Masashi Sode

Last Updated: December 6, 2025
Chapel Hill, NC, United States
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PhD Student in Biomedical Engineering
AI × Ultrasound

Portfolio
github.com/MasashiSode
linkedin.com/in/masashisode

Education

PhD student in Biomedical Engineering **Aug 2023-**
Lampe Joint Department of Biomedical Engineering, UNC–Chapel Hill & NC State (https://bme.unc.edu/),
Chapel Hill, North Carolina, United States
Supervisor Gianmarco Pinton

Master of Engineering in Aerospace Engineering **Mar 2019**
Graduate School of Engineering, Tohoku University (www.tohoku.ac.jp),
Sendai, Miyagi, Japan *GPA 4.0/4.0*

Bachelor of Science in Engineering **Mar 2017**
School of Engineering, Tohoku University,
Sendai, Miyagi, Japan *GPA 3.6/4.0*

Skills

Research skills:
Artificial intelligence
— Deep learning: Inversion problem in ultrasound, Medical AI development, Multimodal deep learning (image, waveform, table, graph structure)
— Machine learning: Gaussian process based Bayesian optimization, numerical optimization
Simulation
— Finite difference method (FDM): Non-linear ultrasound simulation
— Finite element method (FEM): Aircraft wing deformation simulation
— Finite volume method (FVM): Aircraft wing flow simulation
High-performance computation
— Multi-node multi-GPU/CPU simulation development using C, CUDA, and OpenMP
— Distributed AI training on multi node and multi GPU environment
Physics
— Ultrasound physics, non-linear solid mechanics, fluid dynamics for incompressible flow Ultrasound beamforming

Programming Languages: Python, C, CUDA, C++, Fortran
Frameworks: PyTorch (Advanced), PyTorch lightning (Advanced), JAX, Hugging Face, FastAPI, etc.
Platforms: Ubuntu (Advanced, main OS), Windows (Advanced)
Other tools: Git, GitHub, Slack, Google/Microsoft software suites, etc.
Soft skills: Research project management, Scientific writing
Communications: Japanese (native), English (fluent speaker), German (fluent speaker)

Work/Research Experience

Graduate Research Assistant / Integrateting non-linear ultrasound technology with AI **Aug 2023 — present**
Pinton Lab. (https://pintonlab.web.unc.edu/) *Chapel Hill, North Carolina, United States*

- The scope of my research encompasses three primary areas:
  - Physical property inversion from ultrasound signals with deep learning
  - Design and implementation of nonlinear ultrasound simulation techniques
  - Brain imaging and therapeutic applications of ultrasound and deep learning

AI Engineer / Developing a method to diagnose influenza from throat images using deep learning **Oct 2019 — Aug 2023**
Aillis, Inc. (www.aillis.jp) (Startup company) *Tokyo, Japan*

- I proposed and implemented a multimodal AI model using massive real-world data (500,000 clinical images and 10,000 clinical information) for influenza diagnosis.
- As a pivotal researcher and developer on the AI team, I spearheaded the team from prototype to clinical trial to commercialization of an AI for influenza diagnosis. The results of the clinical trial are published here: doi.org/10.2196/38751
- The influenza diagnosis AI predicts influenza infection from multiple throat images and clinical information using multi-view and multi-modal deep learning. I have proposed and developed numerous significant methods and integrated the ideas into medical AI for the clinical trial.
- Our collaborative team conducted a clinical trial, and the medical AI system received regulatory approval (Japanese press release link) in Japan in April 2022, the first prospective study of a medical AI device in Japan.

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AI Engineering Intern / Developed a device to collect patient data in a clinical research and clinical trial. **Jul 2019 — Oct 2019**
Aillis, Inc. (www.aillis.jp) (Startup company) *Tokyo, Japan*

- I led the data collection phase for developing AI for influenza diagnosis. I mainly developed a console device to collect patient data at medical institutions for clinical research in Japan.
- With the device, the company conducted a clinical study in Japan in 2019, collecting clinical information from more than 10,000 patients and 500,000 throat images from nearly 100 medical institutions to build a unique throat image database.

AI Engineering Intern / Sleep stage classification from EEG signal using deep learning **Apr 2019 — Jul 2019**
PGV Inc. (www.pgv.co.jp) (Startup company) *Tokyo, Japan*

- I supported the development of AI models for sleep stage classification from EEG signals and related software.

Leading Position of Research Team / Aircraft design using multi-objective Bayesian optimization **Apr 2015 — Mar 2019**
Tohoku University (bachelor to master) *Miyagi, Japan*

- I conducted research on multi-objective Bayesian optimization for composite aircraft design under the supervision of Professor Okabe (research topic of bachelor's and master's theses). I led the collaborative research with Kawasaki Heavy Industries, Toray Industries, and three aerospace engineering laboratories.
- To create the automated aircraft design method, I integrated the Genetic Algorithm, Multi-Objective Bayesian Optimization with Gaussian Process (github.com/MasashiSode/MOBO), solid mechanics simulation with FEM written in C, fluid dynamics simulation with FVM written in Fortran, and fluid-structure interaction method into a Python library with a high-performance computing environment in Linux.

Accomplishments

Publications

1. Zhuang, L., Ostras, O., **Sode, M.**, Simson, W., Hyun, D., Santibanez, F., Dahl, J., & Pinton, G. (2025). Labeled numerical phantom of abdominal wall for wave-physics based ultrasound imaging: applications to image reconstruction. IEEE Transactions on Ultrasonics, 1–1. https://doi.org/10.1109/tuson.2025.3638314

2. DeRuiter, R. M., Jones, R. M., Belgharbi, H., **Sode, M.**, Lee, H. R., Santibanez, F., Dayton, P. A., & Pinton, G. F. (2025). Improving imaging field of view of 3D transcranial rat brain super-resolution with robotic registered compounding and non-rigid deformation correction. IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, 1–1. https://doi.org/10.1109/tuffc.2025.3574916

3. Wang, J., Ostras, O., **Sode, M.**, Tolooshams, B., Li, Z., Azizzadenesheli, K., Pinton, G., & Anandkumar, A. (2025). Ultrasound lung aeration map via physics-aware neural operators. In arXiv [eess.IV]. arXiv. https://arxiv.org/abs/2501.01157

4. Okiyama, S., Fukuda, M., **Sode, M.**, Takahashi, W., Ikeda, M., Kato, H., Tsugawa, Y., & Iwagami, M. (2022). Examining the Use of an Artificial Intelligence Model to Diagnose Influenza: Development and Validation Study. Journal of Medical Internet Research, 24(12), e38751. https://doi.org/10.2196/38751

Patents

1. Takahashi, W., **Sode, M.**, Kinouchi, T., Yasumi, T., Takahashi, K. (2024). Processing Device, Processing Program, And Processing Method (USPTO Patent No. 20240277231:A1). In US Patent (20240277231:A1). US20240277231A1

2. Ariyasu, Y., **Sode, M.**, Takahashi, W., Todoroki, Y., Fukuda, A., Yoshihara, H. (2024). Processing Device, Processing Program, Processing Method, And Processing System (USPTO Patent No. 20240130604:A1). In US Patent (20240130604:A1). US20240130604A1

3. Fukuda, A., **Sode, M.**, Cap, H. Q., Yasumi, T. (2023). Processing device, processing program, processing method, and processing system (EPO Patent No. 4176794:A1). In European Patent (4176794:A1). EP4176794A1

Conference Presentations

1. **Sode, M.**, & Pinton, G. (2025, Dec 3). Multiple relaxation mechanisms for modeling a broad range of power law ultrasound attenuation in heterogeneous biological tissue, Sixth Joint Meeting Acoustical Society of America and Acoustical Society of Japan, Honolulu, United States.

2. Wang, J., Ostras, O., **Sode, M.**, Tolooshams, B., Li, Z., Azizzadenesheli, K., Pinton, G., & Anandkumar, A. (2025, Dec 2). Direct and quantitative lung aeration mapping from raw ultrasound radio-frequency data using fourier neural operators, Sixth Joint Meeting Acoustical Society of America and Acoustical Society of Japan, Honolulu, United States.

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3. **Sode, M.**, Zhuang, L., Ostras, O., Santibanez, F., Dahl, J., & Pinton, G. (2025, Sep 16). Beamformer-Integrated Sound Speed Estimation Network (BISoN): A Deep Learning-Based Inversion for Transabdominal Ultrasound. The 2025 IEEE International Ultrasonics Symposium (IEEE IUS 2025), Utrecht, Netherlands.

4. **Sode, M.**, Zhuang, L., Ostras, O., Santibanez, F., Dahl, J., & Pinton, G. (2025, Sep 2). Differentiable Beamformer-Integrated Deep Learning for Robust Ultrasound Sound Speed Estimation. ULTRASONC, Chapel Hill, NC, United States.

5. **Sode, M.**, Zhuang, L., Ostras, O., Simson, W., Hyun, D., Santibanez, F., Dahl, J., & Pinton, G. (2024, May 20). Deep Learning-Based Sound Speed Prediction in the Abdominal Wall. ULTRASONC, Chapel Hill, NC, United States.

6. **M. Sode**, N. Ishiura, Y. Nagumo, T. Okabe, Aero-Structural Optimization of a Regional Jet Wing with Failure Criterion, 33rd New Materials Engineering Conference, Fukushima, Japan, 5 - 7 Sep. 2017

7. **M. Sode**, N. Ishiura, Y. Nagumo, T. Okabe, Aero-Structural Optimization of an Aircraft Wing with Failure Criterion, 42nd Composite Material Symposium, Miyagi, Japan, 14 – 15. Sep. 2017

8. **M. Sode**, N. Ishiura, Y. Nagumo, T. Okabe, Multidisciplinary Optimization of Regional Jet Wing, 55th Aircraft Symposium, Shimane, Japan, 20 - 22. Nov. 2017

Major Awards

1. **First Prize: PyTorch Global Summer Hackathon 2020 (https://pytorch.org/blog)** **Jun 2020 — Aug 2020**
   My team won first place for developing a Python library to mitigate the unfairness in machine learning by using constrained optimization.

2. **Grant: Boeing Higher Education Program 2016 (www.ifs.tohoku.ac.jp)** **2016**
   Tohoku University participated in the Boeing Higher Education Program and received a grant from The Boeing Company to produce excellent scientists and engineers who will carry the world's future. Through this grant, I developed an aircraft design method with aero-structural optimization and integrated it into a Python library.

Teaching Experience

1. **Engineering Mathematics Class TA** **Apr 2017 — Aug 2017**
   Tutored first-year undergraduate students in math for engineering using math exercises.

2. **Aircraft Design Class TA** **Apr 2016 — Aug 2016**
   Tutored first-year undergraduate students in general knowledge of aircraft design.

Community Service

1. **AFS Intercultural Program Volunteer** **Apr 2013 — Mar 2019**
   AFS Intercultural Programs, Japan (www.afs.or.jp) *Japan*
   - I supported the international exchange students and Japanese high school students by organizing the orientation and international camps. I studied abroad in Germany for a year (Feb 2011 - Jan 2012) through this organization when I was in high school.
   - AFS Intercultural Programs (https://afs.org) is an international youth exchange organization that has been providing intercultural learning opportunities through high school exchange programs since 1914.

2. **Program Head of AFS International Camp** **Jan 2018 — Aug 2018**
   AFS Intercultural Programs, Japan (www.afs.or.jp) *Japan*
   - I organized the AFS international camp for high school and exchange students.

3. **IPLANET Tutor** **Apr 2014 — Mar 2017**
   Tohoku University *Miyagi, Japan*
   - I had been helping foreign exchange students at the Tohoku University to make the transition to Japanese life.