Dane Grundvig

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Education

2020 – Now **Rice University**, Houston, TX, United States
Doctoral Student Applied and Computational Mathematics
Advisor: *Dr. Matthias Heinkenschloss*
Thesis: Line-Search Based Optimization using Function Approximations with Tunable Accuracy

2018 – 2020 **Brigham Young University**, Provo, UT, United States
Master Student Mathematics
Advisor: *Dr. Vianey Villamizar*
Thesis: High Order Numerical Methods for Problems in Wave Scattering

2012 – 2018 **Brigham Young University**, Provo, UT, United States
B.S. Applied and Computational Mathematics

Research Experience

Apr 2021 – Now **Rice University** Department of Computational and Applied Mathematics

Reduced Order Modeling, Optimization with Approximation Advisor: Matthias Heinkenschloss

Researched optimization algorithms with provable convergence that require inexact evaluation. Implemented optimization algorithms in Python and MATLAB and applied them to a diverse set of problems in engineering design. Worked with multi-disciplinary teams from 4 universities through Multi University Research Initiative. Work directly contributed one journal publication and five conference posters or presentations.

2016 – 2020 **Brigham Young University** Department of Mathematics
Numerical Methods for Wave Scattering Advisor: Vianey Villamizar

Researched high order numerical methods for elastic and acoustic wave scattering. Verified provable high order theory by implementing an efficient algorithm in MATLAB. Provided early research mentorship to 3 undergraduate students who contributed to the project. Published two journal papers and three conference presentations.

Summer 2018 **National Security Agency** Director's Summer Program
Graph Optimization, Language Modeling, and n-gram Techniques

Publications

Villamizar, V., **Grundvig, D.**, Rojas, O., & Acosta, S. (2020). High order methods for acoustic scattering: Coupling farfield expansions ABC with deferred-correction methods. Wave Motion, 95, 102529. `https://doi.org/10.1016/j.wavemoti.2020.102529`

Villamizar, V., Khajah, T., Acosta, S., **Grundvig, D.**, Badger, J., & Rojas, O. (2020). High order local absorbing boundary conditions for acoustic and elastic scattering. Journal of the Acoustical Society of America, 148, 2451. `https://doi.org/10.1121/1.5146764`

Grundvig, D. (2023). Line-Search Based Optimization using Function Approximations with Tunable Accuracy. Master's Thesis, Rice University. `https://hdl.handle.net/1911/115072`

Grundvig, D. and Heinkenschloss M. (2023). Line-Search Based Optimization using Function Approximations with Tunable Accuracy. Under Review

Talks and Presentations

"Highly Accurate Equation Based Finite Difference Method Coupled with Farfield ABC for Acoustic Scattering," SIAM Central States Section, Colorado State University, speaker, 2017

"Line-search methods for unconstrained optimization with inexactness arising from reduced order models," SIAM Texas-Louisiana Section, University of Houston, speaker, 2022

"Line-Search Methods for Unconstrained Optimization with Inexactness Arising from Reduced Order Models," SIAM Conference on Computational Science and Engineering, Eindhoven University of Technology, poster, 2023

"Line Search Based Optimization Using Functions with Tunable Accuracy," SIAM Texas-Louisiana Section, University of Louisiana Lafayette, poster, 2023

"Line-Search Based Optimization Using Function Approximations with Tunable Accuracy," Department of Mathematics Colloquium, Brigham Young University, invited speaker, 2024

Awards

2022-2025 **2022 National Defense Science and Engineering Graduate Fellowship Award**

Award covered tuition, stipend, and travel for three years. Award granted after submission of research proposal, funding contingent on research progress.

Teaching

2020-Now **Rice University** Computational and Applied Mathematics

TA, Differential Equations in Science and Engineering, Spring 2022

Instructor, Differential Equations in Science and Engineering, Summer 2024

2017-2020 **Brigham Young University** Department of Mathematics

Instructor, Essentials of Calculus, Fall 2018

Instructor, Finite Mathematics, Summer 2019

Instructor, Computational Linear Algebra, Winter-Spring 2020

TA, Algorithm Design and Optimization, Fall 2019

TA, Mathematical Analysis, Fall 2019

TA, Algorithm Design and Optimization Lab, Fall 2017-Winter 2018

Skills

Programming   Python, MATLAB, Julia, C++, OpenMP, MPI

Language   English (native), and Spanish (fluent)

Service

Aug 2021 –   **Society for Industrial and Applied Mathematics Student Chapter**, Rice University,
Aug 2022   Treasurer

Sep 2022 –   **Graduate Student Advisory Committee**, Rice University, Department of Applied and
May 2024   Computational Mathematics

Educational Materials

Aug 2016 –   **Brigham Young University** Applied and Computational Mathematics Emphasis program
May 2018

Team created two year long sequence of programming tutorials on scientific computing in Python. Available at `https://foundations-of-applied-mathematics.github.io`.