Hongki Lim

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https://limhongki.github.io

Education

University of Michigan, Ann Arbor Sep 2015 - May 2020
Ph.D., Electrical Engineering and Computer Science
with a concentration in signal processing and machine learning

Inha University Feb 2006 - Aug 2012
B.S., Electronic Engineering

Research Interest

Computer vision; Generative modeling; Unsupervised learning; Inverse Problem; Medical imaging

Technical Skills

Proficient in programming language and machine learning libraries including Matlab, Python, C++, Pytorch, and Tensorflow.

Research and Work Experience

Siemens Healthineers *Senior AI scientist* Sep 2020 - Present
Digital Technology & Innovation
AI research, including projects on machine learning methods for computational medical imaging.
· Developed CT image synthesis methods with given MRI image using a generative model.
· Designed image degradation method from unpaired dataset for training X-ray super-resolution.
· Designed distortion correction methods for multi-shot EPI MR imaging.

University of Michigan *Research assistant* Aug 2016 - May 2020
Advised by Prof. Jeffrey Fessler and Prof. Yuni Dewaraja
Machine learning for imaging research, including projects on image reconstruction methods for medical imaging.
· Designed deep learning-based regularizers and an adaptive parameter control scheme for penalized-likelihood image reconstruction.
· Designed a regularization method incorporating deep learning-based segmentation information.
· Designed a physics-inspired constrained optimization problem for imaging and solved it using a variable splitting method (alternating direction method of multipliers).

University of Michigan May 2016 - Aug 2016
Advised by Prof. Chenliang Xu
Computer vision research, including projects on variants of LSTM and descriptive caption generation for an image using a combination of CNN and RNN.
· Designed an image captioning system combined with CNN to extract the visual features and gated recurrent units (GRU) to generate image captions using spatial attention features from spatial transformer network.

Qualcomm *Internship* Feb - Jun 2015
Computer Vision Group, Corporate Research & Development
Investigated the feasibility of new features of Snapdragon computer vision engine. Analyzed competitors computer vision applications. Wrote one patent draft for internal patent competition.

Samsung Electronics *Associate* Jul 2012 - Mar 2014
Technology Planning Group, Strategic Planning Team, System LSI Division
Established R&D roadmaps of network on chip and software solutions. Examined the necessity of license/royalty payment when adopting software solutions.

Samsung Electronics *Internship* Dec 2011 - Feb 2012
Technology Planning Group, Strategic Planning Team, System LSI Division
Researched rival companies' manufacturing processes.

Korean Air Force *Sergeant* Jul 2009 - Aug 2011
Avionics Maintenance Battalion
Embedded security code for the identification check in aircraft avionic system.

Dissertation

Quantitative image reconstruction methods for low signal-to-noise ratio emission tomography
Advisor: Jeffrey A. Fessler, Yuni K. Dewaraja

Journal Papers

[5] Haowei Xiang, **Hongki Lim**, Jeffrey Fessler, and Yuni Dewaraja. A deep neural network for fast and accurate scatter estimation in quantitative SPECT/CT under challenging scatter conditions. *Eur. J. Nuc. Med. Mol. Im. (EJNMMI)*, 47:2956-67, May 2020.

[4] Il Yong Chun, Zhengyu Huang, **Hongki Lim**, and Jeffrey Fessler. Momentum-Net: Fast and convergent iterative neural network for inverse problems. early access in *IEEE Trans. Pattern Anal. Mach. Intell. (TPAMI)*, July 2020.

[3] **Hongki Lim**, Il Yong Chun, Yuni Dewaraja, and Jeffrey Fessler. Improved low-count quantitative PET reconstruction with an iterative neural network. *IEEE Trans. Med. Imag. (TMI)*, 39(11):3512-22, Nov. 2020.

[2] **Hongki Lim**, Jeffrey Fessler, Scott Wilderman, Allen Brooks, and Yuni Dewaraja. Y-90 SPECT maximum likelihood image reconstruction with a new model for tissue-dependent bremsstrahlung production: A proof-of-concept study. *Phys. Med. Biol. (PMB)*, 63(11):115001, Jun. 2018.

[1] **Hongki Lim**, Yuni Dewaraja, and Jeffrey Fessler. A PET reconstruction formulation that enforces non-negativity in projection space for bias reduction in Y-90 imaging. *Phys. Med. Biol. (PMB)*, 63(3):035042, Feb. 2018.

Conference Proceedings and Abstracts

[12] **Hongki Lim**, Yuni Dewaraja, and Jeffrey Fessler. Joint low-count PET/CT segmentation and reconstruction with paired variational neural networks. *Proc. SPIE 11312 Medical Imaging: Phys. Med. Im.*, p. 113120U, 2020. **Oral presentation**

[11] Haowei Xiang, **Hongki Lim**, Jeffrey Fessler, and Yuni Dewaraja. SPECT/CT scatter correction using deep learning: implementation in Y-90 imaging. *Proc. IEEE Nuc. Sci. Symp. Med. Im. Conf.*, pp. 1-3, 2019.

[10] **Hongki Lim**, Il Yong Chun, Jeffrey Fessler, and Yuni Dewaraja. Improved low count quantitative SPECT reconstruction with a trained deep learning based regularizer. *J. Nuc. Med. (Abs. Book)*, 60(s1): 42., 2019. **Oral presentation**

[9] **Hongki Lim**, Zhengyu Huang, Jeffrey Fessler, Yuni Dewaraja, and Il Yong Chun. Application of trained Deep BCD-Net to iterative low-count PET image reconstruction. *Proc. IEEE Nuc. Sci. Symp. Med. Im. Conf.*, pp. 1-4, 2018. **Oral presentation**

[8] Se Young Chun, **Hongki Lim**, Jeffrey Fessler, and Yuni Dewaraja. On Parameter Selection for Joint Spectral Reconstruction in Y90 SPECT. *Proc. IEEE Nuc. Sci. Symp. Med. Im. Conf.*, pp. 1-4, 2018.

[7] Il Yong Chun, **Hongki Lim**, Zhengyu Huang, and Jeffrey Fessler. Fast and convergent iterative signal recovery using trained convolutional neural networks. *Proc. Allerton*, pp. 155-159, Oct. 2018.

[6] **Hongki Lim**, Jeffrey Fessler, and Yuni Dewaraja. Joint dual photopeak image reconstruction in Lu-177 SPECT. *Eur. J. Nuc. Med. Mol. Imaging*, (Vol. 45, pp. S95-S96), Oct. 2018. **Oral presentation**

[5] **Hongki Lim**, Kyungsang Kim, Quanzheng Li, Jeffrey Fessler, and Yuni Dewaraja. Bias reduction in Y-90 PET with reconstruction that relaxes the non-negativity constraint. *J. Nuc. Med. (Abs. Book)*, 59(s1): 580. 2018. **Oral presentation**

[4] **Hongki Lim**, Yuni Dewaraja, and Jeffrey Fessler. Reducing bias in Y-90 PET images by enforcing non-negativity in projection space. *Proc. IEEE Nuc. Sci. Symp. Med. Im. Conf.*, pp. 1-4, 2017. **Oral presentation**

[3] **Hongki Lim**, Neal Clinthorne, Maurizio Conti, Jeffrey Fessler, and Yuni Dewaraja. Quantitative Y-90 PET for dosimetry in radioembolization. *Eur. J. Nuc. Med. Mol. Imaging*, 44(s2):S398, Oct. 2017.

[2] **Hongki Lim** and Yuni Dewaraja. Impact of Tc-99m SPECT reconstruction methods on lung shunt and lesion/normal liver activity quantification in radioembolization. *J. Nuc. Med. (Abs. Book)*, 58(s1):1032, May 2017. **Poster presentation**

[1] **Hongki Lim**, Yuni Dewaraja, and Jeffrey Fessler. Y-90 SPECT maximum likelihood image reconstruction with a new model for tissue-dependent bremsstrahlung production. *J. Nuc. Med. (Abs. Book)*, 58(s1):746, May 2017. **Oral presentation**

Teaching Experience

University of Michigan *Undergraduate Research Opportunity Program* Sep 2016 - Dec 2016
Advised undergraduate students to engage in image processing related research activities.

Seminars

Michigan State University Comp. Math. Sci. and Engin. Feb 2020
Machine learning based image reconstruction and analysis methods for low signal-to-noise ratio emission tomography.

Massachusetts General Hospital Gordon Center for Medical Imaging Dec 2019
Quantitative image reconstruction and analysis methods for low signal-to-noise ratio emission tomography

Scientific Service

Journal Reviews: IEEE Transactions on Medical Imaging (IEEE-TMI), IEEE Transactions on Computational Imaging (IEEE-TCI), IEEE Transactions on Radiation and Plasma Medical Sciences (IEEE-TRPMS), Journal of Mathematical Imaging and Vision (JMIV)

Awards & Scholarships

IEEE NSS/MIC Trainee Grant	2017, 2018
Rackham Conference Travel Grant	2016, 2017, 2018
Awarded Second Place, UMich EECS 556: Image Processing, *Article*	Apr 2016
Awarded Scholarship for High Score on TOEIC	Fall 2011
Awarded First Place Prize at Control System Design Contest	Fall 2008
Awarded Scholarship from School of Logistics	Spring 2007
Awarded Semester High Honors	Spring, Fall 2006

Relevant Coursework and Certificates

Coursework (UMich): • Machine Learning • Nonlinear Programming • Matrix Methods for Signal Processing and Machine Learning • Foundations of Computer Vision • Advanced Topics In Computer Vision • Image Processing • Probability and Random Processes • Estimation, Filtering, and Detection • Medical Imaging • Optimization Methods in Statistics

MOOC: •Neural Networks and Deep Learning •Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization •Structuring Machine Learning Projects •Convolutional Neural Networks