

# SEUNG WHAN CHUNG

Postdoctoral Fellow ◊ Predictive Engineering & Computational Science ◊ University of Texas, Austin  
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## EDUCATION

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

## RESEARCH

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- **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

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- **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

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- 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

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- 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

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- 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

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- **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

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

## GRADUATE COURSES

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### **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

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### **Computer Languages**

### **Parallel Programming**

### **Scripting**

### **Compiling**

### **Documentation**

### **Visualization and I/O**

### **Presentation**

Fortran, MATLAB, Python

MPI

Python, Bash, Flux

Make, CMake

L<sup>A</sup>T<sub>E</sub>X, Vi/Vim, Mendeley

PLOT3D, Paraview

Beamer, Keynote, Adobe Illustrator/Premiere