

# Muyun Jiang

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## EDUCATION

### Nanyang Technological University, Singapore

August 2018 - August 2019

**Master of Science**, Computer Control and Automation; GPA: 4.5/5.0

- Dissertation Project: Lightweight Semantic Segmentation network for real-time Road Extraction
- Supervisor: Prof. Danwei Wang

### Beijing Institute of Technology, PRC

August 2014 - August 2018

**Bachelor of Engineering**, Electrical Engineering and Automation; GPA 83/100

- Dissertation Project: SVPWM based Permanent Magnet Synchronous Motor drive and control system.
- Supervisor: Assoc. Prof. Lei Dong

## WORK EXPERIENCE

### Nanyang Technological University

September 2019 - Now

Research Associate in ST Engineering-NTU Corporate Laboratory

#### Vision and Inertial based UAV navigation in low light environment

- Carry out calibration tasks of camera to thermal camera, thermal camera to IMU.
- Implementing Visual-Inertial Odometry (VIO) algorithms, such as MSCKF and VINS-Mono for UAV navigation.
- Improve Visual Odometry (VO) performance using Line-Junction-Line structural in low texture environments.

#### Airplane 3D Pose Estimate in image and RGBD point cloud

- Implementing algorithms for instance segmentation and object tracking using Mask-RCNN and DeepSORT.
- Calculate disparity map from stereo cameras for object depth estimation and RGBD point cloud generation.
- Develop algorithms for 3D Model Retrieval for the detected and tracked object.

#### Data-Driven time serial data analysis for Fault Detection and Fault Diagnosis

- Purpose Bagging Stochastic Variational GP Regression (BSVGPR) for Soft Sensor process monitoring
- Purpose Conditional Recurrent Variational Autoencoder (CR-VAE) for Fault Detection and Fault Diagnosis

## PUBLICATIONS

[1] Jinlin Zhu\*, **Muyun Jiang\***, Zheng Zhang, Danwei Wang, Complex Industrial Process Modeling and Monitoring with Conditional Recurrent Variational Autoencoder, **IEEE Transactions on Industrial Informatics** (under review)

[2] Jinlin Zhu\*, **Muyun Jiang\***, Guohao Peng, Zhiqiang Ge, Intelligent Soft Sensor Development for Nonlinear Industrial Big Data via Bagging Bayesian Gaussian Processes, **IEEE Transactions on Industrial Electronics** (Major Revision)

\* Equally Contribution

[3] Guohao Peng, Jinlin Zhu, **Muyun Jiang**, Danwei Wang, Yufeng Yue, ShadowVLAD: Attentional Encoding and Matching for Place Recognition, **ECCV 2020** (under review)

[4] Xiaoyu Tang, Wenhao Fu, **Muyun Jiang**, Guohao Peng, Danwei Wang, Place Recognition Using Line-Junction-Line in Urban Environment, **IEEE CIS-RAM 2019**

[5] **Muyun Jiang**, Jiahui Shi, Hongbin Ma, You Li, A Vision and Neural Network based Air-ground Coordinated Control System, **IEEE ICUS 2017**

## SKILLS

**Proficient in:** C, C++, Python, MATLAB, TensorFlow, PyTorch, ROS, OpenCV, Open3D, Kalibr.

**Familiar with** C#, Golang, Docker, CUDA Programming

## RESEARCH PROJECTS

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### **Intelligent Soft Sensor Development for Nonlinear Industrial Big Data via Bagging Bayesian Gaussian Processes**

Traditional Gaussian process regression (GPR) suffers from the cubic complexity and excessive computation burdens for industrial big data. To get rid of such defect, this work proposes a scalable soft sensor called bagging stochastic variational GP regression (BSVGPR), which can significantly break the formidable obstacle to nonlinear big data modeling. Based on that, the bagging mechanism is encompassed by combining a set of distributed predictors to form a powerful ensemble model. For case study demonstrations, the proposed method is first evaluated on the numerical example and then applied on the real-time oxygen prediction of the hydrogen manufacturing unit.

### **Complex Industrial Process Modeling and Monitoring with Conditional Recurrent Variational Autoencoder**

To account for nonlinear, dynamic and multiple operating conditions properties challenges in complex industrial processes, this work introduces a systematic flowchart for statistical process modeling and monitoring with the deep neural network (DNN) prototype. For data-driven modeling, a novel conditional recurrent variational autoencoder (CRVAE) has been proposed to deal with the nonlinear, dynamic and multi-mode properties unitedly. After that, a systematic fault detection panel is established for latent, residual and combined domains, and then a global detection scheme is further developed by investigating the total loss density. Following the detection results, a feature relevance propagation technique is finally constructed to make the empirical fault diagnosis. For case study, the performance of the proposed method has been comprehensively validated on the industrial benchmark Tennessee Eastman Process.

### **ShadowVLAD: Semantic attentional NetVLAD encoding and matching for Place Recognition**

To cope with the uneven distribution and the unequal discriminability of visual cues in an image, we provide an attention-regulated encoding paradigm named ShadowVLAD. The paradigm adopts a hierarchical weighted embedding mechanism for both attention-aware local refinement and global integration. By this means, discriminative visual words play a more important role in similarity voting during indexing. All proposed modules are differentiable and can be optimized in an end-to-end manner. Experiments demonstrate that the purposed methods outperform previous state-of-the-art on city-scale VPR benchmark data sets.

### **Place Recognition using Line-Junction-Line structure in urban environment**

To improve the Visual Odometry (VO) performance in challenging environments, we propose a novel Line-Junction-Line (LJL) descriptor to build the Bag of Word (BoW) dictionary for robust place recognition in urban environments. Line-Junction-Line is a structure of two lines with their intersection, representing a structure with physical existence and encodes the relationship between the two lines. Experiments on HPatches Dataset demonstrate the superiority of LJL comparing to traditional visual descriptor such as ORB or SIFT, and much faster than learned descriptors such as SuperPoint or D2-Net.