Sung-heon Park

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RESEARCH INTERESTS

Neural radiance field, neural rendering, 3D reconstruction, human reconstruction, generative models, multimodal learning

EXPERIENCE

Samsung Advanced Institute of Technology (SAIT) **Suwon, Korea**

Staff Researcher, Multimedia Systems Lab *01/2022 – Present*

- Co-initiated a neural graphics algorithm project, driving research on neural radiance fields (NeRFs) encompassing dynamic, few-shot, and relightable NeRF. Spearheaded the development of accurate and fast dynamic NeRF training algorithms, recognized with a CVPR'23 highlight paper
- Prototyped lightweight neural rendering algorithms tailored for photorealistic human face avatars, performed network quantization and neural texture implementation
- Implemented neural material rendering frameworks for photorealistic rendering of complex materials, leading to integration of neural network modules to 3D rendering pipelines
- Pioneered an image-to-3D generation framework utilizing depth estimation and image inpainting diffusion models

Staff Researcher, Computer Vision Lab *07/2019 – 12/2021*

- Developed real-time lightweight face liveness detection methods using dual-pixel cameras adopted to Samsung Galaxy S20 and S21 face authentication, engineered disparity extraction method and optimized network architecture
- Designed AI-based auto white balance algorithm based on convolutional neural nets, resulting in a 20% improvement over traditional white balance methods
- Conducted research on 3D human pose estimation under semi-supervised and weakly-supervised settings, resulting in a publication of research paper at ECCV'20

EDUCATION

Seoul National University **Seoul, Korea**

Ph.D. in Engineering, Graduate School of Convergence Science and Technology *03/2014 - 02/2019*

- Thesis: 3D Reconstruction, Weakly-Supervised Learning, and Supervised Learning Methods for 3D Human Pose Estimation (Advisor: Nojun Kwak, Outstanding thesis award)

Korea Advanced Institute of Science and Technology (KAIST) **Daejeon, Korea**

M.S. in Computer Science *03/2012 - 02/2014*

- Thesis: 3D Reconstruction of Manhattan Worlds Based on a Single Image Using Graph Cut Optimization and Minimal Spanning Tree (Advisor: Hyun S. Yang)

B.S. in Computer Science *03/2006 - 02/2012*

- Exchange Student at RMIT University, Melbourne, Australia (07/2009 - 12/2009)

PUBLICATION

1. **Sungheon Park**, Minjung Son, Seokhwan Jang, Young Chun Ahn, Ji-Yeon Kim, and Nahyup Kang, "Temporal Interpolation Is All You Need for Dynamic Neural Radiance Fields," **CVPR 2023** (**Highlight**)
2. **Sungheon Park***, Minsik Lee*, and Nojun Kwak, "Procrustean Regression Networks: Learning 3D Structure of Non-Rigid Objects from 2D Annotations," **ECCV 2020** (*: equal contribution)
3. Jihye Hwang, Jieun Lee, **Sungheon Park** and Nojun Kwak, "Pose Estimator and Tracker Using Temporal Flow Maps for Limbs," **IJCNN 2019**
4. **Sungheon Park** and Nojun Kwak, "3D Human Pose Estimation with Relational Networks, **BMVC 2018**
5. **Sungheon Park**, Minsik Lee, and Nojun Kwak, "Procrustean Regression: A Flexible Alignment-Based Framework for Nonrigid Structure Estimation," **IEEE Transactions on Image Processing**, vol. 27, pp. 249-264, Jan, 2018
6. **Sungheon Park** and Nojun Kwak, "Independent Component Analysis by Lp-norm Optimization," **Pattern Recognition**, vol. 76, pp. 752-760, Apr, 2018.

7. **Sungheon Park**, Taehoon Kim, Kyogu Lee, and Nojun Kwak, “Music Source Separation Using Stacked Hourglass Networks,” **ISMIR 2018**
8. Jihye Hwang, **Sungheon Park**, and Nojun Kwak, “Athlete Pose Estimation by a Global-Local Network,” 3rd International Workshop on Computer Vision in Sports, **CVPR 2017 Workshops**
9. **Sungheon Park** and Nojun Kwak, “Analysis on the Dropout Effect in Convolutional Neural Networks,” **ACCV 2016**
10. **Sungheon Park**, Jihye Hwang, and Nojun Kwak, “3D Human Pose Estimation Using Convolutional Neural Networks with 2D Pose Information,” Geometry Meets Deep Learning Workshop, **ECCV 2016 Workshops**
11. **Sungheon Park** and Nojun Kwak, “Illumination Robust Optical Flow Estimation by Illumination-Chromaticity Decoupling,” **ICIP 2015**
12. **Sungheon Park** and Nojun Kwak, “Cultural Event Recognition by Subregion Classification with Convolutional Neural Network,” ChaLearn Looking at the People Workshop, **CVPR 2015 Workshops**
13. **Sungheon Park**, Hyeopwoo Lee, Suwon Lee, and Hyun S. Yang, “Line-based Single View 3D Reconstruction in Manhattan World for Augmented Reality,” **VRCAI 2015**
14. Jinki Jung, Jihye Hong, **Sungheon Park**, and Hyun S. Yang, “Smartphone as an Augmented Reality Authoring Tool via Multi-touch Based 3D Interaction Method,” **VRCAI 2012**
15. Young Chun Ahn, Seokhwan Jang, **Sungheon Park**, Ji-Yeon Kim, and Nahyup Kang, “PANeRF: Pseudo-view Augmentation for Improved Neural Radiance Fields Based on Few-shot Inputs”, arXiv, 2022
16. **Sungheon Park**, Myunggi Lee, and Nojun Kwak, “Polyp detection in colonoscopy videos using deeply-learned hierarchical features”, Technical report, Seoul National University, 2015.

PATENT

- Method and apparatus for testing liveness (US20210326616A1), 2021
- Object recognition method and object recognition apparatus (US20210397819A1), 2021
- Method and apparatus for detecting liveness based on phase difference (US11244181B2), 2022

AWARDS

- **Samsung Annual Awards Gold prize (2nd place)** in Software development track, an annual recognition for the most innovative technologies at Samsung Electronics, awarded for the work on "Face Liveness Detection using Dual-Pixel Cameras," in 2021
- **Outstanding thesis award**, Graduate School of Convergence Science and Technology, Seoul Nat. University, 2019
- **Honorable mention award** in multi-person pose tracking challenge, awarded for the work “LimbFlowNet: Multi-Stride Pose Tracker and Estimator”, PoseTrack Challenge 2018 (ECCV 2018 Workshops)
- **3rd place** in cultural event recognition challenge, awarded for the work “Cultural Event Recognition by Subregion Classification”, ChaLearn Looking at People Challenge 2015 (CVPR 2015 Workshops)
- National Science and Engineering Undergraduate Scholarship, Korea Student Aid Foundation, 2006-2009

SKILLS

Python, C/C++, CUDA, MATLAB, Tensorflow, JAX, PyTorch, OpenGL, GLSL, HTML, Java, C#, Objective-C, Swift