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., Electrical Engineering

Research Interest

Computer vision; Image reconstruction; Generative model; Unsupervised learning; Inverse problem

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 medical image synthesis methods using generative models and unsupervised learning.

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

• 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.

• Il Yong Chun, **Hongki Lim***, Zhengyu Huang*, and Jeffrey Fessler. Momentum-Net: Fast and convergent iterative neural network for inverse problems. *IEEE Trans. Pattern Anal. Mach. Intell. (TPAMI)*, ?. 2020. To appear

• **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.

• **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.

• **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.

(The asterisks (*) indicate equal contributions.)

Conference Proceedings and Abstracts

• **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.

• 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.*, Oct. 2019. To appear.

• **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

- **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.

- 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.

- 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.

- **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.

- **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.

- **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.

- **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.

- **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.

Teaching Experience

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

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)

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

Course Projects

High Dynamic Range Image Tone Mapping Using a Local Edge-Preserving Multiscale Decomposition *Report*

Image Processing, Prof. Jeff Fessler   Winter 2016

Proposed the joint base-detail decomposition by considering additional constraints on detail layers.

Image Captioning Using Attention Based Recurrent Neural Networks *Report*

Advanced Topics in Computer Vision, Prof. Jason Corso   Winter 2016

Proposed to exploit the spatial transformer network and gated recurrent units for image captioning.

Critiques and Implementation on Recent Image Captioning Methods *Report*

Foundations of Computer Vision, Prof. Jason Corso   Fall 2015

Reproduced the method in "Deep visual-semantic alignments for generating image descriptions" published in CVPR 2015.

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