DONGYOUN KIM

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Education

Iowa State University (ISU) | Ames, IA — Aug 2019 – Present

Doctor of Philosophy in Computer Science — *GPA:* 3.67/4.00

South Dakota State University (SDSU) | Brookings, SD — Aug 2016 – Aug 2019

Master of Science in Computer Science — *GPA:* 3.75/4.00

Kookmin University (KMU) | Seoul, South Korea — Mar 2009 – Feb 2013

Bachelor of Engineering in Electronic Engineering

Research Interesting

Applied machine learning and deep learning for Image Processing, Natural Language Processing

Research Summary

Natural Language Processing & Image Processing| ISU, Dr. Forrest Sheng Bao — May 2023 - Present

Project lead, "Chart Question Answering"

• Researching pre-trained models for learning a foundational language and vision representation

Natural Language Processing| ISU, Dr. Zhu (Drew) Zhang — Jan 2022 – Dec 2022

Project lead, "Chart Question Answering"

• Investigated the differences in answering a question between chart image and natural image to improve the high-level feature extraction and relation with text in the image

Software Analytics & Pervasive Parallelism Laboratory| ISU, Dr. Jannesari Ali — Jan 2020 – May 2021

Project Member, "Model Compression for federated learning"

• Investigated the model compression methods for non-independent and identically distributed challenge in federated learning pruning scheme

• Analyzed the existing compression/neural architecture search models for finding a suitable neural network architecture with Deep Q-learning (DQN) and Deep Deterministic Policy Gradient (DDPG)

Project Lead/Member, "Object detection in Unmanned Aerial Vehicle (UAV) application"

• Conducted the experiments for using Airsim simulator for an environment of multi-drones application in order to detect the specific object in indoor environment

• Tutor a M.S student and revised his thesis adapting Feature Pyramid Network (FPN) for small objects and class imbalance problem in Vis-drone 2018 data

• Improved the accuracy of modified FPN with an inference time of 14 fps by 6.2 mAP than Retina Net

Convergent Computing Technology Laboratory | SDSU, Dr. Sung Shin — Aug 2016 – Aug 2019

Project Lead, "Image-based localization at night"

• Developed the semantic local image conversion method for image-based localization at night

• Collected dataset (~14,000 paired images) with stereo-camera on ground vehicle in Brookings, SD

• Adapted Generative Adversarial Network (GAN) for image conversion and object detection (Mask RCNN) for detecting local regions observed at night scene

• Achieved the higher recovery capability (110.8 average of matching points) than the global conversion method (100.2)

Project Member, "Wireless Body Area Network (WBAN) in space"

• Developed wireless health monitoring system with flexible and wearable Sensors with Arduino and Bluetooth v2.1 and v4.0 systems

• Collaborated with NASA, the University of South Dakota, and electronic engineering department

Project Lead/Member, "Image processing for Medical images"

• Developed 3D knee segmentation with inhomogeneity correction using 2D MRI images

• Achieved the DICE metric (= F1-measurement) as 0.951 (to validate medical volume segmentation)

• Supported 3D Brain MRI Segmentation with intensity non-uniformity problem

• Improved the DICE metric with 0.954 than other fuzzy c-mean clustering methods (~ 0.950)

Project Member, "Image processing for Agriculture application"

• Investigated a classification with Support Vector Machine (SVM) of white mold-affected soybean field from multi-spectral imageries

• Achieved the result with 70.4 % mean accuracy by using Support Vector Machine with a various vegetation index for feature extraction

Class & Personal Project

Project Member, Kaggle "Google Universal Image embedding"

• Developed an image retrieval task with 64 embedding spaces

• Crawled datasets for the training of triplet loss and fine-tuning pre-trained CLIP models

• Achieved 144th rank with 0.549 scores by using CLIP with distance layer loss

Project Lead, Analysis of a prediction model based on given unique signals – Digital Agriculture data

• Explored data processing approaches with descriptive statistics for suitable model selection in unknown unique signals

• Analyzed existing prediction models: multi-linear regression with principal component analysis and non-linear regression model with neural network

• Demonstrated non-linear regression model without outlier data with mean squared error as 0.0001

Project Lead, "Detecting face mask for classifying a correct covering the face"

• Implemented the detecting system to find whether the mask is covering the face over the nose and mouth as a part of HCI 575: Computational Perception; applied pre-trained face detection models

• Proposed and demonstrated the multi-classification model with haar cascades for finding the nose and mouth based on a small size dataset (~ 854 images) with a class imbalance problem

Project Lead, "Horovod-model parallelism for object detection using VisDrone 2019 dataset"

• Applied model parallelism with Horovod framework for extending object detection model (RetinaNet) as a part of Coms 527x concurrent system course

• Observed higher performance of Retina Net with model parallelism by 9 hours than the vanilla model

Project Lead, "The international restaurant smart system services using Java with MVC model"

• Led and managed teammates 3 graduated students

• Designed a restaurant management system such as Reservation, Inventory control, and Sales

• Documented the software engineering documentations from a proposal to a system test plan

Experience

Computer Science Department, Iowa State University |Ames, IA Jan 2022 – Present

Computer Science Graduate Teaching Assistant, *Coms 472/572:* **Principles of Artificial Intelligence**

- Developed and graded homework assignments and projects to provide feedback for students
- Clarified course objectives and answered over 90 student questions to increase understanding of subject

Computer Science Department, Iowa State University |Ames, IA Aug 2019 – Dec 2021

Computer Science Graduate Teaching Assistant, *Coms 113:* **Introduction to spreadsheets and databases**

- As the first TA, taught and managed two lab sections for each ~ 45 undergraduate students
- As the secondary TA, supported two lab sections for each ~ 45 undergraduate students
- Clarified course objectives and answered student questions to increase understanding of subject

South Dakota State University |Brookings, SD Jan 2019 – May 2019

Electronic Engineering Graduate Research Assistant, *Wireless Body Area Network*

- Build a wireless network between the self-developed sensors and a smartphone by using Arduino and Bluetooth v2.1 and v4.0 systems

Computer Science Graduate Research Assistant, *Wireless Body Area Network authentication.*

- Develop a wireless body area network combined with flexible and wearable sensors - with NASA
- Collaborated and communicated with the network team in University of South Dakota

Computer Science Department, South Dakota State University |Brookings, SD Jan 2017 – May 2018

Computer Science Graduate Teaching Assistant, *Programming Language & Soft engineering*

Core Course

- Artificial intelligence
- Machine learning
- Computational perception
- Algorithm
- Theory of computation
- Embedded network system
- Concurrent system
- Problem solving technique
- Advanced computation model learning

Technical & Laboratory Skills

Programming Language*: C, C++, Python, Java, HTML/CSS, R, MATLAB*

Frameworks for machine learning: *TensorFlow/Keras/Scikit-learn, Pytorch, Pandas*

Documentation: *Computer proficiency include MS offices, Latex*

Languages*: Native in Korean, Advanced level in English*

Leadership & Service

Upsilon Pi Epsilon (The National Computer Science Honor Society) Aug 2017 – Aug 2019

Upsilon Pi Epsilon officer | South Dakota State University Aug 2018 – Aug 2019

Scholarship: 2018 UPE Academic Achievement Awards-Scholarship ($1,500)

Korean Student Association in Computer Science | South Dakota State University Aug 2016 – Aug 2019

Publications

1. Chulwoo Pack, **Dongyoun Kim**. "Weakly-supervised Semantic Segmentation on Historical Document Images." International Conference on ACM RACs. (Forthcoming, Summer 2023).
2. Choi, Ju-Hee, **Dongyoun Kim**, Min-Sam Ko, Dong-Eun Lee, Kwangwoo Wi, and Han-Seung Lee, 2023. "Compressive strength prediction of ternary-blended concrete using deep neural network with tuned hyperparameters." Journal of Building Engineering (2023): 107004.
3. Subrahmanyam Vaddi & **Dongyoun Kim** & Chandan Kumar & Shafqat Shad & Ali Jannesari, 2021. "Efficient Object Detection Model for Real-time UAV Application," Computer and Information Science, Canadian Center of Science and Education, vol. 14(1), pages 1-45, February.
4. **Dongyoun Kim**, Sangwon Shin, Jinwoo Park, and Sung Shin. Development of a Semantic Scene Conversion Model for Image based Localization at night. In: Proceedings of the International Conference on ACM RACs, Research in Adaptive and Convergent Systems, Chongqing, China, 2019.
5. **Dongyoun Kim**, Ji Young Lee, Joon Shik Yoon, Kwang Jae Lee, and Kwanghee Won. Development of Automated 3D Knee bone segmentation with Inhomogeneity Correction for Deformable Approach in Magnetic Resonance Imaging. In: Proceedings of the International Conference on ACM RACs, Research in Adaptive and Convergent Systems, Honolulu, Hawaii, 2018.
6. Ji Young Lee, **Dongyoun Kim**, Jin Yeong Mun, Seok Kang, Seong Ho Son, and Sung Shin. Texture Weighted Fuzzy C-Means Algorithm for 3D Brain MRI Segmentation. In: Proceedings of the International Conference on ACM RACs, Research in Adaptive and Convergent Systems, Honolulu, Hawaii, 2018.
7. Suh, Sae-han, **Dongyoun Kim**, Ji-eun Jhang, Emmanuel Byamukama, Gary Hatfield, and Sung-Y. Shin. "Identification of the White-Mold affected Soybean fields by using Multispectral Imageries, Spatial Autocorrelation and Support Vector Machine." In Proceedings of the International Conference on Research in Adaptive and Convergent Systems, pp. 104-109. ACM, 2017.

8. Jin Yeong Mun, Ji Young Lee, **Dongyoun Kim**, and Sung Shin, "Extract texture-problematic femur from Knee MRI using Fuzzy C-means and Region Growing approach", International Conference on Internet (ICONI) 2017.