

SEUNG WHAN CHUNG

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EDUCATION

University of Illinois at Urbana-Champaign	<i>January 2017 - August 2021</i>
Ph. D in Theoretical and Applied Mechanics	GPA: 4.0/4.0
University of Illinois at Urbana-Champaign	<i>August 2014 - December 2016</i>
M. S in Theoretical and Applied Mechanics	GPA: 3.88/4.0
Seoul National University	<i>March 2008 - February 2014</i>
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
 - Uncertainty modeling and propagation of plasma collision cross sections
 - Plasma modeling for prediction of inductively-coupled plasma torch dynamics
- **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 simulation.
 - Developed a novel regular gradient computing method for chaotic particle plasma simulations.
- **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*, accepted, (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

- **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
- **magudi: Dual-consistent, Discrete-exact Adjoint solver for Compressible Flows**
with R. Vishnampet, J. B. Freund <https://bitbucket.org/xpacc-dev/magudi/>
 - Created verification cases to ensure discrete-exactness.
 - Developed a Python-based Bash/Flux-script generator for large-scale gradient-based optimization.
 - Incorporated multi-point penalty-based optimization framework for chaotic dynamical systems.
- **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.

AWARDS/FELLOWSHIPS

Jeong-Song Fellowship	2014 - 2016
<i>Jeong-Song Cultural Foundation, Korea</i>	\$110,000
Honor Graduation Award	2014
<i>Seoul National University</i>	Ranked 5 of 139 (summa cum laude)

GRADUATE COURSES

Fluid Mechanics

Inviscid Flow
Viscous Flow
Instability and Transition
Turbulence

Computational Methods

Computational Mechanics
Uncertainty Quantification
Asymptotic Method
Mathematical Methods II

Applied Mechanics

Control System Theory & Design
Solid Mechanics I
Combustion Fundamentals
Non-Newtonian Fluid Mechanics & Rheology

SKILLS

Computer Languages

Parallel Programming

Scripting

Compiling

Documentation

Visualization and I/O

Presentation

Fortran, MATLAB, Python

MPI

Python, Bash, Flux

Make, CMake

L^AT_EX, Vi/Vim, Mendeley

PLOT3D, Paraview

Beamer, Keynote, Adobe Illustrator/Premiere