Jacob Badger

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Objective

First-year Ph.D. student pursuing a multi-disciplinary degree in Computational Science, Engineering, and Mathematics (CSEM). Passionate problem solver and researcher. Strong technical, interpersonal, and presentation skills. Particularly interested in predictive modeling, and high-order finite element methods.

Education

Academics

University of Texas at Austin — **Austin, TX**
Ph.D. in Computational Science, Engineering, and Mathematics (CSEM) — *2019–present*

- CSEM Fellow

Brigham Young University — **Provo, UT**
BS in Mechanical Engineering and Mathematics (double major) — *2015–2019*

- GPA: 3.95/4.0
- GRE: 170 V, 170 Q (perfect scores)

Notable Projects

BYU Mars Rover: *Autonomous Navigation*

Designed and implemented software for autonomous navigation and obstacle avoidance using LIDAR and stereo-camera sensors. Used fuzzy-logic to classify obstacles, potential fields to avoid obstacles, and a neural net to recognize target objects (tennis balls). Implemented in Python/ROS, with limited C++.

Experience

Graduate Research Assistant — **University of Texas at Austin**
Dr. Leszek Demkowicz — *July 2018 – March 2019*

- Developed a distributed multigrid preconditioned conjugate gradient solver for *hp*-adaptive DPG methods
- Developed sum factorization algorithms for fast integration of DPG matrices on prismatic elements

Undergraduate Research Assistant — **Brigham Young University**
Dr. Larry Howell, Dr. Vianey Villamizar, Dr. Brent Webb — *Nov. 2016 – May 2019*

- Developed novel equations and algorithms for identifying "natural" curved fold configurations
- Derived and implemented novel high-order local absorbing boundary conditions for acoustic scattering
- Implemented novel SLW radiative heat transfer models in comprehensive combustion models

Teaching Assistant — **Brigham Young University**
ME 505—Applied Engineering Math — *Sept. 2018 – Dec. 2018*

- Helped students understand PDE solution methods including eigenfunction expansions and integral transforms

Religious Mission — **Buenos Aires, Argentina**
LDS Church — *Aug. 2013 – Aug. 2015*

- Learned Spanish and worked with people from diverse cultures in humanitarian and missionary efforts

Technical and Personal Skills

- **Programming Languages:** C++/C, Fortran, MATLAB, Python, Mathematica, HTML/CSS
- **Software:** Matlab (Advanced), Solidworks (Advanced), Fluent (Advanced), ANSYS (Intermediate)
- **Communication:** Spanish (Advanced).
- **Other:** Skilled problem solver, quick learner, relentless.

Publications, Presentations, and Grants

Journal Articles

J.C. Badger, S. Henneking, and L. Demkowicz, 2019. "Fast integration of DPG matricies based on sum-factorization." *Oden Institute Report*, 19-15.

J.C. Badger, T.G. Nelson, R.J. Lang, D.M. Halverson, and L.L. Howell, 2018. "Normalized Coordinate Equations and Energy Method for Predicting Natural Curved-Fold Configurations." *Journal of Applied Mechanics*, **86**(7), p.071006.

J.C. Badger, V.P. Solovjov, and B.W. Webb, (in press). "An Exploration of Advanced SLW Modeling Approaches in Comprehensive Combustion Predictions." *Combustion Science and Technology*.

J.C. Badger, S. Acosta, and V. Villamizar, (2019). "High-order local ABC and scaling for multiple acoustic scattering." *Manuscript in preparation*.

D.L. Corey, **J.C. Badger**, and S. Lauzon, 2018. "Spirals, Triangles, and Tie-dyed T-shirts." *The College Mathematics Journal*. **50**(4), pp. 250-259.

Conference Presentations

V. Villamizar, **J.C. Badger**, T. Khajah, and S. Acosta, 2019. "High Order Farfield Expansion ABC coupled with IGA and Finite Differences Applied to Acoustic Multiple Scattering." In *14th International Conference on Mathematical and Numerical Aspects of Wave Propagation* (WAVES 2019), Vienna, Austria, 25-30 August 2019.

V. Villamizar, T. Khajah, **J.C. Badger**, and S. Acosta, 2019. "High Order Methods for Multiple Scattering Combining Isogeometric Analysis with Farfield Expansion ABC." In *15th U S National Congress on Computational Mechanics* (USACM 2019), Austin, 28-31 July 2019.

J.C. Badger, V.P. Solovjov, and B.W. Webb, 2019. "An Exploration of Advanced SLW Modeling Approaches in Comprehensive Combustion Predictions." In *11th Mediterranean Combustion Science meeting* (MCS11), Tenerife, Spain, 16-20 June 2019.

J.C. Badger, T.G. Nelson, R.J. Lang, and L.L. Howell, 2018. "Explaining Curved-Fold Behavior through Normalized Coordinate Equations and Energy Methods." In *7th International Meeting on Origami, Science, Mathematics and Education* (7OSME), Oxford, UK, 5-7 September 2018.

Grants

J.C. Badger, and L.L. Howell, "Single Degree-of-Freedom Rigidly Foldable Origami Flashers Based on Curved-Fold Models." BYU ORCA grant, 2016.