

Alp Dener

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Skills

Optimization: PDE-constrained Problems, Gradient-based Algorithms, Sensitivity Analysis, MDO Architectures

Scientific Computing: High Performance Computing, Parallel Programming, Numerical Solution of PDEs

Programming Languages: Python, C/C++, Fortran 77/90/85

Education

Rensselaer Polytechnic Institute December 2017

Aeronautical Engineering, Ph.D.

University of Maryland, Baltimore County May 2012

Mechanical Engineering, B.S.

Work Experience

Postdoctoral Appointee – Argonne National Laboratory Feb 2018–Present

Mathematics and Computer Science Division

Supervisor: Todd S. Munson

- Principal developer on Toolkit for Advanced Optimization (TAO) and contributor to PETSc
- Research large-scale optimization algorithms with efficient treatment of nonlinear constraints
- Promote TAO, expand its user base, and provide software support for external researchers

Graduate Research Assistant – Rensselaer Polytechnic Institute Feb 2013–Dec 2017

Optimal Design Lab

Supervisor: Jason E. Hicken

- Investigate PDE-constrained multi-disciplinary design optimization problems
- Research gradient-based, reduced-space, matrix-free optimization algorithms
- Develop a parallel-agnostic optimization library tailored for large-scale engineering systems

Undergraduate Research Assistant – University of Maryland, Baltimore County Oct 2010–May 2011

Joint Center for Earth Systems Technology

Supervisor: Gergely Dolgos

- Construction of an optical aerosol measurement instrument
- Design and manufacture of high-precision optical component mounts
- Propose instrument mounting solutions for the NASA GSFC science fleet aircraft

Honors & Awards

- AIAA Student Paper Competition - 1st Place 2018
 - Category: Multidisciplinary Analysis and Optimization

Publications

Journal Articles.....

- Dener, Alp, Marco Andres Miller, et al.** (2020). "Training neural networks under physical constraints using a stochastic augmented Lagrangian approach (submitted)". In: *Journal of Computational Physics*.
- Hicken, Jason E., Pengfei Meng, and Alp Dener** (2020). "Error-tolerant Multisecant Method for Nonlinearly Constrained Optimization (submitted)". In: *Optimization and Engineering, Springer*.
- Miller, Marco Andres et al.** (2020). "Encoder-decoder neural network for solving the nonlinear Fokker-Planck-Landau collision operator in XGC (submitted)". In: *Journal of Plasma Physics*.
- Dener, Alp and Jason E. Hicken** (2017). "Matrix-free Algorithm for the Optimization of Multidisciplinary Systems". In: *Structural and Multidisciplinary Optimization, Springer*. DOI: 10.1007/s00158-017-1734-0.
- Hicken, Jason E. and Alp Dener** (2015). "A Flexible Iterative Solver for Nonconvex, Equality-constrained Quadratic Subproblems". In: *Journal on Scientific Computing, SIAM*. DOI: 10.1137/140994496.

Conference Proceedings.....

- Dener, Alp, Adam Denchfield, and Todd S. Munson** (June 2019). "Preconditioning nonlinear conjugate gradient with diagonalized quasi-Newton". In: *Proceedings for the Platform for Advanced Scientific Computing Conference*. Zurich, Switzerland. DOI: 10.1145/3324989.3325712.
- Dener, Alp and Todd S. Munson** (June 2019). "Accelerating Limited-Memory Quasi-Newton Convergence for Large-Scale Optimization". In: *International Conference on Computational Science*. Faro, Portugal. DOI: 10.1007/978-3-030-22744-9_39.
- Dener, Alp, Jason E. Hicken, et al.** (June 2018). "Enabling Modular Aerostructural Optimization: Individual Discipline Feasible without the Jacobians". In: *2018 Multidisciplinary Analysis and Optimization Conference, AIAA AVIATION Forum*. Atlanta, GA, USA. DOI: 10.2514/6.2018-3570.
- Dener, Alp, Pengfei Meng, et al.** (Jan. 2016). "Kona: A Parallel Optimization Library for Engineering-Design Problems". In: *57th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA SciTech Forum*. San Diego, CA, USA. DOI: 10.2514/6.2016-1422.
- Dener, Alp, Gaetan K. W. Kenway, et al.** (Jan. 2015). "Comparison of Inexact- and Quasi-Newton Algorithms for Aerodynamic Shape Optimization". In: *53rd AIAA Aerospace Sciences Meeting, AIAA SciTech Forum*. Kissimmee, FL, USA. DOI: 10.2514/6.2015-1945.
- Dener, Alp and Jason E. Hicken** (Jan. 2014). "Revisiting Individual Discipline Feasible with matrix-free Inexact-Newton-Krylov". In: *10th AIAA Multidisciplinary Design Optimization Conference, AIAA SciTech Forum*. National Harbor, MD, USA. DOI: 10.2514/6.2014-0110.

Doctoral Thesis.....

- Dener, Alp** (Dec. 2017). "A Modular Matrix-free Approach to Multidisciplinary Design Optimization". PhD thesis. Rensselaer Polytechnic Institute.