SEUNG WHAN CHUNG

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EDUCATION

University of Illinois at Urbana-Champaign *January 2017 - August 2021*
Ph. D in Theoretical and Applied Mechanics GPA: 4.0/4.0
University of Illinois at Urbana-Champaign *August 2014 - December 2016*
M. S in Theoretical and Applied Mechanics GPA: 3.88/4.0
Seoul National University *March 2008 - February 2014*
B. S. in Mechanical and Aerospace Engineering GPA: 3.96/4.3

RESEARCH

◦ **University of Texas, Austin** September 2021 - Present
Postdoctoral Fellow (with Prof. R. Moser, Prof. L. Raja, Dr. T. Oliver) Austin, TX
· Identified uncertainties in electron-argon collision cross sections via Bayesian inference
· Orchestrated system modeling and large-scale numerical simulations to predict inductively-coupled argon plasma torch

◦ **University of Illinois, Urbana-Champaign** January 2015 - August 2021
Graduate Researcher (with Prof. Jonathan Freund) Urbana, IL
· Developed multi-point penalty-based optimization framework for chaotic turbulent flows.
· Implemented and validated turbulence statistics and sound radiation of a compressible Mach-1.3 jet.

◦ **Sandia National Laboratories** January 2017 - May 2017
Student Intern (with Dr. Stephen D. Bond, Dr. Eric C. Cyr) Albuquerque, NM
· Developed a novel regular gradient computing method for chaotic particle plasma simulations.
· Demonstrated gradient computation for Debye shielding response and sheath edge formation.

TEACHING

◦ **TAM 210/211: Statics** Spring 2020
Teaching Assistant University of Illinois at Urbana-Champaign
· Ranked as Excellent in the list of Spring 2020 semester.
· Conducted discussion sessions (1 time/wk) for 27 students.
· Prepared in-depth solution procedures.
· Provided extended office hours: 6 hrs/wk

PUBLICATIONS

S. W. Chung & J. B. Freund, "An optimization method for chaotic turbulent flows," *Journal of Computational Physics*, **457**, (2022).

S. W. Chung, S. D. Bond, E. C. Cyr, & J. B. Freund, "Regular sensitivity computation avoiding chaotic effects in particle-in-cell plasma methods," *Journal of Computational Physics*, **400** (2020).

CONFERENCE TALKS

S. W. Chung & J. B. Freund. "Multi-point penalty-based optimization for optimal control of chaotic turbulent flow," *Bulletin of the American Physical Society*, **66** (2021).

S. W. Chung & J. B. Freund, "Multi-point augmented Lagrangian optimization for chaotic flows," *SIAM Conference on Computational Science and Engineering*, (2021).

S. W. Chung & J. B. Freund. "Multi-point augmented Lagrangian optimization for chaotic flows," *Bulletin of the American Physical Society*, **65** (2020).

S. W. Chung & J. B. Freund, "Adjoint-based analysis of controllability of turbulent jet noise," *Bulletin of the American Physical Society*, **64** (2019).

S. W. Chung, S. D. Bond, E. C. Cyr, & J. B. Freund, "Regular sensitivity computation avoiding chaotic effects in particle-in-cell plasma methods," *International Conference on Numerical Simulation of Plasmas*, (2019).

S. W. Chung, S. D. Bond, E. C. Cyr, & J. B. Freund, "Sensitivity analysis in particle-in-cell methods," *SIAM Conference on Computational Science and Engineering*, (2019).

S. W. Chung, R. Vishnampet, D. Bodony, & J. B. Freund, "Adjoint-based sensitivity of jet noise to near-nozzle forcing," *Bulletin of the American Physical Society*, **62** (2017).

INVITED TALKS

J. B. Freund & **S. W. Chung**, Lawrence Livermore National Laboratory, (2021).

S. W. Chung, *Fluid Mechanics Seminar*, University of Illinois at Urbana-Champaign, (2020).

S. W. Chung, Sandia National Laboratories, (2017).

RESEARCH TOOLS DEVELOPED

- **`TPS`: Torch Plasma Simulator**
  with M. Bolinches, T. Oliver, K. Schulz, R. Moser https://github.com/pecos/tps
  - A discontinuous-Galerkin multi-physics application to support a plasma torch prediction, implmented upon a gpu-enabled finite-element library (`MFEM`)
  - Formulated and implmented a two-temperature non-equilibrium reacting flow solver

- **`magudi`: Dual-consistent, Discrete-exact Adjoint solver for Compressible Flows**
  with R. Vishnampet, J. B. Freund https://bitbucket.org/xpacc-dev/magudi/
  - A Fortran-based compressible flow solver, equipped with discrete-exact adjoint-based gradient.
  - Incorporated a Python-based framework for multi-point penalty-based optimization capability.

- **`adjoint playground`: Adjoint, penalty-based optimization for chaotic flow controls**
  with J. B. Freund *Available upon request*
  - A MATLAB-based penalty-based optimization framework for various chaotic dynamical systems.
  - Provides a discrete-exact adjoint gradient for semi-implicit Runge-Kutta 4th-order time integrator.

- **`PASS`: Particle Adjoint Sensitivity Sandbox**
  with J. B. Freund https://github.com/dreamer2368/PASS
  - A Fortran-based 1D Particle-in-Cell – Monte-Carlo-Collision code for plasma kinetics simulations.
  - Particle-exact/particle-pdf sensitivity solver

AWARDS/FELLOWSHIPS

Jeong-Song Fellowship 2014 - 2016
Jeong-Song Cultural Foundation, Korea $110,000

Honor Graduation Award 2014
Seoul National University Ranked 5 of 139 (summa cum laude)

Presidential Science Fellowship 2008 - 2014
M. B. Lee, the President of Republic of Korea $40,000

GRADUATE COURSES

Fluid Mechanics	**Computational Methods**	**Applied Mechanics**
Inviscid Flow	Computational Mechanics	Control System Theory & Design
Viscous Flow	Uncertainty Quantification	Solid Mechanics I
Instability and Transition	Asymptotic Method	Combustion Fundamentals
Turbulence	Mathematical Methods II	Non-Newtonian Fluid Mechanics & Rheology

SKILLS

Computer Languages	Python, C++, MATLAB, Fortran
Parallel Programming	MPI, CUDA (MFEM)
Scripting	Python, Bash, Flux
Compiling	Make, CMake
Documentation	LaTeX, Vi/Vim, Mendeley
Visualization and I/O	PLOT3D, HDF5, Paraview
Presentation	Beamer, Keynote, Adobe Illustrator/Premiere