Paul Kwon

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Education

University of California at Berkeley   Berkeley, CA
Ph.D. in Mechanical Engineering (Computer Vision concentration)   *2017*
M.S. in Computer Science (AI/CV/ML concentration)   *2014*

Seoul National University   Seoul, South Korea
B.S. (double) in Computer Science and Mechanical Engineering, *Cum Laude*   *2008*

Experience

Phantom AI   Mountain View, CA
Deep Learning Team Manager   *2023 — present*
Staff Computer Vision (Deep Learning) Engineer   *2022 — present*
Senior Computer Vision (Deep Learning) Engineer   *2017 — 2022*

- Led and designed deep learning projects from initiation to completion (i.e., data collection, training, and benchmarks) including traffic light/sign detection, lidar detection, time-series tail light signal recognition, monocular 3D pose estimate, tire detection, horizon estimation, etc.) in order to meet NRE deliverables, successful L4-driving demonstration, ground-truth generation for evaluation, etc.
- Published four self-driving-related papers and invented two patents.
- Designed and implemented models for embedded systems including NVIDIA (TensorRT with C++/CUDA custom layer implementations), Texas Instruments, and Renesas Electronics, all requiring model quantization and complex debugging.
- Achieved 10th place in KITTI 2D vehicle detection and 2nd place in KITTI 3D vehicle detection.

UC Berkeley   Berkeley, CA
Graduate Research Assistant   *2011 – 2017*

- Adopted Word2Vec techniques to cluster design concept descriptions written in human languages.
- Applied a Siamese CNN network for challenging image registration problem and increased performance by introducing a new way of data augmentation. (Siamese network Github repository got over 250 ★)
- Developed an image feature descriptor algorithm using line segments by capturing the distribution of lines in a novel way despite challenging inputs including severe changes in image intensity.
- Developed an automatic grading system for AutoCAD Multi-view drawing, calculating the best affine transformation between students drawing and the solution drawing.

Lawrence Livermore National Laboratory   Livermore, CA
Summer Internship (5 consecutive years)   *5 Summers in 2012 – 2016*

- Participated in an aerial image registration project to find a transformation between multi-modal images (e.g., across different sensors and times, etc.)
- Outstanding Achievement Award in 2015 Summer Poster Symposium

Korea Defense Intelligence Command   Seoul, South Korea
Mandatory Military Service (dual citizenship)   *2008 – 2010*

CEMWare Co.   Seoul, South Korea
Software Engineer   *2003 – 2006*

- Launched CEMTool 6.0 (a MATLAB-like scientific computation software written in C++)
- Improved its computation engine (speed and complier) and initiated trace debugging functionality with a better GUI.

Skills

Python (+Cython), Tensorflow, PyTorch, TensorRT, CUDA, OpenGL, Matlab, C/C++

Publications

- Myoung Hwan Oh, Min Gee Cho, Dong Young Chung, Inchul Park, **Youngwook Paul Kwon**, Colin Ophus, Dokyoon Kim, Min Gyu Kim, Beomgyun Jeong, X. Wendy Gu, Jinwoung Jo, Ji Mun Yoo, Jaeyoung Hong, Sara McMains, Kisuk Kang, Yung-Eun Sung, A. Paul Alivisatos, Taeghwan Hyeon, "Design and Synthesis of Multigrain Nanocrystals via Geometric Misfit Strain," Nature (cover), 2020.
- {Kiwoo Shin, **Youngwook Paul Kwon**}*, Masayoshi Tomizuka, "RoarNet: A Robust 3D Object Detection based on RegiOn Approximation Refinement," arXiv, 2018.
- Jinkyu Kim, Hyunggi Cho, Myung Hwangbo, Jaehyung Choi, John Canny, **Youngwook Paul Kwon**, "Deep Traffic Light Detection for Self-driving Cars from a Large-scale Dataset," IEEE International Conference on Intelligent Transportation Systems (ITSC) 2018.
- {Donghan Lee, **Youngwook Paul Kwon**}*, Jinkyu Kim, Jongsang Suh, "A Novel Trajectory Prediction of Traffic Participants for Autonomous Lane Change Assistance," IEEE International Symposium on Advanced Vehicle Control (AVEC) 2018.
- {Donghan Lee, **Youngwook Paul Kwon**}*, Sara McMains, and J. Karl Hedrick, "Convolutional Neural network-based Lane Change Intention Prediction of Surrounding Vehicles for Adaptive Cruise Control," IEEE International Conference on Intelligent Transportation Systems (ITSC) 2017.
- Chengwei Zhang, **Youngwook Paul Kwon**, Julia Kramer, Euiyoung Kim, and Alice Merner Agogino, "Using Machine Learning to Support Concept Clustering in Design Teams," Journal of Mechanical Design
- Chengwei Zhang, **Youngwook Paul Kwon**, Julia Kramer, Euiyoung Kim, and Alice Merner Agogino, "Deep Learning for Design in Concept Clustering," ASME International Design Engineering Technical Conferences 2017.
- **Youngwook Paul Kwon**, and Sara McMains, "Artificial Intensity Remapping: Learning Multimodal Image Descriptors without Multimodal Image Data," Neural Information Processing Systems Workshop (NIPSW): Reliable Machine Learning in the Wild 2016.
- **Youngwook Paul Kwon**, Hyojin Kim, Goran Konjevod, and Sara McMains, "DUDE (DUality DEscriptor): A robust descriptor for disparate images using line segment duality," IEEE International Conference on Image Processing (ICIP) 2016.
- Sushrut Pavanaskar, Sushrut Pande, **Youngwook Paul Kwon**, Zhongin Hu, Alla Sheffer, and Sara McMains, "Energy-efficient vector field based toolpaths for CNC pocket machining," Journal of Manufacturing Processes 2015 *(outstanding paper at NAMRC15)*.
- **Youngwook Paul Kwon** and Sara McMains, "An automated grading/feedback system for 3-view engineering drawings using RANSAC," ACM Learning at Scale (L@S) 2015 *(acceptance ratio: 25%)*.
- **Youngwook Paul Kwon**, "Line segment-based aerial image registration," MS thesis, UC Berkeley, May 2014.

Patents

- **Youngwook Paul Kwon**, Phantom AI Inc. Data Augmentation Using Computer Simulated Objects for Autonomous Control Systems. US 11,144,065 B2, 2019.
- **Youngwook Paul Kwon**, Phantom AI Inc. Lane Line Reconstruction Using Future Scene and Trajectory. US 11,670,173 B2, 2023.

Honors & Awards

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'15	**Outstanding Achievement,** Summer Poster Symposium at LLNL	*Livermore, CA*
'15	**Outstanding Paper in Manufacturing Process,** Presented at NAMRC/SME 43	*Berkeley, CA*
'11,14,15	**Graduate Division Block Grant Award + Henry Lurie Family Fund,** Fellowship	*Berkeley, CA*
'07	**Highest Rank,** Compiler course, the most demanding course in computer science at SNU	*Seoul, KOR*
'97–99	**90 Finalists,** Annual High School Programming Olympiads in Seoul for three years	*Seoul, KOR*

Teaching Experience

2014S	**ME101,** High Mix/Low Volume Manufacturing (TA)	*UC Berkeley*
2013F	**E28,** Visualization and Graphics for Design (RA)	*UC Berkeley*

Course Projects at UC Berkeley
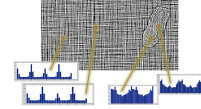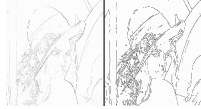
Machine Learning

  Digit recognition using Support vector machine / Gaussian classifiers (implementation)

  Spam classification using Decision tree, AdaBoost, Random forest (implementation)
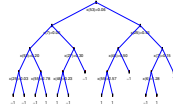
Computer Vision

  HOG, Multiple View Geometry, Edge Detection, Digit Recognition, Texture
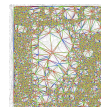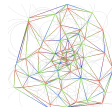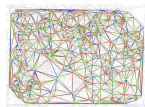

Artificial Intelligence

  Searching, Reinforcement Learning, Sampling, Classification for Pacman

Mesh Generation / Computational Geometry
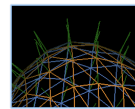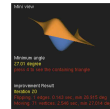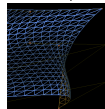
  2D Delaunay Triangulation implementation

Computer Graphics

  Shading, Ray Tracing, Reflections, Bezier Subdividing, 2D Fluid Simulation
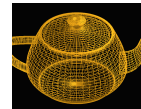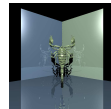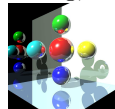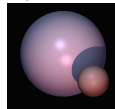
Parallel Programing

  Matrix multiplication / N-particle Simulation / Mesh optimazation using MPI, OpenMP, CUDA, UPC

Personal Interests

- Avid tennis player
- Woodworking/3D-printing hobbyist