

Jianli Wei

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OBJECTIVE

Seeking **Deep Learning and Machine Learning** Researcher position applying Object Detection & Tracking, Semantic Segmentation, Feature Extraction & Matching with exceptional Python coding skills and expertise in PyTorch, OpenCV, etc.

EDUCATION

The Ohio State University

Columbus, OH

Ph.D. - Electrical & Computer Engineering

January 2020 - December 2023

- Dissertation title: Geopositioning Multiple Autonomous Platforms using Deep Learning and Photogrammetry
- Advisor: Professor Alper Yilmaz

M.S. - Electrical & Computer Engineering

August 2017 - May 2019

- Non-Thesis title: Pattern Recognition using Gaussian Mixture Model with E-M Algorithm

University of Electronic Science and Technology of China

Chengdu, China

B.E. (Bachelor of Engineering) - Electronic Information Engineering

September 2014 - June 2017

RESEARCH EXPERIENCE

The Ohio State University, Graduate Research Assistant

January 2020 - Present

Autonomous Positioning and Tracking of Aerial Vehicles using Geographic AI

- Reduced UAS reliance on Global Positioning System, which can be jammed and suffer from multipath problems
- Proposed a real-time pipeline alternative to the GPS functionality using UAS embedded vision system
- Constructed the pipeline consisting of an off-line fast geospatial Quadtree data retrieval, a selection of feature detection and matching schemes, and attitude-control mechanism guaranteeing the scalability of flight region
- Achieved realtime UAS geotracking accuracy by 3.39 meters in average and 5.38 meters in maximum

UAS Navigation in Real World using Reinforcement Learning (RL)

- Inspired by human's instinct: environment understanding and landmark recognition, the team enabled the UAS self-navigation via recognizing its surrounding environment using its embedded vision sensor
- Trained the agent in reinforcement learning framework to interactively learn the navigation policy and familiarize itself using images from vision sensor in an designed UASNAV environment
- Let the UAS fly in the real world to recognize the landmarks and take action according to the learned policy
- Proposed a novel end-to-end UAS navigation framework for long-range vision based navigation in the real world. Experiments demonstrated that the UAS can navigate itself to the destination hundreds meters away from a random selected starting point with following the shortest path

Object Detection and Height Estimation using Deep Learning (Funded by Ford Motor Company)

- Developed object height estimation algorithm using vehicle-mounted monocular vision system and deep learning
- Proposed an end-to-end pipeline consisting of the choice from a selection of advanced object detectors and photogrammetry module doing depth estimation, 2D to 3D backprojection and object height decomposition
- Proposed MOHE-Net detecting and estimating object (over 80 classes) height. Estimated a 183 centimeters tall person within an average error of 5.09 centimeters, around 2.8%

Video Background and Foreground Segmentation using Machine Learning

- Converted moving camera object detection task to foreground segmentation. Segmented objects not belonging to changing background in video setting
- Trained a developed neural network in an end-to-end manner and introduced Conditional Random Fields as a temporal regularization by modeling interactions between previous frames and current CNNs output
- Applied Focal Loss to assign all training samples dynamic weights to enforce more focus on hard examples
- Proposed MBS-Net that achieves 97.53% Mean IoU on background and 76.06% on foreground on ApolloScape

Artificial Intelligence Technique for Trajectory Estimation of Maritime Vessel

- Generated georeferenced tracks of maritime vessel traffic based on the data recorded from a single electro-optical camera imaging the traffic from a moving platform
- Localized target vessel among several similar vessels in image coordinates with tracking by detection strategy
- Defined the geometric relation between GPS-based spherical coordinates of latitude and longitude in the world frame, the local camera centered coordinates and the local image coordinates
- Geotracked target vessel in video and retrieved its geoposition in the accuracy by 15.26 meters in average

WORK EXPERIENCE

The Ohio State University, Student Associate

August 2019 - December 2019

No-Reference Image Enhancement using Generative Adversarial Networks (GANs)

- Improve image resolution, remove noise and enhance low-light image using GANs in a weakly supervised way.

Map Learning for Geolocalization using Deep Learning Methods

- Globally geolocalization on OpenStreetMap topological layer through Neural Matching Translation Network.

LANL earthquake prediction competition in Natural Language Processing format

- Predict upcoming laboratory earthquakes via analyzing collected data using Long Short-Term Memory Network

TEAM MANAGEMENT EXPERIENCE

UAS Geopositioning & Navigation

- Led junior researcher converting UAS geopositioning pipeline from Python to C++ and deployed it to Jetson Orin. Accelerated inference speed from 15 fps to 35 fps, 133% faster
- Provided guidance for building up virtual environment with Unity game engine. Demonstrated UAS geopositioning pipeline to be working in virtual environment in an online manner
- Partnered with graduated research team to develop UAS navigation in real world using Reinforcement Learning
- Proposed a novel end-to-end UAS navigation framework for long-range vision based navigation in the real world
- Managed UAS data collection and flight results analysis. Demonstrated that the UAS can navigate itself to the destination hundreds meters away from a random selected starting point with following the shortest path

SKILLS & QUALIFICATIONS

- Areas of Research: Deep Learning, Computer Vision, Machine Learning, Reinforcement Learning
- Advanced Qualifications: Large scale data processing, Distributed data parallel computing, GPU based high performance computing (NCCL), DL model deployment on Jetson Nano/Orin
- Programming Languages & Frameworks: Python, Matlab, Git, PyTorch, OpenCV, Numpy, matplotlib, Pandas, SciPy, scikit-learn, Docker, ArcGis pro
- Coursework: Photogrammetric Computer Vision, Pattern Recognition, VideoGrammetry, Optimization, Image Processing, Algorithms, Intro Time Series Analysis, Project Management

PUBLICATIONS

JOURNAL

- **Wei, J.**, Yilmaz, A., 2023. A Visual Odometry Pipeline for Real-Time UAS Geotracking. *Drones* 2023, 7, 569. <https://doi.org/10.3390/drones7090569>

CONFERENCE

- **Wei, J.**, Karakay, D. and Yilmaz, A., A Gis Aided Approach for Geolocalizing an Unmanned Aerial System Using Deep Learning. *IEEE Sensors 2022* (pp. 1-4). IEEE.
- Han, Y., **Wei, J.**, and Yilmaz, A., October. UAS Navigation in the Real World Using Visual Observation. *IEEE Sensors 2022* (pp. 1-4). IEEE.
- **Wei, J.**, Wei, J., Xu, G. and Yilmaz, A., DeepTracks: Geopositioning Maritime Vehicles in Video Acquired from a Moving Platform. *IEEE Sensors 2021* (pp. 1-4). IEEE.
- **Wei, J.**, Wei, J., Xu, G. and Yilmaz, A., DeepTracks: Geopositioning Maritime Vehicles in Video Acquired from a Moving Platform. *IEEE Sensors 2021* (pp. 1-4). IEEE.
- **Wei, J.**, Jiang, J. and Yilmaz, A., MOHE-net: Monocular object height estimation network using deep learning and scene geometry. *The International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences*, 43, pp.557-564.
- **Wei, J.**, Jiang, J. and Yilmaz, A., MBS-net: A moving-camera background subtraction network for autonomous driving. *The International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences*, 43, pp.69-76.
- **Wei, J.**, Koroglu, M.T., Zha, B. and Yilmaz, A., Pedestrian localization on topological maps with neural machine translation network. *IEEE SENSORS 2019* (pp. 1-4). IEEE.

PATENT

- System and Method for Hypersonic Aerial Platform Geopositioning (*in review*)