Tong Shen

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SUMMARY

• Demonstrated expertise in implementing learning algorithms and conducting feasibility analysis in complex scenario
• Hands-on experience with deep learning toolkits, such as **TensorFlow, Keras**, proficiency in **Python and C++**
• Keep track of state-of-the-art algorithms in deep learning area with a wide knowledge span to **CV, Speech, NLP,** etc

EDUCATION

Purdue University, West Lafayette, IN 08/2016 - 05/2018
Master of Science in Mechanical Engineering, GPA: 3.85/4.00

Xi'an Jiaotong University, Shannxi, China 08/2012 - 05/2016
Bachelor of Engineering in Measurement Technique and Instrument

SKILLS

Languages	Python, C++/C, Shell Script, MATLAB, R
Packages	TensorFlow, OpenCV, Keras, PyTorch, Kaldi, MLFlow, scikit-learn, Matplotlib, PIL, PCL, imgaug, etc.
Technical	CV, Object Detection/Segmentation, NLP, Reinforcement Learning, SLAM
Tools	Git, Jupyter, Grid engine, Docker, LaTeX, Office, Vim

RESEARCH AND PROFESSIONAL EXPERIENCE

Research Engineer II in Computer Vision, Zebra Technologies Corporation: 10/2018 - Present
Chief Technology Office *Lincolnshire, IL, United States*

Human Loader Blurring to Conceal Human Worker's Identity in SmartPack Solutions
- Trained **Mask-RCNN** (for performance), **CenterNet** (for efficiency) and **YOLOv3** (for real time) on 30,000 images to locate every loader in real time at container and trailer loading scenario.
- Analyzed model results with images sequences and located stationary false positives in background for retraining to further reduce false positives and improve performance.
- Utilized public pedestrian dataset as a supplement to help on occlusion, blur, crowd cases and reached 98.5% accuracy.

Automatic Container Type Recognition with RGBD Images in SmartPack Solutions
- Recognize container type in real time to facilitate fullness estimation, provide loading guidance, monitor loading process
- Trained **Mask-RCNN** to recognize and locate container by their frontal door images in loading process.
- For containers with identical frontal door, run OCR engine to track their serial number and 3D point cloud processing to measure container ceiling dimension to help classification.
- Further filtered out rare mis-classifications with consistency validation and reached over 99% accuracy.

Visual Servoing with Price Label Recognition, Alignment for Autonomous Shelf Labeling Robot
- Provided visual guidance to robot arm movement in order to point the printer head directly to price label on the shelf
- Trained **YOLOv3** to detect all price labels in camera field of view as ROI to facilitate future processing.
- Extracted features from price label ROIs using **SIFT** and match these points in price label bitmap to recognize the target label to be modified and align the ROI image and label bitmap
- Calculated 3D pose transformation matrix with **Efficient Perspective-N-Point(EPnP)** algorithm based on the matched point pairs in order to move the printer head directly pointing to the price label.

Software Engineer Intern, AIsense Inc.: 06 - 08/2018
Technical Team on Automatic Speech Recognition *Los Altos, California, United States*
- Extract single person's audio segments with high transcripting confidence using our existing ASR model with Kaldi
- Performed bootstrapping with high confidence segments to build enhanced, personalized acoustic model for one person
- Incorporated multi-head attention mechanism to polish the LSTM language model and improve the rescore process.

Graduate Research Assistant, Purdue University: 10/2016 - Present
Department of Mechanical Engineering *West Lafayette, Indiana United States*

Fine-Grained Visual Categorization over 8142 Categories on iNaturalist Species Dataset

- Fine-tuned our model based on an ensemble of ImageNet pretrained models: InceptionResnetv2 and Inceptionv4.
- Aggressively augmented minority class images and implemented weighted cross entropy to compensate data unbalance.
- Incorporated attention model to localize objects in images and detected their fine-grained features to increase accuracy
- Reached over **86%** top-3 accuracy on final test dataset

Obfuscated Face Reconstruction via Deep Generative Adversarial Networks(GANs)

- Employed TensorFlow to set up and fine-tuning Neural Nets model and monitored the whole training process
- Designed end-to-end ResNet to recover image details and incorporated VGG net to perceptually evaluate the result
- Implemented advanced GANs to reconstruct image from its 8x shrinked counterpart (Not recognizable by human)
- First work to formalize 8x heavily blurred image reconstruction with GANs and obtained great result in CelebA dataset

Arduino Controlled Autonomous Robot for Balls Collection and Disposal (Simulating Mars Rover)

- Incorporated Video Camera and image segmentation algorithm to locate the target and container in real time
- Developed PID algorithm for the robot to track and follow the target, through C programming in Arduino IDE
- Collaborated on the design and fabrication of the robots powertrain, sensor and navigation hardware
- 1^{st} place in the final competition

Undergraduate Research Assistant, Xi'an Jiaotong University: 02/2015-06/2016
Institute of Precision Engineering *Xi'an China*

The Structured Illumination Optical Sectioning Microscope for 3D Imaging on Micron-scale Surface
Adopted by our department to measure surface parameters of MEMS devices

- Utilized one dimensional optical grating scanning to realize structured illumination and precise 3D imaging
- Designed and built up the light path and scanning mechanism on the basis of an optical microscope
- Denoised and processed signals from CMOS camera and reconstructed the output 3D image, programmed in MATLAB

Subwavelength Focusing by Binary Multi-annular Plates(MAPs): Design and Experiment
Published in the Journal of Optics in Feb.2015

- Extracted the feature of the MAP focus points, which outperformed traditional lens in subwavelength focusing
- Precisely adjusted and calibrated the experimental system using Coordinate Measuring Machine
- Calculated and simulated experiment in advance with MATLAB and verified our model through precise experiment

Optical Sensor Designer, Xian Huateng Internet of Things Co., Ltd.: 05 - 08/2015
Sensor Design and Fabrication Team *Xi'an China*

- Hands-on designed and fabricated smart optical switcher and remote control as part of smart home

PUBLICATIONS

Chen Chen, **Tong Shen**, Zhidong Du, Junxue Zhang, Jicheng Wang, Amy Marconnet, Liang Pan, "*Microscale two-dimensional (2D) temperature mapping by ratiometric fluorescence imaging under orthogonal excitations*", *Experimental Thermal and Fluid Science*, Volume 94, June 2018, Pages 168-171 [LINK]

Tao Liu, **Tong Shen**, Shuming Yang, Zhuangde Jiang, "*Subwavelength focusing by binary multi-annular plates: design theory and experiment*", *Journal of Optics*, Feb 15', Volume 17, Number 3 [LINK]

LEADERSHIP AND ACHIEVEMENTS

Vice President of Sports Department of the Student Union 09/2013 - 06/2014

- Co-organized annual basketball games of Mechanical Engineering and found sponsorship to operate the whole event

The Second Prize in TiC100 Cup in National Creative Business Design Competition 04/2015

- Collaborated with engineering students to design a series of electronic devices to realize smart home, such as smart alarm clock, smart blinds windows and smart humidifier.

Merit Graduate Student at Xi'an Jiaotong University 04/2016

Siyuan Scholarship at Xi'an Jiaotong University 09/2013, 09/2014, 09/2015