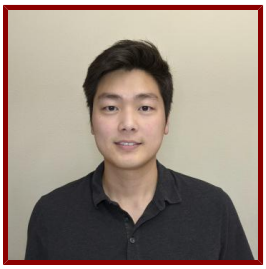
Stanford



Dongwoon Hyun

Instructor, Radiology - Pediatric Radiology

Bio

BIO

My research interests are focused on the development and clinical translation of new ultrasound imaging techniques to improve the quality and diagnostic value of ultrasound imaging. My interests are in clinical translation of ultrasound molecular imaging for early cancer detection, improving image quality in difficult-to-image patients, and to reduce noise artifacts in ultrasound images. In my research, I have refined adaptive beamforming methods such as coherence-based imaging, helped to pioneer the use of deep learning tools on raw ultrasound data to produce more accurate B-mode images and more sensitive ultrasound molecular images, and developed GPU-based software beamforming tools to deploy these methods in real-time on experimental and clinical imaging systems.

ACADEMIC APPOINTMENTS

- Instructor, Radiology - Pediatric Radiology

PROFESSIONAL EDUCATION

- Ph.D., Duke University , Biomedical Engineering (2017)
- B.S.E., Duke University , Biomedical Engineering (2010)

LINKS

- Open-source GPU-based real-time software beamformer: https://gitlab.com/dongwoon.hyun/rtbf
- B-mode imaging with a neural-network beamformer: https://gitlab.com/dongwoon.hyun/nn_bmode

Teaching

COURSES

2023-24

- Advanced Ultrasound Imaging: BMP 235, RAD 235 (Win)

2022-23

- Advanced Ultrasound Imaging: RAD 235 (Win)

2021-22

- Advanced Ultrasound Imaging: RAD 235 (Win)

Publications

PUBLICATIONS

- **Distributed Aberration Correction Techniques Based on Tomographic Sound Speed Estimates.** *IEEE transactions on ultrasonics, ferroelectrics, and frequency control*
  Ali, R., Brevett, T., Hyun, D., Brickson, L. L., Dahl, J. J.
  2022; 69 (5): 1714-1726

- **Ultrasound Lesion Detectability as a Distance Between Probability Measures** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Hyun, D., Kim, G. B., Bottenus, N., Dahl, J. J.
  2022; 69 (2): 732-743

- **A Universal End-to-End Description of Pulse-Echo Ultrasound Image Reconstruction**
  Hyun, D., Aylward, S., Noble, J. A., Hu, Y., Lee, S. L., Baum, Z., Min, Z.
  SPRINGER INTERNATIONAL PUBLISHING AG.2022: 128-138

- **Deep Learning for Ultrasound Image Formation: CUBDL Evaluation Framework and Open Datasets** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Hyun, D., Wiacek, A., Goudarzi, S., Rothlubbers, S., Asif, A., Eickel, K., Eldar, Y. C., Huang, J., Mischi, M., Rivaz, H., Sinden, D., van Sloun, R. G., Strohm, et al
  2021; 68 (12): 3466-3483

- **Real-Time In Vivo Imaging of Human Liver Vasculature Using Coherent Flow Power Doppler: A Pilot Clinical Study** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Li, Y., Hyun, D., Ducey-Wysling, J., Durot, I., D'Hondt, A., Patel, B., Dahl, J. J.
  2021; 68 (9): 3027-3041

- **Histogram Matching for Visual Ultrasound Image Comparison** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Bottenus, N., Byram, B. C., Hyun, D.
  2021; 68 (5): 1487-1495

- **Passive Cavitation Mapping by Cavitation Source Localization From Aperture-Domain Signals-Part II: Phantom and In Vivo Experiments** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Telichko, A., Lee, T., Hyun, D., Chowdhury, S., Bachawal, S., Herickhoff, C. D., Paulmurugan, R., Dahl, J. J.
  2021; 68 (4): 1198–1212

- **Reverberation Noise Suppression in Ultrasound Channel Signals Using a 3D Fully Convolutional Neural Network** *IEEE TRANSACTIONS ON MEDICAL IMAGING*
  Brickson, L. L., Hyun, D., Jakovljevic, M., Dahl, J. J.
  2021; 40 (4): 1184–95

- **Blood Flow Imaging in the Neonatal Brain Using Angular Coherence Power Doppler** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Jakovljevic, M., Yoon, B., Abou-Elkacem, L., Hyun, D., Li, Y., Rubesova, E., Dahl, J. J.
  2021; 68 (1): 92–106

- **An Information-Theoretic Spatial Resolution Criterion for Qualitative Images**
  Hyun, D., IEEE
  IEEE.2021

- **Real-Time Universal Synthetic Transmit Aperture Beamforming with Retrospective Encoding for Conventional Ultrasound Sequences (REFoCUS)**
  Hyun, D., Dahl, J. J., Bottenus, N., IEEE
  IEEE.2021

- **Upstream Machine Learning in Radiology.** *Radiologic clinics of North America*
  Sandino, C. M., Cole, E. K., Alkan, C., Chaudhari, A. S., Loening, A. M., Hyun, D., Dahl, J., Imran, A. A., Wang, A. S., Vasanawala, S. S.
  2021; 59 (6): 967-985

- **Superiorized Photo-Acoustic Non-NEgative Reconstruction (SPANNER) for Clinical Photoacoustic Imaging.** *IEEE transactions on medical imaging*
  Steinberg, I. n., Kim, J. n., Schneider, M. K., Hyun, D. n., Zlitni, A. n., Hooper, S. M., Klap, T. n., Sonn, G. A., Dahl, J. J., Kim, C. n., Gambhir, S. S.
  2021; PP

- **Acoustically Driven Microbubbles Enable Targeted Delivery of microRNA-Loaded Nanoparticles to Spontaneous Hepatocellular Neoplasia in Canines** *ADVANCED THERAPEUTICS*
  Kumar, S., Telichko, A. V., Wang, H., Hyun, D., Johnson, E. G., Kent, M. S., Rebhun, R. B., Dahl, J. J., Culp, W. N., Paulmurugan, R.
  2020

- **Extending Retrospective Encoding for Robust Recovery of the Multistatic Data Set** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Ali, R., Herickhoff, C. D., Hyun, D., Dahl, J. J., Bottenus, N.
  2020; 67 (5): 943–56

- **Effects of motion on correlations of pulse-echo ultrasound signals: Applications in delay estimation and aperture coherence** *JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA*
  Hyun, D., Dahl, J. J.
  2020; 147 (3): 1323–32

- **Nondestructive Detection of Targeted Microbubbles Using Dual-Mode Data and Deep Learning for Real-Time Ultrasound Molecular Imaging.** *IEEE transactions on medical imaging*
  Hyun, D. n., Abou-Elkacem, L. n., Bam, R. n., Brickson, L. L., Herickhoff, C. D., Dahl, J. J.
  2020

- **Application of Common Midpoint Gathers to Medical Pulse-Echo Ultrasound for Optimal Coherence and Improved Sound Speed Estimation in Layered Media**
  Ali, R., Hyun, D., Dahl, J. J., IEEE
  IEEE.2020

- **Challenge on Ultrasound Beamforming with Deep Learning (CUBDL)**
  Bell, M., Huang, J., Hyun, D., Eldar, Y. C., van Sloun, R., Mischi, M., IEEE
  IEEE.2020

- **Application of a Range-Doppler Algorithm to Frequency-Domain Beamforming of Ultrasound Signals**
  Jakovljevic, M., Michaelides, R., Biondi, E., Herickhoff, C., Hyun, D., Zebker, H., Dahl, J., IEEE
  IEEE.2020

- **Human Placental Vasculature Imaging Using Long Ensemble Angular-coherence-based Doppler**
  Li, Y., Chueh, J., Ness, A., Hyun, D., Jakovljevic, M., Lyell, D., Winn, V., Dahl, J. J., IEEE
  IEEE.2020

- **Short-Lag Spatial Coherence Imaging in 1.5-D and 1.75-D Arrays: Elevation Performance and Array Design Considerations** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Morgan, M. R., Hyun, D., Trahey, G. E.
  2019; 66 (6): 1047–56

- **Beamforming and Speckle Reduction Using Neural Networks.** *IEEE transactions on ultrasonics, ferroelectrics, and frequency control*
  Hyun, D., Brickson, L. L., Looby, K. T., Dahl, J. J.
  2019; 66 (5): 898–910

- **Improved Visualization in Difficult-to-Image Stress Echocardiography Patients Using Real-Time Harmonic Spatial Coherence Imaging** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Hyun, D., Crowley, A. C., LeFevre, M., Cleve, J., Rosenberg, J., Dahl, J. J.
  2019; 66 (3): 433–41

- **An Open Source GPU-Based Beamformer for Real-Time Ultrasound Imaging and Applications**
  Hyun, D., Li, Y., Steinberg, I., Jakovljevic, M., Klap, T., Dahl, J. J., IEEE
  IEEE.2019: 20–23

- **Vector Flow Velocity Estimation from Beamsummed Data Using Deep Neural Networks**
  Li, Y., Hyun, D., Dahl, J. J., IEEE

IEEE.2019: 860–63

- **Local speed of sound estimation in tissue using pulse-echo ultrasound: Model-based approach.** *The Journal of the Acoustical Society of America*
  Jakovljevic, M., Hsieh, S., Ali, R., Chau Loo Kung, G., Hyun, D., Dahl, J. J.
  2018; 144 (1): 254

- **CLINICAL UTILITY OF FETAL SHORT-LAG SPATIAL COHERENCE IMAGING** *ULTRASOUND IN MEDICINE AND BIOLOGY*
  Long, W., Hyun, D., Choudhury, K., Bradway, D., McNally, P., Boyd, B., Ellestad, S., Trahey, G. E.
  2018; 44 (4): 794–806

- **Improved Sensitivity in Ultrasound Molecular Imaging With Coherence-Based Beamforming.** *IEEE transactions on medical imaging*
  Hyun, D. n., Abou-Elkacem, L. n., Perez, V. A., Chowdhury, S. M., Willmann, J. K., Dahl, J. J.
  2018; 37 (1): 241–50

- **Reverberation Noise Suppression in the Aperture Domain Using 3D Fully Convolutional Neural Networks**
  Brickson, L. L., Hyun, D., Dahl, J. J., IEEE
  IEEE.2018

- **High Sensitivity Liver Vasculature Visualization Using a Real-time Coherent Flow Power Doppler (CFPD) Imaging System: A Pilot Clinical Study**
  Li, Y., Hyun, D., Durot, I., Willmann, J. K., Dahl, J. J., IEEE
  IEEE.2018

- **Adaptive Grayscale Mapping to Improve Molecular Ultrasound Difference Images**
  Shu, J., Hyun, D., Abou-Elkacem, L., Willmann, J., Dahl, J., IEEE
  IEEE.2018

- **Efficient Strategies for Estimating the Spatial Coherence of Backscatter** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Hyun, D., Crowley, A. L., Dahl, J. J.
  2017; 64 (3): 500-513

- **Coherence Beamforming and its Applications to the Difficult-to-Image Patient**
  Dahl, J. J., Hyun, D., Li, Y., Jakovljevic, M., Bell, M. L., Long, W. J., Bottenus, N., Kakkad, V., Trahey, G. E., IEEE
  IEEE.2017

- **Visualization of Small-Diameter Vessels by Reduction of Incoherent Reverberation With Coherent Flow Power Doppler.** *IEEE transactions on ultrasonics, ferroelectrics, and frequency control*
  Li, Y. L., Hyun, D., Abou-Elkacem, L., Willmann, J. K., Dahl, J. J.
  2016; 63 (11): 1878-1889

- **Short-Lag Spatial Coherence Imaging on Matrix Arrays, Part II: Phantom and In Vivo Experiments** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Jakovljevic, M., Byram, B. C., Hyun, D., Dahl, J. J., Trahey, G. E.
  2014; 61 (7): 1113-1122

- **Short-Lag Spatial Coherence Imaging on Matrix Arrays, Part I: Beamforming Methods and Simulation Studies** *IEEE TRANSACTIONS ON ULTRASONICS FERROELECTRICS AND FREQUENCY CONTROL*
  Hyun, D., Trahey, G. E., Jakovljevic, M., Dahl, J. J.
  2014; 61 (7): 1101-1112

- **A GPU-based real-time spatial coherence imaging system**
  Hyun, D., Trahey, G. E., Dahl, J., Bosch, J. G., Doyley, M. M.
  SPIE-INT SOC OPTICAL ENGINEERING.2013

- **Lesion Detectability in Diagnostic Ultrasound with Short-Lag Spatial Coherence Imaging** *ULTRASONIC IMAGING*
  Dahl, J. J., Hyun, D., Lediju, M., Trahey, G. E.
  2011; 33 (2): 119-133

- **Development and Evaluation of Pulse Sequences for Freehand ARFI Imaging**
  Doherty, J. R., Dumont, D. M., Hyun, D., Dahl, J. J., Trahey, G. E., IEEE
  IEEE.2011: 1281–84