Fluid Dynamics**: **Modeling, Reduction and Simulation**, *Virginia Tech*.

2017 **VT Graduate Student Conference**, *Virginia Tech*, Title: Spatial Filtering of Reduced Order Models.

Teaching

RA Research Assistant, Virginia Tech

–Summer 2017, 2018, 2019, 2020, and Fall 2020.

TA Teaching Assistant, Virginia Tech

–Fall 2016, Spring 2017, Fall 2017, Spring 2018, Spring 2020, and Spring 2021 semesters

Instructor Instructor, Virginia Tech

–For Fall 2018 and Fall 2019, Instructor for MATH 1225 : Calculus I

–For Spring 2019 Instructor for MATH 1226 : Calculus II

Complementary Skills

Language English (Advanced, 5 years living in the USA), Spanish (Beginner), and Turkish (native).

Programming Matlab