Tae Soo Kim

taesoo.kim@lunit.io
https://taesoo-kim.github.io
github.com/TaeSoo-Kim
Last updated: November, 2024

Objective

I am passionate about building AI systems that can generalize to challenging real world problems. Currently, I am a research scientist and a team lead at Lunit where I am part of a group whose mission is to conquer cancer through artificial intelligence. My research has been applied to a wide range of applications including video surveillance, surgical data science, medical image analysis and healthcare. I thrive under a team environment and find great satisfaction in achieving as a team.

Education

Johns Hopkins University — Baltimore, MD
Ph.D. in Computer Science, Advisor: Dr. Gregory D. Hager — 2015–2021

- Thesis: "Model-driven and Data-driven Methods for Recognizing Compositional Interactions from Videos"

Johns Hopkins University — Baltimore, MD
M.S. in Computer Science, Advisor: Dr. Russell Taylor and Dr. Austin Reiter — 2014–2015

- Thesis: "3D Reconstruction System using a Flexible Endoscope and a Laser"

Johns Hopkins University — Baltimore, MD
B.S.E in Computer Science — 2010–2014

- Graduated with general honors
- Minor: Robotics

Professional Experience

Lunit — Seoul, Korea
Senior Research Scientist and Team Lead — 2021.06 - Current

- **AI Research: Model Team** (2022.09 - Current)
- The AI model team develops AI models for all product line ups in the Cancer Screening Department of Lunit including Lunit INSIGHT CXR^{TM}, Lunit INSIGHT MMG^{TM} and Lunit INSIGHT DBT^{TM}.
- As a team lead, I contribute by managing the team of 10+ researchers to deliver best-in-class AI models for productization by setting up scalable processes for collaboration, data annotation, training, inference and evaluation.
- We build evidence for AI algorithms for future Lunit products by executing forward looking research projects that directly improve our products and publishing scientific papers. (See publications: [1]–[3], [5], [6])
- **AI Research: Chest X-ray Team** (2021.06 - 2022.09)
- The chest X-ray team at the Lunit AI Research department is in charge of developing core deep learning algorithms used in the Lunit INSIGHT CXR^{TM} product line.
- As a research scientist and team lead, I contribute to the product by optimizing the vision model for lesion detection, adding new detectable lesions to the model, releasing AI engines and managing the team.

Siemens Healthineers (Siemens Corporate Research) — Princeton, NJ
Graduate Research Intern: hosted by Dr. Shaohua Kevin Zhou — Summer 2016

- **Bone Removal Project**

- The aim of the Bone Removal project was to develop deep learning algorithms to remove voxels representing bones in a computed tomography angiography volume.
- As an integrated software for immediate deployment in products, the bone removal software was required to be highly precise, efficient and fast.
- As a graduate research intern, I developed a novel 3D convolutional neural network architecture with decomposed convolutions for bone removal.
- My approach increased accuracy and precision while decreasing memory usage and inference time. The developed bone removal model was successfully deployed to commercial products. (See patents: [16], [17]).

Hyundai Heavy Industries, Medical Systems Department Seoul, Korea
Undergraduate Research Intern Summer 2012

- **Medical Robotics Project**
- The goal of the project was to build a minimally invasive surgical robot to remove malignant masses from breast cancer patients.
- As part of the computer vision team, I developed an algorithm for recognizing malignant/benign masses and cysts from breast ultrasound images. My main task involved data curation and implementation of state of the art machine learning algorithms.

Academic Experience

Johns Hopkins University Baltimore, MD
Graduate Research Assistant 2018-2021

- **The Deep Intermodal Video Analytics (DIVA) project funded by IARPA**
- The DIVA program is a US government funded multi-institutional research program that aims to develop a robust automated activity detection system for multi-camera video surveillance applications.
- As a senior Ph.D student of the JHU DIVA team, I assumed a leadership role in the team's research, development and deployment of system deliverables to the program.
- I developed a zero-shot action recognition system that requires no labeled training examples of the test activities. (See publications: [8], [11])
- I developed a simulation software for synthesizing human activities from economic motion capture systems. We use the generated dataset to train activity recognition systems. (See publications: [4], [9], [14])

Johns Hopkins University Baltimore, MD
Graduate Research Assistant 2016-2018

- **Language of Surgery project funded by the Johns Hopkins Wilmer Eye Institute**
- In collaboration with the surgeons from the Johns Hopkins Wilmer Eye Institute, the project aimed to build intelligent tools to automatically analyze videos of cataract surgery.
- The goal is to build an intelligent system that provides actionable feedback to trainees by reviewing their surgical performance from video recordings.
- I showed that videos of cataract surgery can be annotated accurately at scale using crowd-sourced workers. (See publication: [13])
- As a machine learning and computer vision lead in the team, I developed deep learning algorithms to automatically recognize surgical phases from videos. (See publications: [12])
- I developed a deep learning model that provides objective assessment of surgical technical skill from cataract surgery videos. (See publication: [10])

Johns Hopkins University Baltimore, MD
Masters Thesis Research 2014-2015

- **System for stereo reconstruction from monoscopic endoscope images**

- In collaboration with the department of head and neck surgery of the Johns Hopkins hospital, the project aimed to develop an economic solution for an endoscope capable of accurate 3D reconstruction of organs.
- I developed an active stereo vision system using a pattern generating laser inserted into a working channel of an endoscope.
- With a solution costing under a 100 dollars added to the endoscope, I developed a system capable of accurate 3D reconstruction using monoscopic endoscope images. (See patent: [18])

Teaching

- **Head Teaching Assistant** at Johns Hopkins University — Fall 2015,2016
  Computer vision *(Dr. Austin Reiter)*
- **Head Teaching Assistant** at Johns Hopkins University — Spring 2016
  Augmented Reality *(Dr. Nasir Navab)*
- **Head Teaching Assistant** at Johns Hopkins University — Summer 2015
  Intro. Programming *(Dr. Sara More)*
- **Head Teaching Assistant** at Johns Hopkins University — Spring 2015
  Data Structures *(Dr. Sara More)*

Skills

- **Machine Learning/Computer Vision:** Python, Pytorch, Keras, Tensorflow, Opencv, Matlab, Docker
- **Simulation:** UnrealEngine, UnrealCV, Axis-Neuron, ROS
- **Other:** Html, Php, Javascript, Java, SQL, Android-Studio, Confluence

Languages

- **Korean:** Native
- **English:** Bilingual

Service

- **Organizer** of MICCAI Tutorial on AI for Medical Image Analysis in Practice — 2022.09
  As part of the organization team, I contributed by preparing the proposal, promoting the event and organizing the tutorial event at MICCAI.
- **President** of Korean Graduate Students Association at JHU — 2018–2019
  As an elected leader of the Korean graduate student body, I served to provide constructive support, opportunities as well as entertainment to members of the Korean community at JHU.
- **Vice president** of Korean Graduate Students Association at JHU — 2017–2018
  As a VP of the largest Korean student group at JHU, my main responsibility involved networking with industry representatives for on-campus recruitment events and information sessions for Korean graduate students at JHU.
- **Reviewer** — 2015–current
  for CVPR, ICCV, ECCV, AAAI, MICCAI, IPCAI, TMI

Publications

[1] L. Dillard, H. Lee, W. Lee, **T.S. KIM**, A. Diba, and T. Kooi, "Selectivekd: A semi-supervised framework for cancer detection in dbt through knowledge distillation and pseudo-labeling", in *MICCAI-W*, 2024.

[2] H. Lee, J. Kim, E. Park, M. Kim, **T.S. KIM***, and T. Kooi, "Enhancing breast cancer risk prediction by incorporating prior images", in *MICCAI*, 2023.

[3] G. Nam, **T.S. KIM**, S. Lee, and T. Kooi, "Oooe: Only-one-object-exists assumption to find very small objects in chest radiographs", in *MICCAI-W*, 2022.

[4] **T.S. KIM**, B. Shim, M. Peven, W. Qiu, A. Yuille, and G. D. Hager, "Learning from synthetic vehicles", in *WACV-W Real World Surveillance*, 2022.

[5] **T.S. KIM***, G. Jang, S. Lee, and T. Kooi, "Did you get what you paid for? rethinking annotation cost of deep learning based computer aided detection in chest radiographs", in *MICCAI*, 2022.

[6] J. Song, **T.S. KIM**, J. Kim, G. Nam, T. Kooi, and J. Choo, "Is user feedback always informative? retrieval latent defending for semi-supervised domain adaptation without source data", in *ECCV*, 2021.

[7] **T.S. KIM**, J. Jones, and G. D. Hager, "Motion guided attention fusion to recognize interactions from videos", in *ICCV*, 2021.

[8] **T.S. KIM***, J. Jones*, M. Peven*, Z. Xiao, J. Bai, Y. Zhang, W. Qiu, A. Yuille, and G. D. Hager, "Daszl: Dynamic action signatures for zero-shot learning", in *AAAI*, 2021.

[9] **T.S. KIM**, Michael, W. Qiu, A. Yuille, and G. D. Hager, "Synthesizing attributes with unreal engine for fine-grained activity analysis", in *WACV-W*, 2019.

[10] **T.S. KIM**, M. O'Brien, S. Zafar, A. Malpani, G. D. Hager, S. Sikder, and S. Vedula, "Objective assessment of intraoperative technical skill in capsulorhexis using videos of cataract surgery", in *IJCARS*, 2019.

[11] **T.S. KIM**, Y. Zhang, Z. Xiao, M. Peven, W. Qiu, J. Bai, A. Yuille, and G. D. Hager, "Safer: Fine-grained activity detection by compositional hypothesis testing", in *arxiv*, 2019.

[12] **T.S. KIM***, F. Yu*, G. S. Croso*, Z. Song, F. Parker, G. D. Hager, A. Reiter, S. Vedula, H. Ali, and S. Sikder, "Assessment of automated identification of phases in videos of cataract surgery using machine learning and deep learning techniques", in *Jama Network Open*, 2019.

[13] **T.S. KIM**, A. Malpani, A. Reiter, G. D. Hager, S. Sikder, and S. Vedula, "Crowdsourcing annotation of surgical instruments in videos of cataract surgery", in *MICCAI-W*, 2018.

[14] W. Qiu, F. Zhong, Y. Zhang, S. Qiao, Z. Xiao, **T.S. KIM**, Y. Wang, and A. Yuille, "Unrealcv: Virtual worlds for computer vision", in *ACM-MM*, 2017.

[15] **T.S. KIM** and A. Reiter, "Interpretable 3d human action analysis with temporal convolutional networks", in *CVPR-W*, 2017.

[16] S. K. Zhou, M. Chen, H. Ding, B. Georgescu, M. A. Gulsun, **T.S. Kim**, A. P. Kiraly, X. Lu, J.-h. Park, P. Sharma, S. Sun, D. Xu, Z. Xi, and Y. Zheng, "Method and system for artificial intelligence based medical image segmentation", in *US Patent Application Number 62/414,913*, 2017.

[17] M. Chen, **T.S. Kim**, J. Kretschmer, S. Seifert, S. K. Zhou, M. Schobinger, D. Liu, Z. Xu, S. Grbic, and H. Zhang, "Deep learning based bone removal in computed tomography angiography", in *US Patent 10,852,907*, 2019.

[18] K. C. Olds, **T.S. KIM**, R. H. Taylor, and A. Reiter, "System for stereo reconstruction from monoscopic endoscope images", in *US Patent 10,368,720*, 2019.