

# Zhuoyao Zhong

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## Education

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2015/09 - present School of Electronic and Information Engineering, South China University of Technology

**PhD Candidate in Information Engineering** SCUT-DLVC Lab. **Supervisor: Prof. Lianwen Jin**

**Research Interests:** Character recognition, Text detection, Layout analysis, Text-centric image understanding

2011/09 - 2015/06 School of Electronic and Information Engineering, South China University of Technology

**B.Eng. in Electronics and Information Engineering** Outstanding Undergraduate Thesis Award

## Research Experience

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**2016/07 – present** **Robust text detection** Key designer & developer

**Mentor: MSRA Researcher Qiang Huo and Lei Sun**

- The first to propose to use Faster R-CNN and Mask R-CNN to address the text detection problem
- Proposed a **novel anchor-free region proposal network (AF-RPN)** that can generate high-quality proposals of various shapes in an anchor-free manner to get rid of hand-crafted anchor design for Faster/Mask R-CNN framework; The idea of anchor-free is also popular in the field of **generic object detection** recently
- Proposed a **novel Relation Network based line grouping approach** to grouping text primitives effectively and detecting text instances with large inter-character spaces robustly
- Proposed a **new region-wise adaptive scaling approach** to detecting small text efficiently on high resolution images (Achieved a competitive F-measure of 77.49% by only processing 896x896 pixels on average for each image on ICDAR-2017 MLT dataset)
- Achieved **state-of-the-art results** on horizontal (ICDAR-2013), multi-oriented (ICDAR-2017 MLT, ICDAR-2105 and MSRA-TD500) and curved (Total-text and SCUT-CTW1500) text detection benchmarks
- Deployed in the industry-leading [Microsoft's new-generation Printed and Handwritten OCR API](#) in Microsoft Cognitive Services, outperforming [Google Vision API](#) significantly on the challenging indoor dataset including 11 scenarios in total (e.g., "document", "receipt", "invoice", "street view", and "product label", etc.)

**2019/03 – present** **Page object detection for document understanding** Key designer & developer

**Mentor: MSRA Researcher Qiang Huo and Lei Sun**

- The first to propose a **unified framework** that can detect both page objects (i.e., text-blocks, formulas, figures and tables) and text-lines within page objects for document understanding scenarios
- Will be deployed in Microsoft's new "ReadDocument" API in Microsoft Cognitive Services

**2014/09 – 2016/07** **Offline handwritten Chinese character recognition** Key designer & developer

**Mentor: Prof. Lianwen Jin**

- The first to propose to incorporate directional features (e.g., Gabor, HoG and gradient features) as domain knowledge into deep convolutional neural network to boost performance on offline HCCR
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- Achieved a **new state-of-the-art result** on ICDAR-2013 offline HCCR competition dataset; Source code of our approach has been publicly available on [GitHub](#)

## Selected Publications

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- [1] **Zhuoyao Zhong**, Lei Sun, and Qiang Huo, “A Teacher-Student Learning based Born-Again Training Approach to Improving Scene Text Detection Accuracy”, IEEE International Conference on Document Analysis and Recognition (ICDAR), 2019.
- [2] Chixiang Ma\*, **Zhuoyao Zhong\***, Lei Sun, and Qiang Huo, “A Relation Network Based Approach to Curved Text Detection”, IEEE International Conference on Document Analysis and Recognition (ICDAR), 2019. (\* Equal contribution)
- [3] Zhida Huang\*, **Zhuoyao Zhong\***, Lei Sun, and Qiang Huo, “Mask R-CNN with Pyramid Attention Network for Scene Text Detection”, IEEE Winter Conference on Applications of Computer Vision (WACV), 2018. (\* Equal contribution)
- [4] **Zhuoyao Zhong**, Lei Sun, and Qiang Huo, “An Anchor-Free Region Proposal Network for Faster R-CNN based Text Detection Approaches”, International Journal on Document Analysis and Recognition (IJDA), 2018. (Under review, SCI Journal IF:1.298, arxiv preprint arXiv:1804.09003)
- [5] Wei Jia\*, **Zhuoyao Zhong\***, Lei Sun, and Qiang Huo, “A CNN-based Approach to Detecting Text from Images of Whiteboards and Handwritten Notes”, IEEE International Conference on Frontiers in Handwriting Recognition (ICFHR), 2018. (\* Equal contribution, oral presentation)
- [6] **Zhuoyao Zhong**, Lei Sun, and Qiang Huo, “Improved Localization Accuracy by LocNet for Faster R-CNN based Text Detection in Natural Scene Images”, Pattern Recognition, 2017. (Minor revision, SCI Journal, IF:4.582)
- [7] **Zhuoyao Zhong**, Lianwen Jin, and Shuangping Huang, “DeepText: A New Approach for Text Proposal Generation and Text Detection in Natural Images”, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2017. (Oral presentation)
- [8] Shuangping Huang, **Zhuoyao Zhong**, Lianwen Jin, Shuye, Zhang, and Haobin Wang, “DropRegion Training of Inception Font Network for High-Performance Chinese Font Recognition”, Pattern Recognition, 77: 395-411, 2017. (SCI Journal, IF:4.582)
- [9] Lianwen Jin, **Zhuoyao Zhong**, Zhao Yang, Weixin, Yang, Zecheng Xie and Jun Sun, “Applications of Deep Learning for Handwritten Chinese Character Recognition: A Review”, Acta Automatica Sinica, 2016, 42(8): 1125-1141.
- [10] **Zhuoyao Zhong**, Lianwen Jin, and Zecheng Xie, “High Performance Offline Handwritten Chinese Character Recognition Using GoogLeNet and Directional Feature Maps”, IEEE International Conference on Document Analysis and Recognition (ICDAR), 2015. (Oral presentation)

## Skills

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- Programming languages: **C/C++**, **Python**, **matlab**
- Deep learning toolboxes: **Caffe**, **Caffe2**, **PyTorch**
- Good ability of reading and writing in English

## Selected Awards and Honors

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- Co-contributor of [Microsoft's new-generation Printed and Handwritten OCR API](#), 2018
- IEEE ICDAR 2017 Travel Awards, 2017
- “JianZhong Cai” Scholarship, SCUT, 2015 ~ 2017
- Outstanding Undergraduate Thesis Award, SCUT, 2015
- Outstanding Project of National College Students' Innovative Plan, SCUT, 2014