Il Yong Chun

4125 EECS Bldg., 1301 Beal Ave., Ann Arbor, MI 48109-2122 (Email: iychun@umich.edu, Phone: 765-586-3511)

OBJECTIVE To seek a tenure-track faculty position, particularly in computational imaging and/or translational imaging

EDUCATION

Purdue University USA
Ph.D. in Electrical and Computer Engineering Aug. 2009 – Aug. 2015
- Thesis title: Advances in medical imaging and image reconstruction
- Advisors: Prof. Thomas M. Talavage and Prof. Ben Adcock

Korea University South Korea
B.Eng. in Electrical Engineering Mar. 2002 – Feb. 2009

University of Hong Kong Hong Kong
Exchange Student in Electrical and Electronic Engineering Aug. 2007 – May 2008

WORK EXPERIENCE

University of Michigan USA
Research Fellow in Electrical Engineering and Computer Science May 2016 – Present
(supervisor: Prof. Jeffrey Fessler)
- Convolutional neural networks: Theory and appl. to extreme imaging
- Block optimization: Theory and appl. to convolutional operator learning
- Tensor decomposition and appl. to light-field photography

Purdue University USA
Postdoctoral Research Associate in Mathematics Aug. 2015 – May 2016
(supervisor: Prof. Ben Adcock)
- Compressed sensing and parallel acquisition: Theory

Purdue University USA
Research Assistant (advisor: Prof. Thomas M. Talavage) Aug. 2010 – May 2015
Teaching Assistant (advisor: Prof. Michael D. Zoltowski) Jan. 2011 – May 2011
- Signals and systems (ECE301)

Research Assistant (advisor: Prof. Michael G. Heinz) Aug. 2011 – May 2013

Samsung Advanced Institute of Technology South Korea
Graduate Intern (supervisor: Dr. Jung-Bae Kim) Jun. 2013 – Jul. 2013
- Multi-modal (ultrasonography & MRI) image registration

Neuroscience Research Institute South Korea
Lecturer (supervisor: Prof. Zang-Hee Cho) May 2013 – Jun. 2013
- Lecture: Introduction to optimization
- Research: High-resolution PET image reconstruction

Intel Labs USA
Graduate Intern (supervisor: Dr. Willem M. Beltman) May 2011 – Jul. 2011
- Blind source separation of convolutive speech mixtures in mobile environment

Gangnam-gu and Yeongdeungpo-gu District Offices South Korea
Public Interest Service Personnel Jun. 2003 – Sep. 2005

PUBLICATION

Preprints

Il Yong Chun, David Hong, Ben Adcock, and Jeffrey A. Fessler, "Convolutional analysis operator learning: Dependence on training data and compressed sensing recovery guarantees," preprint, Jul. 2018.

Ikbeom Jang, **Il Yong Chun**, Eric L. Breedlove, Larry J. Leverenz, Eric A. Nauman, and Thomas M. Talavage, "Axonal impairment in high school football athletes: Longitudinal study using diffusion weighted imaging," preprint, Oct. 2017.

Submitted Journal Papers

Miao-Bin Lien, Che-Hung Liu, **Il Yong Chun**, Saiprasad Ravishankar, Hung Nien, Minmin Zhou, Jeffrey A. Fessler, Theodore B. Norris, and Zhaohui Zhong, "Ranging and light field imaging with transparent photodetectors," submitted to *Science*, Aug. 2018.

Il Yong Chun and Jeffrey A. Fessler, "Convolutional analysis operator learning: Acceleration, convergence, application, and neural networks," submitted to *IEEE Trans. Image Process.*, Jan. 2018. [Online] Available: `http://arxiv.org/abs/1802.05584`

Il Yong Chun, Xuehang Zheng, Zhipeng Li, Yong Long, and Jeffrey A. Fessler, "Sparse-view X-ray CT reconstruction using ℓ_1 prior with learned transform," under review for *IEEE Trans. Rad. Plasma Med. Sci.*, Nov. 2017. [Online] Available: `http://arxiv.org/abs/1711.00905`

Journal Papers

Il Yong Chun and Ben Adcock, "Uniform recovery from subgaussian multi-sensor measurements," to appear in *Appl. Comput. Harmon. Anal.*, Sep. 2018. [Online] Available: `http://arxiv.org/abs/1610.05758`

Il Yong Chun and Jeffrey A. Fessler, "Convolutional dictionary learning: Acceleration and convergence," *IEEE Trans. Image Process.*, vol. 27, no. 4, pp. 1697–1712, Apr. 2018. [Online] Available: `https://arxiv.org/abs/1707.00389`

Il Yong Chun and Ben Adcock, "Compressed sensing and parallel acquisition," *IEEE Trans. Inf. Theory*, vol. 63, no. 8, pp. 4860–4882, May 2017. [Online] Available: `http://arxiv.org/abs/1601.06214`

Il Yong Chun, Song Noh, David J. Love, Thomas M. Talavage, Stephen Beckley, and Sherman J. Kisner, "Mean squared error (MSE)-based excitation pattern design for parallel transmit and receive SENSE MRI image reconstruction," *IEEE Trans. Comput. Imag.*, vol. 2, no. 4, pp. 424–439, Dec. 2016.

Il Yong Chun, Ben Adcock, and Thomas M. Talavage, "Efficient compressed sensing SENSE pMRI reconstruction with joint sparsity promotion," *IEEE Trans. Med. Imag.*, vol. 5, no. 1, pp. 354–368, Jan. 2016.

Il Yong Chun, Xianglun Mao, Eric L. Breedlove, Larry J. Leverenz, Eric A. Nauman, and Thomas M. Talavage, "DTI detection of longitudinal WM abnormalities due to accumulated head impacts," *Dev. Neuropsychol.*, vol. 40, no. 2, pp. 92–97, May 2015.

Conference Papers & Abstracts

Il Yong Chun and Jeffrey A. Fessler, "Convergent iterative signal recovery using trained convolutional neural networks," (to appear) in *Annual Allerton Conf. on Commun., Control, and Comput.*, 2018.

Il Yong Chun and Jeffrey A. Fessler, "Signal recovery using trained CNNs: Relation to compressed sensing and application to sparse-view CT," (to appear) in *Asilomar Conf. on Signals, Syst., and Comput.*, 2018.

Hongki Lim, Jeffrey A. Fessler, Yuni K. Dewaraja, **Il Yong Chun**, "Application of trained Deep BCD-Net to iterative low-count PET image reconstruction," (to appear) in *Proc. IEEE Nuclear Science Symposium (NSS) and Medical Imaging Conference (MIC)*, Nov., 2018.

Il Yong Chun and Jeffrey A. Fessler, "Deep BCD-Net using identical encoding-decoding CNN structures for iterative image recovery," in *Proc. IEEE Image, Video, and Multidim. Signal Process. (IVMSP) Workshop*, Apr. 2018. [Online] Available: `http://arxiv.org/abs/1802.07129`

Il Yong Chun, Cameron J. Blocker, and Jeffrey A. Fessler, "Low-rank plus sparse tensor models for light-field reconstruction from focal stack data," in *Proc. IEEE Image, Video, and Multidim. Signal Process. (IVMSP) Workshop*, Apr. 2018.

Saiprasad Ravishankar, **Il Yong Chun**, and Jeffrey A. Fessler, "Physics-driven deep training of dictionary-based algorithms for MR image reconstruction," in *Proc. Asilomar Conf. on Signals, Syst., and Comput.*, Pacific Grove, CA, Nov. 2017, pp 1859–1863.

Il Yong Chun and Jeffrey A. Fessler, "Convergent Convolutional Dictionary Learning using Adap-

tive Contrast Enhancement (CDL-ACE): Application of CDL to image denoising," in *Proc. Sampling Theory and Appl. (SampTA)*, Tallinn, Estonia, Jul. 2017, pp 460–464.

Il Yong Chun, Xuehang Zheng, Yong Long, and Jeffrey A. Fessler, "Sparse-view X-ray CT reconstruction using ℓ_1 regularization with learned sparsifying transform," in *Proc. Intl. Mtg. on Fully 3D Image Recon. in Rad. and Nuc. Med. (Fully 3D)*, Xi'an, China, Jun. 2017, pp 115–119.

Ikbeom Jang, **Il Yong Chun**, Sumra Bari, Yukai Zou, Eric A. Nauman, and Thomas M. Talavage, "DTI reveals persistent effects on white matter in football players with history of sports-related concussion," *IN Neuroimaging Symp.*, Bloomington, IN, Nov. 2016.

Il Yong Chun and Ben Adcock, "Compressed sensing and parallel acquisition: Optimal uniform and nonuniform recovery guarantees," *Shannon Centennial Symposium*, Ann Arbor, MI, Sep. 2016.

Il Yong Chun, Chen Li, and Ben Adcock, "Sparsity and parallel acquisition: Optimal uniform and nonuniform recovery guarantees," in *Proc. IEEE Intl. Conf. on Multimedia and Expo (ICME) 2016, Workshop on Sparsity and Compressive Sensing in Multimedia (MM-SPARSE)*, Seattle, WA, Jul. 2016, pp 1–6. [Online] Available: `http://arxiv.org/abs/1603.08050`

Il Yong Chun and Ben Adcock, "Optimal sparse recovery for multi-sensor measurements," in *Proc. IEEE Inf. Theory Workshop (ITW)*, Cambridge, UK, Aug. 2016, pp 270–274. [Online] Available: `http://arxiv.org/abs/1603.06934`

Sumra Bari, **Il Yong Chun**, Larry J. Leverenz, Eric A. Nauman, and Thomas M. Talavage, "DTI detection of WM abnormalities using randomization test with complete and incomplete pairs," in *Proc. Org. for Hum. Brain Mapp. (OHBM)*, Honolulu, HI, Jun. 2015.

Ikbeom Jang, **Il Yong Chun**, Larry J. Leverenz, Eric A. Nauman, and Thomas M. Talavage, "DWI detection of WM abnormality and relation with collision events in high school athletes," in *Proc. Org. for Hum. Brain Mapp. (OHBM)*, Honolulu, HI, Jun. 2015.

Ikbeom Jang, **Il Yong Chun**, Larry J. Leverenz, Eric A. Nauman, and Thomas M. Talavage, "Robust detection of axonal abnormalities in high school collision-sport athletes: Longitudinal single subject analysis," in *Proc. Intl. Soc. Mag. Res. Med. (ISMRM)*, Toronto, ON, May 2015.

Il Yong Chun, Ben Adcock, and Thomas M. Talavage, "Efficient compressed sensing SENSE parallel MRI reconstruction with joint sparsity promotion and mutual incoherence enhancement," in *Proc. IEEE Eng. Med. Biol. Soc. (EMBS)*, Chicago, IL, Aug. 2014, pp. 2424–2427.

Il Yong Chun, Ben Adcock, and Thomas M. Talavage, "Non-convex compressed sensing CT reconstruction based on tensor discrete Fourier slice theorem," in *Proc. IEEE Eng. Med. Biol. Soc. (EMBS)*, Chicago, IL, Aug. 2014, pp. 5141–5144.

Il Yong Chun, Allan Diaz, Sijia Qiu, Larry J. Leverenz, Eric A. Nauman, and Thomas M. Talavage, "DTI detection of symptomatic and asymptomatic injury due to repetitive hit exposures," *IN Neuroimaging Symp.*, Bloomington, IN, Oct. 2013.

Il Yong Chun and Thomas M. Talavage, "Efficient compressed sensing statistical X-ray/CT reconstruction from fewer measurements," in *Proc. Intl. Mtg. on Fully 3D Image Recon. in Rad. and Nuc. Med. (Fully 3D)*, Lake Tahoe, CA, Jun. 2013, pp. 30–33.

Il Yong Chun, Allan Diaz, Xiaodong Li, Yun Jang Jin, Larry J. Leverenz, Eric A. Nauman, and Thomas M. Talavage, "DTI detection of symptomatic and asymptomatic injury due to repetitive head blows," in *Proc. Org. for Hum. Brain Mapp. (OHBM)*, Seattle, WA, Jun. 2013.

Il Yong Chun and Thomas M. Talavage, "Fast non-convex statistical compressed sensing MRI reconstruction based on approximated $Lp(0 < p < 1)$-quasi-norm with fewer measurements than using $L1$-norm," in *Proc. Intl. Soc. Mag. Res. Med. (ISMRM)*, Salt Lake City, UT, Apr. 2013.

Il Yong Chun and Thomas M. Talavage, "Edge-preserving non-iterative MAP SENSE MRI reconstruction," in *Proc. Intl. Soc. Mag. Res. Med. (ISMRM)*, Salt Lake City, UT, Apr. 2013.

Il Yong Chun and Thomas M. Talavage, "Sparse Tikhonov-regularized SENSE MRI reconstruction," in *Proc. Intl. Soc. Mag. Res. Med. (ISMRM)*, Salt Lake City, UT, Apr. 2013.

Il Yong Chun, Allan Diaz, Yun Jang Jin, Xiaodong Li, Larry J. Leverenz, Eric A. Nauman, and

Thomas M. Talavage, "Robust detection of progressive white matter abnormalities in mTBI using DW-MRI," in *Proc. Intl. Soc. Mag. Res. Med. (ISMRM)*, Salt Lake City, UT, Apr. 2013.

HONORS AND AWARDS

Travel Funds for Purdue Engineering Ph.D. Candidates, Purdue Univ. Sep. 2014

Travel Funds, 12^{th} Fully 3D Jun. 2013

Magna Cum Laude Merit Award, 21^{st} ISMRM Apr. 2013

Award of Trainee (Educational) Stipend, 21^{st} ISMRM Apr. 2013

Semester High Honor, Korea Univ. Dec. 2005 – Jun. 2007

Honors Scholarship, Korea Univ. Feb. 2006 – Aug. 2007

TALKS

Seminar Presentations

"Breaking imaging limits via ML & AI"
Seminar, Shanghai Jiao Tong University (UM-SJTU JI) Sep. 2018

"Breaking imaging limits via ML & AI"
Special Seminar, Ulsan National Institute of Science and Technology (ECE) Sep. 2018

"Breaking imaging limits via ML & AI"
Seminar, Yonsei University (CSE) Aug. 2018

"Breaking imaging limits"
Colloquium, Ohio State University (ECE) Mar. 2018

"Breaking imaging limits"
Seminar, Texas Tech University (ECE) Feb. 2018

"Convolutional dictionary learning using a fast block proximal gradient method"
Communications & signal processing seminars, University of Michigan (EECS) Apr. 2017

"Compressed sensing and parallel acquisition"
Communications & signal processing seminars, University of Michigan (EECS) Jan. 2016

Conference Presentations

"Application of trained Deep BCD-Net to iterative low-count PET image reconstruction"
IEEE Nuclear Science Symposium (NSS) and Medical Imaging Conference (MIC) Nov. 2018

"Signal recovery using trained CNNs: Relation to compressed sensing and application to sparse-view CT"
Special session on *Machine learning advances in medical imaging*
on *Asilomar Conf. on Signals, Syst., and Comput.* **(Invited)** Oct. 2018

"Convergent iterative signal recovery using trained convolutional neural networks"
Special session on *Computational imaging and inverse problems*
on *Annual Allerton Conf. on Commun., Control, and Comput.* **(Invited)** Oct. 2018

"From convolutional analysis operator learning (CAOL) to convolutional neural network (CNN)"
Minisymposium on *Recent advances in convolutional sparse representations*
on *SIAM Conf. on Imaging Science (IS)* **(Invited)** Jun. 2018

"Deep BCD-Net using identical encoding-decoding CNN structures for iterative image recovery"
IEEE Image, Video, and Multidim. Signal Process. (IVMSP) Workshop Jun. 2018

"Low-rank plus sparse tensor models for light-field reconstruction from focal stack data"
IEEE Image, Video, and Multidim. Signal Process. (IVMSP) Workshop Jun. 2018.

"Physics-driven deep training of dictionary-based algorithms for image reconstruction"
Asilomar Conf. on Signals, Syst., and Comput. **(Invited)** Nov. 2017

"Convergent convolutional dictionary learning using adaptive contrast enhancement (CDL-ACE): Application of CDL to image denoising"

Sampling Theory and Appl. (SampTA) Jul. 2017

"Efficient sparse-view X-ray CT reconstruction using ℓ_1 regularization with learned sparsifying transform"
Intl. Mtg. on Fully 3D Image Recon. in Rad. and Nuc. Med. (Fully 3D) Jun. 2017

"DTI reveals persistent effects on white matter in football players with history of sports-related concussion"
IN Neuroimaging Symp. Nov. 2016

"Optimal sparse recovery for multi-sensor measurements"
IEEE Inf. Theory Workshop (ITW) 2016 Aug. 2016

"Sparsity and parallel acquisition: Optimal uniform and nonuniform recovery guarantees"
Workshop on Sparsity and Compressive Sensing in Multimedia (MM-SPARSE)
IEEE Intl. Conf. on Multimedia and Expo (ICME) 2016 Jul. 2016

"Robust detection of axonal abnormalities in high school collision-sport athletes: longitudinal single subject analysis"
Intl. Soc. Mag. Res. Med. (ISMRM) May 2015

"Non-convex compressed sensing CT reconstruction based on tensor discrete Fourier slice theorem"
IEEE Eng. Med. Biol. Soc. (EMBS) Aug. 2014

"Efficient compressed sensing statistical X-ray/CT reconstruction from fewer measurements"
Intl. Mtg. on Fully 3D Image Recon. in Rad. and Nuc. Med. (Fully 3D) Jun. 2013

"Robust detection of progressive white matter abnormalities in mTBI using DW-MRI"
Intl. Soc. Mag. Res. Med. (ISMRM) Apr. 2013

PROFESSIONAL EXPERIENCE

Reviewer for the following journals:

- IEEE Transactions on Image Processing
- IEEE Transactions on Medical Imaging
- IEEE Transactions on Computational Imaging
- Journal of X-Ray Science and Technology
- Medical Image Analysis

Reviewer for the following proceedings:

- IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2018

Membership:

- Member in IEEE
- Affiliated member in IEEE special interest group on computational imaging

ACTIVITIES

Purdue Electrical Engineering Korean Association (PEEKA) Purdue Univ.
Vice President Aug. 2011 – Aug. 2012

Academic Society of Communication Engineering Korea Univ.
President Mar. 2006 – Jun. 2007

VISA STATUS H1-B

MILITARY SERVICE

Republic of Korea Army South Korea
Private Jun. 2003 – Sep. 2005

PROGRAM SKILL MATLAB, C, and C++