HEEJOON MOON

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Research Interests

My main research interests include **Geometric Computer Vision, Visual Localization, and Spatial AI.** My recent research has focused on privacy-preserving visual localization, but my research interest is not limited to this. I also have a lot of interest in applications of 3D vision tasks, *e.g.* robotics, autonomous driving, and 3D reconstruction.

Education

- **Hanyang University** Seoul, South Korea
  [Integrated MS-Ph.D.] Department of Artificial Intelligence *Sep. 2023 - Present*
  - GPA: 4.35 / 4.50
  - Tuition fees and maintenance fully funded by Hanyang University AI Scholarship

- **KyungHee University** Gyeongi-do, South Korea
  [B.S.] Department of Software Convergence, College of Software Convergence *Mar. 2018 - Aug. 2023*
  - **Summa Cum Laude** (GPA: 4.03 / 4.30, Ranked #1 out of 80 students)
  - Tuition fees fully funded by KyungHee University Software Scholarship
  - Majored in Robot & Vision Track
  - Leave of absence due to compulsory military service (Summer 2019 - Fall 2020)

Peer-reviewed publications

[1] **Heejoon Moon***, Jeonggon Kim*, Sudipta N. Sinha, Je Hyeong Hong, "2D Feature Lattices for Privacy-Preserving Image Queries in Visual Localization", *Under review*
- Keywords: Minimal solvers (P3P, P2ORI solver) in visual localization, Non-parametric optimization

[2] **Heejoon Moon**, Jongwoo Lee, Jeonggon Kim, Je Hyeong Hong, "Depth-Guided Privacy-Preserving Visual Localization Using 3D Sphere Clouds", in *Proceedings of the British Machine Vision Conference (**BMVC**)*, 2024
- Keywords: Depth-guided localization, 3D line geometry, Scene inversion
[Paper]

[3] **Heejoon Moon**, Chungwhan Lee, Je Hyeong Hong, "Efficient Privacy-Preserving Visual Localization Using 3D Ray Clouds," in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2024
- Keywords: Minimal solver (5+1 solver), Generalized camera model, 3D line geometry, Non-parametric optimization
[Paper] **[Code]**

[4] Jiyoung Jung, **Heejoon Moon**, Geunhyeok Yu, Hyoseok Hwang, "Generative Perturbation Network for Universal Adversarial Attacks on Brain-Computer Interfaces," *IEEE Journal of Biomedical and Health Informatics*, 2023
- Keywords: Universal adversarial perturbation, Generative models
[Paper] **[Code]**

Patent

- **Privacy-Preserving Image-based Localization using 3D Ray Clouds** South Korea, PCT
  *Je Hyeong Hong, **Heejoon Moon**, Chungwhan Lee*

Research Experiences

- **Spatial AI Lab, Hanyang University** Seoul, South Korea
  Integrated MS-Ph.D. (Advisor: Prof. Je Hyeong Hong) *Feb. 2023 - current*
  - Main research topics: visual localization, geometric vision, scene inversion
  - Research outputs: 1 **CVPR**, 1 **BMVC**, 1 PCT patent submission
  - **Recently Coworked with Dr Sudipta N. Sinha**, leading to a top conference submission currently under review.

- **AI & Robotics Lab, KyungHee University** Gyeongi-do, South Korea
  Undergraduate Research Intern (Advisor: Prof. Hyoseok Hwang) *Mar. 2021 - Dec. 2022*
  - Main research topics: Adversarial Attack, BCI
  - Led to 1 international journal (Q1) submission

Projects

- **3D Reconstruction with Multi-View RGB-D Images**
  "Development of Moving Robot-based Immersive Video Acquisition and Processing System in Metaverse", IITP, Korea
  - Implementing 3D object Reconstruction pipeline from scratch using multi-view RGB-D images. **[Paper]** **[Github](85stars)**
  - Keywords: Multi-View, Feature based Registration, ICP Registration, Pose Graph Optimization
- **Turtlebot Manipulation with Optical Flow in Gazebo Simulation**
  Manipulation of Turtlebot in Gazebo simulation, directed by the direction of Optical Flow. **[Github]**
  - Keywords: Optical Flow, Teleoperation
- **Image Style Transfer**
  Converting pictures of KyungHee University into several styles, based on AdaIN Style Transfer. **[Project page Link]**
  - Keywords: Style-Transfer
- **KITTI360 Visualization**
  Visualization of KITTI360 dataset, containing Lidar/Laser/Stereo point clouds and 360(fisheye) RGB Images. **[Github]**
  - Keywords: Sensor-Fusion

Academic Experiences

- **Invited poster session, Korean Conference on Computer Vision (KCCV) 2024** Busan, South Korea
  Efficient Privacy-Preserving Visual Localization Using 3D Ray Clouds, also presented in CVPR 2024 *Aug. 2024*
- **Academic service as a conference reviewer**
  WACV 2024, CVPR 2024, ECCV 2024
- **Programming Camp: Deep Learning for Computer Vision, KCVS** Virtual, Feb. 2022
- **Summer School: Image Understanding & Signal Processing Summer School, IEIE** Virtual, Jul. 2021

Teaching Experiences

- **Student Tutor, Hanyang Univ.** Seoul, South Korea
  Joining as a student tutor for a lecture. *Sep. 2023 - Dec. 2023*
  - **Computer Vision:** Making tutorial codes for LUKAS-KANADE optical-flow & Video anomaly detection
- **Student Tutor, KyungHee Univ.** Gyeongi-do, South Korea
  Joining as an undergraduate student tutor for lectures. *Mar. 2022 - Dec. 2022*
  - **Robot Sensor Data Processing:** Making SfM tutorial codes & documents for assignments, Q&A
  - **Robot Programming:** Making tutorial codes about SLAM(gMapping, ORB-SLAM, Graph-SLAM) on ROS Gazebo

Skills

- **Programming** - C/C++, Python
- **Frameworks** - PyTorch, Eigen3, Ceres-Solver, ROS, Open3D, OpenCV, Scikit-Learn
- **Language** - English(fluent), Korean(native)

Awards and Honors

- **LG Electronics Group Best Paper Award** June 2023
  Summer Annual Conference of IEIE 2023, [Paper]
- **KyungHee University Academic Scholarship** Fall 2018, Spring 2019
  for outstanding performance (Ranked-top 1 in each semester)
- **KyungHee University Software Festival Awards** Nov. 2021
  Campus Images with Neural Style Transfer, [Project page Link]
- **Dean's List, KyungHee University** Fall 2018 - Fall 2023
  Awarded for academic excellence