Craig Michoski[ϒ]

Curriculum Vitæ

Contact: Sapientai LLC
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Professional Experience:

- CEO, Sapientai LLC (2019-present)
- Research Scientist, ODEN Institute for Computational Engineering and Sciences (ODEN), University of Texas at Austin (2015-present)
- Research Associate (John A. Evans), Aerospace Engineering Sciences, University of Colorado Boulder (2014-2015)
- Lecturer, Department of Aerospace Engineering & Engineering Mechanics, University of Texas at Austin (2012)
- Research Associate (Clint Dawson), Institute for Computational Engineering and Sciences (ICES), University of Texas at Austin (2012-present)
- Postdoctoral Fellow (Clint Dawson), Institute for Computational Engineering and Sciences (ICES), University of Texas at Austin (2009-2012)
- Graduate Teaching Assistant, Department of Chemistry and Biochemistry, University of Texas at Austin (2003-2009)
- Technical staff (Makkuni Jayaram), Institute for Cellular and Molecular Biology (ICMB), University of Texas at Austin (2003)
- Technical Staff (Barry Pryor), The School of Plant Sciences, University of Arizona (2001-2002)
- Technical Staff (Kevin Jones), Department of Molecular, Cellular, and Developmental Biology (Neurobiology), University of Colorado Boulder (1999)
- Research Assistant (Steve Schultz), Department of Chemistry and Biochemistry, University of Colorado Boulder (1998-1999)

Education:

PhD, Computational Chemistry & Applied Mathematics

- University of Texas at Austin (2009)
- Co-Advisor: Alexis F. Vasseur, *Department of Mathematics*
- Co-Advisor: John F. Stanton, *Department of Chemistry & Biochemistry*
- Dissertation title: *Evolution Equations in Physical Chemistry*

B.A. in Chemistry & Biochemistry

- University of Colorado Boulder (1999)

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Honors and Awards:

Data-enabled Fusion Technology (DeFT) (2020)

- ARPA-E

Partnership for Multiscale Gyrokinetic (MGK) Turbulence (2018)

- Department of Energy

Partnership Center for High-Fidelity Boundary Plasma Simulation (2017)

- Department of Energy

SI2-SSI: Collaborative Research: STORM: A Scalable Toolkit for an Open Community Supporting Near Realtime High Resolution Coastal Modeling (2014)

- National Science Foundation

Honorarium, Republic of Korea, Dong-A University, Busan (2012)

- Department of Mathematics, Dong-A University (Professor Young-Sam Kwon)

Chemistry award (2009)

- Department of Chemistry & Biochemistry, UT Austin

NSF interdisciplinary RTG Fellowship (2008)

- Department of Mathematics, UT Austin

Welch teaching award (2003-2004)

- Department of Chemistry & Biochemistry, UT Austin

Selected Publications:

Full Google Scholar Page

1. Dongyang Kuang and Craig Michoski. Dual stream neural networks for brain signal classification. *Journal of Neural Engineering*, 18(1):016006, 2021
2. Craig Michoski, Miloš Milosavljević, Todd Oliver, and David R Hatch. Solving differential equations using deep neural networks. *Neurocomputing*, 399:193–212, 2020
3. Craig Michoski, Clint Dawson, Ethan J Kubatko, Damrongsak Wirasaet, S Brus, and Joannes J Westerink. A comparison of artificial viscosity, limiters, and filters, for high order discontinuous galerkin solutions in nonlinear settings. *Journal of Scientific Computing*, 66(1):406–434, 2016

4. Craig Michoski, Jesse Chan, Luke Engvall, and John A Evans. Foundations of the blended isogeometric discontinuous galerkin (bidg) method. *Computer Methods in Applied Mechanics and Engineering*, 305:658–681, 2016

5. Craig Michoski, Alen Alexanderian, C Paillet, Ethan J Kubatko, and Clint Dawson. Stability of nonlinear convection–diffusion–reaction systems in discontinuous galerkin methods. *Journal of Scientific Computing*, 70(2):516–550, 2017

6. Danial Faghihi, Varis Carey, Craig Michoski, Robert Hager, Saloman Janhunen, Choong-Seock Chang, and RD Moser. Moment preserving constrained resampling with applications to particle-in-cell methods. *Journal of Computational Physics*, 409:109317, 2020

7. Craig Michoski, Chris Mirabito, Clint Dawson, Damrongsak Wirasaet, Ethan J Kubatko, and Joannes J Westerink. Adaptive hierarchic transformations for dynamically p-enriched slope-limiting over discontinuous galerkin systems of generalized equations. *Journal of Computational Physics*, 230(22):8028–8056, 2011

8. Clint Dawson, Ethan J Kubatko, Joannes J Westerink, Corey Trahan, Christopher Mirabito, Craig Michoski, and Nishant Panda. Discontinuous galerkin methods for modeling hurricane storm surge. *Advances in Water Resources*, 34(9):1165–1176, 2011

9. Ali Samii, Craig Michoski, and Clint Dawson. A parallel and adaptive hybridized discontinuous galerkin method for anisotropic nonhomogeneous diffusion. *Computer Methods in Applied Mechanics and Engineering*, 304:118–139, 2016

10. C Michoski, C Dawson, C Mirabito, EJ Kubatko, D Wirasaet, and JJ Westerink. Fully coupled methods for multiphase morphodynamics. *Advances in water resources*, 59:95–110, 2013

Other Major Publications

1. C. Michoski. **ArcSyn3sis**: an open-source toolkit for coprocessor accelerated HPC models using Blended Isogeometric Discontinuous Galerkin (BIDG) Methods, using HPX, OCCA, and MPI+OpenMP.

2. C. Michoski, F. Waelbroeck. **ArcOn**: an open-source turbulent plasma toolkit for high performance computing applications (github).

3. C. Michoski, E. Kubatko, C. Dawson, C. Mirabito, S. Brus, J.J. Westerink, D. Wirasaet, et al., Discontinuous Galerkin Shallow Water Equation Model (**DG-SWEM**): A framework for large-scale geophysical flow modeling (github).

Teaching:

Engineering Computation (2012)
Advanced Physical Chemistry Laboratory (2009, 2005, 2004)
Research Methods (2008, 2007, 2006)
Physical Chemistry *Thermodynamics & Kinetics* (2008, 2007)
Dean Scholars (2005)
Physical Chemistry Laboratory (2006, 2005, 2004, 2003)

Current professional membership:

Society for Industrial and Applied Mathematics (SIAM)
American Mathematical Society (AMS)
American Physical Society (APS)
American Chemical Society (ACS)

Talks and Proceedings:

1. **2018-present**
   - Many more ....
2. **ICES-IFS Meeting, Austin, TX**
   - Seminar: Surrogate Modeling and Isogeometric Analysis in Fusion
   - July 2, 2018
3. **SciDAC Fusion Machine-Learning Workshop, Princeton, NJ**
   - Invited talk: Examples of Machine Learning in Fusion Applications
   - June 6-7, 2018
4. **Partnership Center for High-Fidelity Boundary Plasma Simulation, Denver, CO**
   - Status talk: Uncertainty Quantification and Particle Resampling
   - March 19-21, 2018
5. **59th Annual Meeting of the APS Division of Plasma Physics, Milwaukee, WI**
   - Invited talk: Global Surrogates for the Upshift of the Critical Threshold in the Gradient for ITG Driven Turbulence
   - October 23-27, 2017
6. **Workshop on High-Fidelity Boundary Plasma Simulation on Leadership Class Computers, Princeton, NJ**

- Invited talk: Uncertainty Quantification
- October 4-6, 2017

7. **Texas Applied Mathematics and Engineering Symposium, Austin, Texas**

   - Invited talk: Performance Comparison of HPX vs. OCCA for the Discontinuous Galerkin Finite Element Method on Knights Landing Chips
   - September 22 2017

8. **The Applied Mathematics Colloquium, APAM, Columbia University, NYC, NY**

   - Invited talk: The Blended Isogeometric Discontinuous Galerkin Method in Exascale Computing
   - September 12 2017

9. **International Atomic Energy Agency (IAEA) Technical Meeting on Fusion Data Processing, Validation and Analysis, Boston, MA**

   - Invited talk: Towards a tokamak steady-state model
   - May 30 – June 2, 2017

10. **SIAM Conference on Computation Science & Engineering, Atlanta, GA**

    - Invited talk: Scaling at Exascale in Blended Isogeometric, Discontinuous Galerkin and PIC Approaches
    - March 1 2017

11. **American Meteorological Society Annual Meeting, 3rd Symposium on HPC for Weather, Water, and Climate. Seattle, WA.**

    - Invited talk: Application of High Performance ParallelX (HPX) for High Performance Computing of Hurricane Storm Surge
    - January 2017

12. **QUEST Annual Workshop, New York at Stony Brook, NY**

    - Invited talk: Uncertainty Quantification in Gyrokinetic Simulation of Plasma
    - July 7 2016

13. **NIFS, Toki, Japan**

    - Invited talk: Contaminant Transport in LHD
    - October 25 2016

14. **NIFS, Toki, Japan**

    - Invited talk: Computationally Engineering Fusion
    - October 5 2016

15. **EPSI/QUEST Collaboration, Stony Brook, NY**

    - Invited talk: Uncertainty Quantification in Gyrokinetic Simulation of Plasma
    - July 7 2016

16. **ECCOMAS Congress 2016, Crete Island, Greece**

    - Invited talk: Stabilizing/Optimizing Fluvial Water Systems with DG Methods
    - June 8 2016

17. **Center for Computational Mathematics Seminar, Denver, CO**

    - Invited talk: An Introduction to Discontinuous Isogeometric Methods in Reactive Magnetized Plasma
    - October 5 2015

18. **13th U.S. National Congress on Computational Mechanics (USNCCM13), San Diego, CA**

    - Isogeometric Methods for Complex and Multi-physics Systems
    - Invited talk: Blended Isogeometric-Discontinuous Galerkin Methods for Multiphysics Applications and Shape Optimization
    - July 29 2015

19. **SIAM Conference on Mathematical and Computational Issues in the Geosciences, Palo Alto, CA**

    - Stability of Nonlinear Convection-Diffusion-Reaction Systems in Discontinuous Galerkin Methods
    - June 29, 2015

20. **Boulder Fluids Seminar Series, Boulder, CO**

    - Discontinuous Galerkin methods in coastal engineering, geophysical flow modeling, and plasma dynamics
    - June 2, 2015

21. **2015 Sherwood Fusion Theory Conference**

    - Title: RF Wave Propagation and Scattering in Turbulent Tokamaks: Reactive Magnetized Plasma
    - March 2015

22. **Applied Mathematics, Changwon National University Changnyeong, Gyeongsannam-do, South Korea**

    - Short Course: An Introduction to Discontinuous Galerkin Methods
    - January 28–Feb 14, 2015

23. **Aerospace Engineering Sciences (Computational Mechanics Seminar), Boulder, CO**

    - Invited talk: A Primer on Discontinuous Galerkin Methods, DG-SWEM, and ArcOn
    - December 2, 2014

24. **STORM kickoff meeting, Baton Rouge, LA**

    - Invited talk: A Primer on DG methods, and DG-SWEM
    - October 21, 2014

25. **HyPerComp Inc., Las Angelas, CA**

    - Invited talk: Finite Elements in Nonlinear Applications
    - August 5, 2014

26. **World Congress on Computational Mechanics (WCCM IX), Barcelona, Spain**

    - Invited talk: Stabilization techniques in discontinuous Galerkin methods
    - July 23, 2014

27. **International Conference on Spectral and High Order Methods (ICOSAHOM'14), Salt Lake City, UT**

    - Invited talk: Regularizing nonlinear systems with discontinuous solutions in higher order methods
    - June 27, 2014

28. **12th U.S. National Congress on Computational Mechanics (USNCCM12), Raleigh, NC**

    - Invited talk: Discontinuous Galerkin Methods in Coastal Dynamics
    - July 24 2013

29. **MIT, Multidisciplinary simulation, estimation, and assimilation systems, Boston, MA**

    - Invited talk: Discontinuous Galerkin Methods in Nonlinear Dynamics
    - February 28 2013

30. **2013 SIAM Conference on Computational Science and Engineering, Boston, MA**

    - Co-organizer, Mini-symposium: Advances in Computational Methods for Wave phenomena
    - (Spring 2013) Talk title: Discontinuous Galerkin methods in wave phenomena, tokamaks and storm surge

31. **University of Cambridge, Isaac Newton Institute for Mathematical Sciences, Cambridge, United Kingdom**

- Session: Adaptive Multiscale Methods for the Atmosphere and Ocean
- (Fall 2012) Talk title: Adaptive multiscale discontinuous Galerkin methods for multiphase morphodynamics

32. **SIAM Conference on the Life Sciences (LS12), Minneapolis, MN**

    - (Summer 2012) Talk title: Fully Coupled Multiphase Morphodynamics

    University of Houston, Scientific Computing Seminar, Houston, TX

    - (Fall 2011) Talk title: Adaptive Hierarchical Slopelimiting.

33. **11-th US National Congress on Computational Mechanics (USNCCM-11), Minneapolis, MN**

    - (Summer 2011) Talk title: Dynamic p-enrichment Schemes with Dynamic Slopelimiting for Multicomponent Reactive Flows.

34. **IMA Annual Program Year Workshop, Minneapolis, MN**

    - (Spring 2009) Title: Chemical Dynamics: Challenges and Approaches.

35. **Working Dynamical Systems Seminar Series, Austin, TX**

    - (Fall 2008) Talk title: Nonlinear PDEs, Finite Elements and Universal Attractors

36. **Group Theory Seminar Series, Austin, TX**

    - (Summer 2006) A workshop lecture series on advanced topics in group theory held in the Mathematics and Physics Departments. Several talks were given on topics ranging from loop groups to perturbation theory.

Professional Journal Referee:

Canadian Journal of Physics
Communications in Computational Physics
Computational Geosciences
Computers and Fluids
Computer Methods in Applied Mechanics and Engineering
Journal of Physics A: Mathematical and Theoretical
Journal of Physics D: Applied Physics
Nonlinearity
Numerical Algorithms
Ocean Dynamics
Plasma Physics and Controlled Fusion