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

Deep learning; Inverse problem; Image reconstruction; Medical image analysis

Dissertation

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

Journal Papers

[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.*, 63(3):035042, Feb. 2018.

[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.*, 63(11):115001, Jun. 2018.

[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.*, 39(11):3512-22, Nov. 2020.

[4] 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.*, ?. 2020. To appear

[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.*, 47:2956-67, May 2020.

(The asterisks (*) indicate equal contributions.)

Conference Proceedings and Abstracts

[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.

[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.

[3] **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.

[4] **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.

[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.

[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.

[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.

[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.

[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.

[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

[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.*, Oct. 2019. To appear.

[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.

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.

University of Michigan *Research assistant*   Aug 2016 - May 2020
Advised by Prof. Jeffrey Fessler and Prof. Yuni Dewaraja
Medical imaging research, including projects on image reconstruction methods for emission tomography.

University of Michigan   May 2016 - Aug 2016
Advised by Prof. Chenliang Xu
Computer vision research, including projects on variants of LSTM and video understanding.

Qualcomm *Internship*   Feb - Jun 2015
Computer Vision Group, Corporate Research & Development
Built datasets and evaluated Snapdragon computer vision engine. Investigated the feasibility of Snapdragon computer vision engine's new features. 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 video compression, network on chip and software solutions. Examined the necessity of license/royalty payment when adopting software solutions. Performed competitor analysis on their research areas. Managed technology transfer progress between Samsung Electronics divisions. Prioritized R&D project plans according to necessity, resources and profits.

Samsung Electronics *Internship*   Dec 2011 - Feb 2012
Technology Planning Group, Strategic Planning Team, System LSI Division
Assisted industry-university collaboration by drafting interim reports. Researched rival companies' manufacturing processes. Assessed Korean minor companies' capability for outsourcing relevant technologies.

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

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)

Affiliations

- IEEE, Student Member
- Society of Nuclear Medicine and Molecular Imaging, Associate Member
- European Association of Nuclear Medicine, Junior Member

Relevant Coursework and Skills

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
Programming Language: **Python, Matlab**, C++
Deep Learning frameworks: **PyTorch, TensorFlow**, Caffe

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 network 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, 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