# Hyungjin Chung

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Research interests

Deep Learning, Diffusion models, Energy-based models,
Inverse problems, Computational Imaging, Compressed-sensing MRI

Education

**KAIST** Daejeon, Korea
PhD in Bio & Brain Engineering 2021.03 – Present
Advisor: Professors Jong Chul Ye

**KAIST** Daejeon, Korea
MA in Bio & Brain Engineering 2019.03 – 2021.02
Thesis: TomoGAN: Unsupervised Learning-based Reconstruction of Tomography
Advisor: Professors Jong Chul Ye

**Korea University** Seoul, Korea
BA in Biomedical Engineering 2015.03 – 2019.02

Honors and scholarships

**KAIST Scholarship** 2021.02 - Present
**Korea Government Scholarship** 2019.03 - 2021.02

Awards

**2021 BISPL Best Researcher Award** 2021.12

**2020 BISPL Best Researcher Award** 2020.12

Professional service

**Advisory board member** 2021.05 – Present
SNUHRad-AICON: SNUH-Radiology AI Collaboration Network

**Journal reviewer**
Medical Image Analysis, IEEE TMI, IEEE TCI, BMC bioinformatics, Medical Physics, Scientific Reports, BMC pregnancy and childbirth

**Conference reviewer**
MIDL (2021, 2022)

Publications (Top ML conferences)

**Come-Closer-Diffuse-Faster: Accelerating Conditional Diffusion Models for Inverse Problems through Stochastic Contraction**

Hyungjin Chung, Byeongsu Sim, and Jong Chul Ye
*IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2022*

Publications (Journals)

**Unsupervised Deep Learning Methods for Biological Image Reconstruction and Enhancement**

Mehmet Akçakaya, Burhaneddin Yaman, Hyungjin Chung, Jong Chul Ye,
*IEEE SPM, 2021 (in press)*

**A Deep Learning Model for Diagnosing Gastric Mucosal Lesions Using Endoscopic Images: Development, Validation, and Method Comparison**
Joon Yeul Nam*, Hyungjin Chung*, Kyu Sung Choi*, Hyuk Lee*,
Seung Jun Han, Tae Jun Kim, Hosim Soh, Eun Kang, Soo-Jeong Cho,
Jong Chul Ye, Jong Pil Im, Sang Gyun Kim, Yoon Jun Kim, Joo Sung Kim, Jung-Hwan Yoon, Hyunsoo Chung, Jeong-Hoon Lee
*Gastrointestinal Endoscopy, 2021* **(*First author)**

**Feature Disentanglement in generating three-dimensional structure from two-dimensional slice with sliceGAN**
Hyungjin Chung, Jong Chul Ye
*Nature Machine Intelligence, 2021*

**Missing Cone Artifacts Removal in ODT using Unsupervised Deep Learning in Projection Domain**
Hyungjin Chung*, Jaeyoung Huh*, Geon Kim, Yong Keun Park, Jong Chul Ye
*IEEE Transactions on Computational Imaging*

**Two-Stage Deep Learning for Accelerated 3D Time-of-Flight MRA without Matched Training Data**
Hyungjin Chung, Eunju Cha, Leonard Sunwoo, Jong Chul Ye
*Medical Image Analysis, 2021.*

**Deep learning STEM-EDX tomography of nanocrystals**
Yoseob Han*, Jaeduck Jang*, Eunju Cha*, Junho Lee*, Hyungjin Chung*,
Myoungho Jeong, Tae-Gon Kim, Byeong Gyu Chae, Hee Goo Kim, Shinae Jun, Sungwoo Hwang, Eunha Lee, Jong Chul Ye
*Nature Machine Intelligence, 2021.* **(*First author)**
***Selected as 2021 March Issue Cover***

**Unpaired training of deep learning tMRA for flexible spatio-temporal resolution**
Eunju Cha, Hyungjin Chung, Eung Yeop Kim, Jong Chul Ye.
*IEEE Transactions on Medical Imaging, 2020.*

**Unpaired deep learning for accelerated MRI using optimal transport driven cycleGAN**
Gyutaek Oh, Byeongsu Sim, Hyungjin Chung, Leonard Sunwoo, Jong Chul Ye.
*IEEE Transactions on Computational Imaging, 2020.*

Preprints

**Score-based diffusion models for accelerated MRI**

Hyungjin Chung and Jong Chul Ye
*arXiv preprint arXiv:2110.05243*

**Simultaneous super-resolution and motion artifact removal in diffusion-weighted MRI using unsupervised deep learning**
Hyungjin Chung, Jaehyun Kim, Jeong Hee Yoon, Jeong Min Lee, Jong Chul Ye
*arXiv preprint arXiv:2105.00240*

International Confernce

**Deep learning fast MRI using channel attention in magnitude domain**

Joonhyung Lee*, Hyunjong Kim*, Hyungjin Chung*, Jong Chul Ye
*IEEE International Symposium on Biomedical Imaging, 2020.*
**(*First author)**

**Unsupervised Merge-Residual Learning for Time-of-Flight MRI**
Hyungjin Chung, Eunju Cha, Leonard Sunwoo, Jong Chul Ye
*IEEE International Symposium on Biomedical Imaging Workshop, 2020.*

Patent

**Accelerating method of conditional diffusion models for inverse problems using stochastic contraction and the apparatus thereof**
Jong Chul Ye, Hyungjin Chung, Byeongsu Sim
*Korea patent application, 2021.*

**Score-based Diffusion Model for Accelerated MRI and Apparatus thereof**
Jong Chul Ye, Hyungjin Chung
*Korea patent application, 2021.*

**Task-agnostic image processing method and apparatus using transformer and federated split learning**
Jong Chul Ye, Hyungjin Chung, Gyutaek Oh, Sangjoon Park, Boah Kim, Jeongsol Kim
*Korea patent application, 2021.*

**Crowd Deep Learning Method of Medical Artificial Intelligence and Apparatus thereof**

Jong Chul Ye, Hyungjin Chung, Gyutaek Oh, Sangjoon Park
*Korea patent application, 2021.*

**Unsupervised deep learning method for tomography for complete removal of missing cone artifact and apparatus therefore**
Jong Chul Ye, Hyungjin Chung, JaeYoung Huh
*Korea patent application, 2020.*

**Two-Stage unsupervised learning method for 3D Time-of-flight MRA reconstruction and the apparatus therefore**
Jong Chul Ye, Hyungjin Chung, Eunju Cha, Leonard Sunwoo
*Korea patent application, 2020.*

## Research experience

**Unsupervised deep learning for compressed sensing MRI reconstruction**
KAIST 2020.04 – 2021.02
Research project conducted in collaboration with Seoul National University Bundang Hospital.

**Deep learning-based performance prediction of deep learning**
KAIST 2020.03 – 2021.02
Project presented in VRPGP 2020

**Development of reconstruction algorithm of STEM-EDX tomography**
Samsung Electronics 2019.12 – 2020.11

## Teaching experience

**Head Teaching assistant, KAIST** Fall 2021
BiS 800: Machine Learning for Medical Image Analysis

**Teaching assistant, KAIST** Spring 2021
BiS 301: Bioengineering Laboratory I

**Teaching assistant, KAIST** Fall 2020
BiS 452: Biomedical Imaging

**Teaching assistant, KAIST** Spring 2020
BiS 400, MAS 480 : Advanced Intelligence

**Teaching assistant, KAIST** Fall 2019
BiS 452: Biomedical Imaging

**Teaching assistant, KAIST** Spring 2020
BiS 301, : Bioengineering Laboratory I

## Skills

**Computational Imaging**

- Compressed sensing MRI (CS-MRI)
- Computational tomography (CT)
- Inverse problems in vision
- Optical diffraction tomography (ODT)
- Microscopy
- Phase Retrieval

**Deep Learning Framework**
PyTorch, JAX, Tensorflow

**Programming**
Python, MATLAB, C++.