Lin Yang

Contact Information

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Education background

University of Notre Dame, IN, USA

Ph.D. Computer Science and Engineering **Aug. 2013 – Jul. 2018**

- Advisor: Danny Z. Chen
- Dissertation: New Deep Learning Based Approaches for Biomedical Image Segmentation and Related Problems
- GPA: overall 4.0/4.0

Huazhong University of Science and Technology, Wuhan, China

B.S. Optoelectronic Information Engineering **Sep. 2009 – Jun. 2013**

- GPA: overall 89/100

Work experience

Verily Life Sciences, Mountain View, CA

Software Engineer **Jul. 2018 – Present**

- Developing and leveraging new deep learning technologies to improve diabetic retinopathy and diabetic macular edema detection in fundus images (more accurate, more robust, better explainability).

Internship experience

Verily Life Sciences, Mountain View, CA

Software Engineering Intern **May. 2017 – Aug. 2017**

Google, Pittsburgh, PA

Software Engineering Intern **May. 2016 – Aug. 2016**

Skills

Skilled in designing deep learning models (FCN and RNN).

Skilled in deep learning frameworks (Tensorflow, Torch, and Caffe).

Skilled in computer vision (image segmentation/classification and image enhancement).

Programming Languages: C++, Python, Go, R, and Matlab.

Publications and Patents

Conference Papers:

[1] **Yang, L.**, Zhang, Y., Guldner, I.H., Zhang, S., Chen, D.Z.: Fast background removal in 3D fluorescence microscopy images using one-class learning. In MICCAI 2015.

[2] **Yang, L.**, Zhang, Y., Guldner, I.H., Zhang, S., Chen, D.Z.: 3D segmentation of glial cells using fully convolutional networks and k-terminal cut. In MICCAI 2016 *(Student Travel Award)*.

[3] **Yang, L.**, Zhang, Y., Chen, J., Zhang, S., Chen, D.Z.: Suggestive annotation: A deep active learning framework for biomedical image segmentation. In MICCAI 2017 *(Oral Presentation)*.

[4] Zhao, Z., **Yang, L.**, Zheng, H., Guldner, I.H., Zhang, S., Chen, D.Z.: Deep learning based instance segmentation in 3D biomedical images using weak annotation. In MICCAI 2018 *(Co-first author)*.

[5] Zheng, H., Zhang, Y., **Yang, L.**, Liang, P., Zhao, Z., Wang, C., Chen, D.Z.: A new ensemble learning framework for 3D biomedical image segmentation. AAAI 2019 *(Co-first author)*.

[6] Mu, J., **Yang, L.**, Kamocka, M.M., Zollman, A.L., Carlesso, N., Chen, D.Z.: Segmentation of vascular structures and hematopoietic cells in 3D microscopy images and quantitative analysis. In SPIE Medical Imaging 2015.

[7] Zhang, Y., **Yang, L.**, MacKenzie, J.D., Ramachandran, R., Chen, D.Z.: A seeding-searching-ensemble method for gland segmentation and detection. In BIBM 2015.

[8] Chen, J., **Yang, L.**, Zhang, Y., Alber, M., Chen, D.Z.: Combining fully convolutional networks and recurrent neural networks for 3D biomedical image segmentation. In NIPS 2016.

[9] Zhang, Y., **Yang, L.**, Chen, J., Fredericksen, M., Hughes, D.P., Chen, D.Z.: Deep adversarial networks for biomedical image segmentation utilizing unannotated images. In MICCAI 2017.

[10] Palit, I., **Yang, L.**, Ma, Y., Chen, D.Z., Niemier, M.T., Xiong, J., Hu, X.S., Biomedical image segmentation using fully convolutional networks on TrueNorth. In CBMS 2018.

[11] Xu, X., Lu, Q., **Yang, L.**, Hu, X.S., Chen, D.Z., Hu, Y., Shi, Y.: Quantization of fully convolutional networks for accurate biomedical image segmentation. In CVPR 2018.

Patents:

[1] A noninvasive imaging system for monitoring vital signs of avian embryos. China Patent CN102960265A, filed December 5, 2012, and issued March 13, 2013.

[2] Diagnosis Model Optimization for Hardware Variations. US Provisional Patent Application.

[3] Surgical Video Retrieval Based on Preoperative Images. US Provisional Patent Application.

[4] A Step-Based System for Providing Surgical Intraoperative Cues. US Provisional Patent Application.

[5] Surgical Simulator Providing Labeled Data. US Provisional Patent Application.

[6] Segmenting Ultrasound Images. WIPO (PCT)

Journal Articles:

[1] **Yang, L.**, You, S., Zhang, L., Yang, T., Li, P., Lu, J. (2013). Noninvasive vasculature detection using laser speckle imaging in avian embryos through intact egg in early incubation stage. *Biomedical optics express*, 4(1), 32-37.

[2] Guldner, I.H., **Yang, L.**, Cowdrick, K.R., Wang, Q., et al. (2016). An integrative platform for three-dimensional quantitative analysis of spatially heterogeneous metastasis landscapes. *Scientific reports*, 6, 24201. (*Co-first author*)

[3] Zhang, Y., **Yang, L.**, MacKenzie, J.D., Ramachandran, R., Chen, D.Z. (2016). A seeding-searching-ensemble method for gland segmentation in H&E-stained images. *BMC medical informatics and decision making*, 16(2), 80.

[4] Shi, B., **Yang, L.**, Weninger, T. (2017). Forward backward similarity search in knowledge networks. *Knowledge-Based Systems*, 119, 20-31.

[5] Chen, D.Z., Craft, D., **Yang, L.** (2015). A circular matrix-merging algorithm with application in volumetric intensity-modulated arc therapy. *Theoretical Computer Science*, 607, 126-134.

Selected Honors and Awards

First prize. National Olympiad in Informatics in Provinces, 2007.

First prize in Hubei, China. National Electronic Design Contest, 2011.

First prize. Intel Cup Embedded System Design Contest, 2012.

Selected Professional Experience

Cell analysis in large-scale 3D brain images

In this project, we aim to study the roles and behavior of various brain cells during brain tumor metastasis. Our research provides tools to visualize, segment, and analyze each individual cells in large-scale 3D brain images (potentially for whole brain 3D images).

(1) To visualize fine structures of brain cells in 3D, we designed a method based on one-class learning to efficiently remove the fluorescence background;

(2) To achieve accurate cell-level segmentation, we first utilized deep learning to achieve precise voxel-level segmentation, then we developed a k-terminal cut algorithm to accurately cut the voxel-level segmentation into cell instances.

(3) To capture the complex protrusion morphologies of brain cells, we designed a shortest-path based algorithm to thoroughly analyze the characteristics of brain cells' protrusions.

Reducing manual annotation efforts for deep learning methods

In this project, we aim to significantly reduce the manual annotation efforts for deep learning based biomedical image segmentation methods. We developed methods to improve the effectiveness of manual annotation by suggesting the most valuable samples to annotate and improve the efficiency of manual annotation by allowing inexact labeling.

(1) To select the most valuable data for annotation, we developed a method that combines active learning and deep learning to select uncertain and representative samples.

(2) To allow inexact labeling, we designed a method that can achieve accurate segmentation by only using bounding box annotation.