

Xinshuo Weng

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RESEARCH INTERESTS

Computer vision and machine learning: understanding humans from images and video, machine learning for vision, image motion and tracking, 3D vision, and the intersection of reinforcement learning and vision.

EDUCATION

Carnegie Mellon University , Ph.D. in Robotics Institute, School of Computer Science	Aug.2018 - May.2023
Carnegie Mellon University , M.S. in Computer Vision, Computer Science, GPA: 4.06/4.3	Aug.2016 - Dec.2017
The Johns Hopkins University , Summer Research Program in Computer Science	Jun.2016 - Aug.2016
Wuhan University , China, B.S. in Electrical Engineering, GPA(Major): 3.8(3.9)/4.0, Ranking: 2	Sep.2012 - Jun.2016
University College Dublin , Ireland, Exchange Program in Computer Science, GPA: 4.1/4.2	Jan.2016 - May.2016

PUBLICATIONS

- Y. Man, **X. Weng**, K. Kitani, “GroundNet: Segmentation-Aware Monocular Ground Plane Estimation with Geometric Consistency“, ArXiv preprint arXiv:1811.07222.
- X. Dong, S. Yu, **X. Weng**, S. Wei, Y. Yang, Y. Sheikh, “Supervision-by-Registration: An Unsupervised Approach to Improve the Precision of Facial Landmark Detectors“, Computer Vision and Pattern Recognition (**CVPR**), 2018.
- **X. Weng**, S. Wu, F. Beainy, K. Kitani, “Rotational Rectification Network: Enabling Pedestrian Detection for Mobile Vision“, IEEE Winter Conf. on Applications of Computer Vision (**WACV**), 2018.
- N. Lee, **X. Weng**, V. Boddeti, Y. Zhang, F. Beainy, K. Kitani, T. Kanade, “Visual Compiler: Synthesizing a Pedestrian Pose Estimator from a Single Image“, ArXiv preprint arXiv:1612.05234.

EXPERIENCE

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| Research Associate, Carnegie Mellon University, Advised by Kris Kitani | Aug.2018 - Present |
| • <i>3D Object Understanding (Recognition, Detection, Tracking and Forecasting)</i> | |
| Research Engineer, Oculus Research Pittsburgh (Facebook Reality Lab) | Feb.2018 - Aug.2018 |
| • <i>Super-Resolution Dense Landmark Detection for Hands and Body</i> | |
| Research Collaborator, Oculus Research Pittsburgh (Facebook Reality Lab), Advised by Yaser Sheikh | Jan.2017 - Dec.2017 |
| • <i>Unsupervised Cycle Lucas-Kanade Network for Landmark Tracking</i> <ul style="list-style-type: none">◦ Proposed the cycle loss, minimizing the reprojection error between forward-backward tracking and initialization◦ Implemented deep inverse compositional Lucas-Kanade network and achieved unsupervised training using cycle loss | |
| • <i>Supervision-by-Registration: An Unsupervised Approach to Improve the Precision of Facial Landmark Detectors</i> <ul style="list-style-type: none">◦ Proposed a registration loss using optical flow as a free supervision to learn a coherent landmark detector in video | |
| • <i>Semi-Automatic Multiview Keypoint Annotation Tool</i> <ul style="list-style-type: none">◦ Provided 100X speed-up and coherent landmarks across viewpoints and frames using optical flow and epipolar constraint | |
| Research Associate, Carnegie Mellon University, Advised by Kris Kitani | Aug.2016 - Present |
| • <i>Rotational Rectification Network (R2N): Enabling Pedestrian Detection for Mobile Vision</i> <ul style="list-style-type: none">◦ Proposed the GPPooling layer to achieve rotational invariance in CNNs and learned a rotation estimation network (REN)◦ Proposed the R2N, composing REN and a spatial transformer network, to achieve arbitrary-oriented pedestrian detection | |
| • <i>Visual Compiler: Synthesizing a Pedestrian Pose Estimator from a Single Image</i> <ul style="list-style-type: none">◦ Built an image synthesis pipeline based on inferring the scene information: camera pose, surface normal and horizon line◦ Proposed to learn a scene-and-region specific CNN for simultaneous detection, pose estimation, and human segmentation | |
| • <i>Learning Coherency for Human Segmentation with Skeleton</i> | |

Updated on November 20, 2018.

- Built a synthetic human dataset with ground truth of bounding box, segmentation map and skeleton using Unreal/3ds Max
- Proposed a coherency loss to enforce explicit consistency between skeleton and segmentation in multi-task learning

Research Intern, Facebook, Advised by Yaser Sheikh

May.2017 - Aug.2017

- *ChopNet: Hierarchical Chopping Network for Super-Resolution Facial Landmark Alignment*
 - Achieved average L2 distance error less than 0.8mm over 224 landmarks on images with resolution of 5120×3840

Research Intern, The Johns Hopkins University, Advised by Alan Yuille

Jun.2016 - Aug.2016

- *Unsupervised Learning of Object Semantic Parts from Internal States of CNNs by Population Encoding*
 - Proposed to learn semantic object parts in CNNs by clustering activations from the intermediate layers using K-means++
 - Achieved object detection built upon learned semantic object parts and obtained the 83% mAP on PASCAL3D+

Research Assistant, Wuhan University, Advised by Lei Yu

Dec.2015 - Jun.2016

- *Bayesian Sparse Regression for Photometric Stereo Reconstruction*
 - Modeled the Lambertian reflectance using hierarchical Bayesian model and solved it using Majorization-Minimization
 - Generalized to objects with non-Lambertian reflectance property using piecewise linear model

Computer Vision Intern, INVO Automotive Electronics Co.,Ltd

Oct.2015 - Dec.2015

- *Automatic Omnidirectional Parking Assist System for Autonomous Driving*
 - Implemented image stitching pipeline with omnidirectional camera calibration, homography estimation, and blending
 - Achieved lane detection using convolutional neural networks (CNNs), and built an embedded system for wheel control

Research Intern, Shanghai Baolong Automotive Corporation

Jun.2015 - Oct.2015

- *Real-Time 3D Panoramic Vehicle System with Pedestrian Detection*
 - Implemented 3D dense reconstruction with omnidirectional cameras and achieved pedestrian detection using HOG+SVM
 - Adapted Real-Time Object Detection (YOLO) network for pedestrian detection and deployed the system to the product

Team Lead of Undergraduate Research, Wuhan University

Mar.2014 - Mar.2015

- *Is It Cold or Hot? An Intelligent Personalized Temperature-Controlled System Using Multi-Layer Perceptron*
 - Built a smart room hardware system with wireless sensors, and learned a Neural Network for temperature control
 - Achieved personalized temperature control with average error less than 1 Celsius on real customers and simulated data

AWARDS AND HONORS

- Outstanding Graduate Award, Wuhan University, 2016.
- Wuhan University Scholarship (4%), 2013, 2015, 2016.
- CSC (China Scholarship Council) Scholarship (1%), 2015.
- Yang Gui Scholarship (4%), Wuhan University, 2015.
- Undergraduate Research Fellowship, Wuhan University, 2014, 2015.
- China National Scholarship (1%), 2014.

TEACHING

- Teaching Assistant (TA) with Martial Hebert, **Geometry-Based Methods in Computer Vision (16-822)**, CMU, Fall 2018

PROFESSIONAL SERVICE

- Conference Reviewer: **CVPR, ACCV**
- Journal Reviewer: **TCSVT**

SKILLS

- Language and Tool: C++, OpenCV, Python, Matlab, Caffe/Torch/PyTorch/Tensorflow, CUDA, Shell, Git, Lua, C, Java, \LaTeX