

Tae Ha (Jeff) Park

PH.D. CANDIDATE, DEPARTMENT OF AERONAUTICS & ASTRONAUTICS, STANFORD UNIVERSITY

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Education

Stanford University

Stanford, CA

PH.D. IN AERONAUTICS & ASTRONAUTICS | ADVISOR: DR. SIMONE D'AMICO

Apr. 2018 - (Expected) Jun. 2024

- Title: Robust Machine Learning for Vision-Based Navigation about Non-Cooperative Resident Space Objects
- Teaching Assistant for AA279A: Space Mechanics (2019, 2021, 2022).

Stanford University

Stanford, CA

M.S. IN AERONAUTICS & ASTRONAUTICS

Sep. 2017 - Apr. 2020

- Conducted research on deep learning, computer vision, spacecraft swarm navigation and optimization

Harvey Mudd College (HMC)

Claremont, CA

B.S. IN ENGINEERING

Aug. 2013 - May 2017

- Graduated with High Distinction (GPA: 3.81/4.0)
- Member of the Tau Beta Pi Engineering Honors Society
- De Pietro fellow in Civil Engineering

Experience

Infinite Orbits SAS

Toulouse, France

COMPUTER VISION AND GUIDANCE, NAVIGATION AND CONTROL INTERN

Jun. 2022 - Aug. 2022

- Constructed a satellite rendezvous simulator and scene renderer based on Unreal Engine 5 and C++ to train and validate convolutional neural networks for monocular pose estimation and tracking of known noncooperative spacecraft

Space Rendezvous Laboratory (SLAB), Stanford University

Stanford, CA

RESEARCH ASSISTANT | ADVISOR: DR. SIMONE D'AMICO

Jan. 2019 - Current

- Developed robust deep learning models and navigation algorithms for vision-based Rendezvous and Proximity Operations (RPO) in space to support various missions (e.g., on-orbit servicing, debris removal) for sustainable space development
- Developed a deep learning model for 3D reconstruction and pose estimation of an unknown spacecraft from single 2D images
- Developed the Testbed for Rendezvous and Optical Navigation (TRON) facility at SLAB that can simulate various RPO scenarios using a mockup satellite model under high-fidelity spaceborne illumination settings 📺 📺
- Developed advanced open-source benchmark datasets (e.g., SPEED+, SHIRT, SPE3R) using synthetic renders such as OpenGL/Unreal Engine and TRON to train and validate spaceborne vision-based deep learning and navigation algorithms with emphasis on robustness across domain gap between synthetic and spaceborne data

Dynamics Laboratory, HMC

Claremont, CA

DE PIETRO FELLOW | ADVISOR: DR. ZIYAD DURON

May 2016 - May 2017

- Developed a method to assess the functionality of steel anchors embedded within a concrete dam based on the Performance-Based Testing using spectral analysis, spectrogram, and model verification
- Analyzed the earthquake response of Monticello dam by constructing and evaluating a lumped element model of dam, reservoir and a spillway

HMC

Claremont, CA

STUDENT RESEARCHER | ADVISOR: DR. PHILIP D. CHA

May 2016 - May 2017

- Developed a method to accelerate the modal convergence of eigen-characteristics of (non-)uniform rods carrying various lumped attachments

Publications

Preprints

[P1] Online Supervised Training of Spaceborne Vision during Proximity Operations using Adaptive Kalman Filtering

T. H. Park, S. D'Amico

arxiv:2309.11645 (2023). [🔗](#)

Peer-Reviewed Journal Articles

- [J6] Adaptive Neural-Network-Based Unscented Kalman Filter for Robust Pose Tracking of Noncooperative Spacecraft
T. H. Park, S. D'Amico
Journal of Guidance, Control, and Dynamics (2023). DOI: 10.2514/1.G007387 [🔗](#)
- [J5] Robust Multi-Task Learning and Online Refinement for Spacecraft Pose Estimation across Domain Gap
T. H. Park, S. D'Amico
Advances in Space Research (2023). DOI: 10.1016/j.asr.2023.03.036 [🔗](#) [🔄](#)
- [J4] Leveraging Neural Network Uncertainty in Adaptive Unscented Kalman Filter for Spacecraft Pose Estimation
L. Pasqualetto Cassinis, **T. H. Park**, N. Stacey et al.
Advances in Space Research (2023). DOI: 10.1016/j.asr.2023.02.021 [🔗](#)
- [J3] Satellite Pose Estimation Competition 2021: Results and Analyses
T. H. Park, M. Märten, M. Jawaid et al.
Acta Astronautica (2023). DOI: 10.1016/j.actaastro.2023.01.002 [🔗](#)
- [J2] Satellite Pose Estimation Challenge: Dataset, Competition Design and Results
M. Kisantal, S. Sharma, **T. H. Park** et al.
IEEE Transactions on Aerospace and Electronic Systems (2020). DOI: 10.1109/TAES.2020.2989063 [🔗](#)
- [J1] Improved Modal Convergence Using the Assumed Modes Method for Rods Carrying Various Lumped Elements
P. D. Cha, **T. H. Park**
International Journal of Mechanical Engineering Education (2018). DOI: 10.1177/0306419017720424 [🔗](#)

Conference Proceedings & Presentations

- [C9] SPEED-UE-Cube: A Machine Learning Dataset for Autonomous, Vision-Based Spacecraft Navigation
Z. Ahmed, **T. H. Park**, A. Bhattacharjee et al.
46th AAS Guidance, Navigation and Control Conference, Breckenridge, Colorado, February 2-7 (2024). [🔗](#) [🔄](#) **[ACCEPTED]**
- [C8] Rapid Abstraction of Spacecraft 3D Structure from Single 2D Image
T. H. Park, S. D'Amico
2024 AIAA SciTech Forum (2024). DOI: 10.2514/6.2024-2768 [🔗](#) [🔄](#)
- [C7] Adaptive End-to-End Architecture for Autonomous Spacecraft Navigation and Control During Rendezvous and Proximity Operations
J. Kruger, T. Guffanti, **T. H. Park** et al.
34th AIAA/AAS Space Flight Mechanics Meeting (2024). DOI: 10.2514/6.2024-0430 [🔗](#)
- [C6] Adaptive Neural Network-based Unscented Kalman Filter for Spacecraft Pose Tracking at Rendezvous
T. H. Park, S. D'Amico
2022 AAS/AIAA Astrodynamics Specialist Conference, Charlotte, North Carolina, August 7-11 (2022). [🔗](#)
- [C5] Robust Multi-Task Learning and Online Refinement for Spacecraft Pose Estimation across Domain Gap
T. H. Park, S. D'Amico
11th International Workshop on Satellite Constellations & Formation Flying, Milano, Italy, June 7-10 (2022). [🔗](#)
- [C4] SPEED+: Next-Generation Dataset for Spacecraft Pose Estimation across Domain Gap
T. H. Park, M. Märten, G. Lecuyer et al.
2022 IEEE Aerospace Conference (2022). DOI: 10.1109/AERO53065.2022.9843439 [🔗](#) [🔄](#)
- [C3] Robotic Testbed for Rendezvous and Optical Navigation: Multi-Source Calibration and Machine Learning Use Cases
T. H. Park, J. Bosse, S. D'Amico
2021 AAS/AIAA Astrodynamics Specialist Conference, Virtual, August 8 - 12 (2021). [🔗](#)
- [C2] Generative Model for Spacecraft Image Synthesis using Limited Dataset
T. H. Park, S. D'Amico
2020 AAS/AIAA Astrodynamics Specialist Conference, South Lake Tahoe, California, August 9 - 13 (2020). [🔗](#)
- [C1] Towards Robust Learning-Based Pose Estimation of Noncooperative Spacecraft
T. H. Park, S. Sharma, S. D'Amico

Open-Source Datasets

[D5] Spacecraft Pose Estimation Dataset of a 3U CubeSat using Unreal Engine (SPEED-UE-Cube)

T. H. Park, Z. Ahmed, A. Bhattacharjee et al.

Stanford Digital Repository (2024). 

[D4] SPE3R: Synthetic Dataset for Satellite Pose Estimation and 3D Reconstruction

T. H. Park, S. D'Amico

Stanford Digital Repository (2024). DOI: 10.25740/pk719hm4806

[D3] SHIRT: Satellite Hardware-In-the-loop Rendezvous Trajectories Dataset

T. H. Park, S. D'Amico

Stanford Digital Repository (2022). DOI: 10.25740/zq716br5462 

[D2] Next Generation Spacecraft Pose Estimation Dataset (SPEED+)

T. H. Park, M. Märtens, G. Lecuyer et al.



Stanford Digital Repository (2021). DOI: 10.25740/wv398fc4383

[D1] Spacecraft Pose Estimation Dataset (SPEED)

S. Sharma, **T. H. Park**, S. D'Amico

Stanford Digital Repository (2019). DOI: 10.25740/dz692fn7184

Activities

Co-organizer Kelvins Satellite Pose Estimation Competition (2021) , AI4Space (CVPR workshop) (2024) 
Journal of Spacecraft and Rockets (2020) , Journal of Aerospace Information Systems (2021 - 22) , Advances in
Reviewer Space Research (2022-23) , IEEE Transactions on Aerospace and Electronic Systems (2022 - 23) , Journal of
Guidance, Control, Dynamics (2023)

Skills

Programming MATLAB/Simulink, Python, C/C++, CUDA, \LaTeX
Deep Learning PyTorch (Python & C++), ONNXRuntime, TensorRT, MATLAB Deep Learning Toolbox™
Libraries OpenCV, PyTorch3D, OpenMP, CVX/CVXPY
Rendering OpenGL, Unreal Engine
Languages Korean (native) , English (fluent) , Japanese (proficient) , French (conversational)

Honors & Awards

2019	Best Paper Award , 2019 AAS/AIAA Astrodynamics Specialist Conference	Portland, ME
2015	Tau Beta Pi Engineering Honors Society , HMC	Claremont, CA
2015	De Pietro Fellowship in Civil Engineering , HMC	Claremont, CA
2013	Harvey S. Mudd Merits , HMC	Claremont, CA
2013-17	Dean's List , HMC	Claremont, CA