Yu Liu

Contact Information

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Education

Ph.D. in Computer Science *Sep. 2014 – Oct. 2018*
Leiden University, Leiden, The Netherlands
- Thesis: Exploring Images with Deep Learning for Classification, Retrieval and Synthesis
- Advisor: Prof. Michael S. Lew

M.S. in School of Software *Sep. 2011 – Jul. 2014*
Dalian University of Technology, Dalian, China
- Thesis: Viewpoint Independent Action Recognition based on Projective Invariants
- Advisor: Prof. He Guo

B.S. in School of Software *Sep. 2007 – Jul. 2011*
Dalian University of Technology, Dalian, China
- Thesis: Sparse Representation for Facial Expression Recognition
- Advisor: Dr. Qi Jia

Research Interests

- **Image Recognition**: image classification, edge detection, semantic segmentation.
- **Vision and Language**: image captioning, image-text matching, image search with language.
- **Image Synthesis**: image-to-image translation, fashion style transfer, text-to-image generation.

Featured Research

SwapGAN for Fashion Style Transfer *Nov. 2017 – Mar. 2018*
- *Background*: person-to-person fashion clothing swapping allowes people to see what they would look like by wearing different clothes, with no effort of dressing them physically. The challenge is due to the varying deformations among different human poses.
- *Method*: this work proposes a deep generative approach, namely SwapGAN. It can accomplish this task by integrating three generators conditioned on different priors in a multi-stage manner.
- *Result*: both qualitative and quantitative experiments show the effectiveness of SwapGAN.

Deep Learning for Vision & Language Applications *Jul. 2016 – Present*
- *Backgorund*: we can recognize a picture of a panda after hearing the description “black and white bears” without ever having seen one. This shows the cross-modal interaction between vision and language. The difficult is how we can bridge the modality gap between vision and language.
- *Method*: in terms of image captioning and image-text matching, this research work presents several deep learning approaches, including a recurrent residual fusion network (RRF-Net), a unified multi-modal matching and classification network (MMC-Net), a dual prediction network (DPN) and cycle-consistent embeddings (CycleMatch).

- *Result*: the proposed approaches have achieved comparable performance on the benchmarks such as MSCOCO and Flickr30K.

Convolutional Fusion Networks for Image Recognition *Dec. 2015 – Jun. 2016*

- *Background*: instead of increasing the depth of CNNs, an efficient alternative is to efficiently integrate intermediate layers in CNNs.
- *Solution*: this work develops a convolutional fusion network (CFN) on top of a plain CNN. CFN can integrate multiple intermediate layers with adaptive weights and generate a fused feature representation.
- *Result*: CFN shows promising performance for not only image-level classification, but also pixel-level classification such as semantic segmentation and edge detection.

Accurate and Efficient Image Retrieval *Oct. 2014 – Mar. 2015*

- *Backgrund*: a robust image retrieval system should be typically optimized regarding two factors: accuracy and efficiency
- *Solution*: this work proposes a novel image retrieval approach, namely DeepIndex, which can incorporate deep visual representations into the inverted index scheme. In addition, DeepIndex is an effective solution to integrate multiple deep features at an indexing level and can make a bridge between different CNNs.
- *Result:* the experiments show the discriminatory capabilities of deep neural networks and the efficient search of the inverted index.

Shape Recognition Using Projective Invariants *Jul. 2012 – Mar. 2014*

- *Background*: many existing shape descriptors are typically derived from pairwise measures (e.g. distances and angles), which may vary with severe geometrical deformations such as affine and projective transformations.
- *Solution*: this work focuses on designing a new shape descriptor based on the projective invariant, characteristic number (CN). The proposed shape descriptor computes CN values on a series of 5 sample points along the shape contour with the intervals varying from coarse to fine.
- *Result*: our shape descriptor can be robust to severe perspective transformations and other variations including noise, missing parts and articulated deformations.

Project Experience: GPGPU Parallel Image Processing *Oct. 2011 – Mar. 2013*

- This project develops a parallel image processing platform based on the CUDA library. A range of parallel strategies are designed and implemented to increase the computational performance of typical image processing algorithms.

Publications

➢ *Conference Papers*:

- **Yu Liu**, Yanming Guo, Wei Chen, Michael S. Lew. "An Extensive Study of Cycle-Consistent Generative Networks for Image-to-Image Translation", International Conference on Pattern Recognition (ICPR), 2018.
- Hongchang Shan, **Yu Liu**, Todor Stefanov. "A Simple Convolutional Neural Network for Accurate P300 Detection and Character Spelling in Brain Computer Interface", International Joint Conference on Artificial Intelligence (IJCAI), 2018.
- Yanming Guo, **Yu Liu**, Maaike H.T. de Boer, Li Liu, Michael S. Lew. "A Dual Prediction Network for Image Captioning", IEEE International Conference on Multimedia and Expo (ICME), 2018.
- Theodoros Georgiou, Sebastian Schmitt, Markus Olhofer, **Yu Liu**, Thomas Back, Michael S. Lew. "Learning Fluid Flows", International Joint Conference on Neural Networks (IJCNN), 2018.
- **Yu Liu**, Yanming Guo, Erwin M. Bakker, Michael S. Lew. "Learning a Recurrent Residual Fusion Network for Multimodal Matching", IEEE International Conference on Computer Vision (ICCV), 2017.

- **Yu Liu**, Michael S. Lew. "Improving the Discrimination between Foreground and Background for Semantic Segmentation", IEEE International Conference on Image Processing (ICIP), 2017.
- **Yu Liu**, Yanming Guo, Michael S. Lew. "On the Exploration of Convolutional Fusion Networks for Visual Recognition", International Conference on MultiMedia Modeling (MMM), 2017. **(Best Paper Award)**
- **Yu Liu***, Yanming Guo*, Michael S. Lew (* equal contributions). "What Convnets Make for Image Captioning", International Conference on MultiMedia Modeling (MMM), 2017.
- **Yu Liu**, Michael S. Lew. "Learning Relaxed Deep Supervision for Better Edge Detection", IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2016.
- **Yu Liu**, Yanming Guo, Song Wu, Michael S. Lew. "DeepIndex for Accurate and Efficient Image Retrieval", ACM International Conference on Multimedia Retrieval (ICMR), 2015.
- **Yu Liu**, Qi Jia, He Guo, Xin Fan. "A Shape Matching Framework Using Metric Partition Constraint", IEEE International Conference on Image Processing (ICIP), 2013.

➢ *Journal Papers*:

- **Yu Liu**, Li Liu, Yanming Guo, Michael S. Lew. "Learning Visual and Textual Representations for Multimodal Matching and Classification", Pattern Recognition (PR), 2018.
- **Yu Liu**, Yanming Guo, Theodoros Georgiou, Michael S. Lew. "Fusion that Matters: Convolutional Fusion Networks for Visual Recognition", Multimedia Tools and Applications (MTAP), 2018.
- Yanming Guo, **Yu Liu**, Songyang Lao, Erwin M Bakker, Liang Bai, Michael S. Lew. "Bag of Surrogate Parts Feature for Visual Recognition", IEEE Transactions on Multimedia (TMM), 2018.
- Yanming Guo, **Yu Liu**, Erwin M. Bakker, Yuanhao Guo, Michael S. Lew. "CNN-RNN: A Large-scale Hierarchical Image Classification Framework", Multimedia Tools and Applications (MTAP), 2018.
- Yanming Guo, **Yu Liu**, Theodoros Georgiou, Michael S. Lew. "A review of semantic segmentation using deep neural networks", International Journal of Multimedia Information Retrieval (IJMIR), 2018.
- Qi Jia, Xin Fan, **Yu Liu**, Haojie Li, Zhongxuan Luo, He Guo. "Hierarchical Projective Invariant Contexts for Shape Recognition", Pattern Recognition (PR), 2016.
- Yanming Guo, **Yu Liu**, Ard Oerlemans, Songyang Lao, Song Wu, Michael S. Lew. "Deep Learning for Visual Understanding: A Review", Neurocomputing, 2016.
- Qi Jia, Xin Fan, Zhongxuan Luo, **Yu Liu**, He Guo. "A New Geometric Descriptor for Symbols with Affine Deformations", Pattern Recognition Letters (PRL), 2014.

Academic Service

- Program committee member for the 2nd CEFRL workshop, ECCV 2018.
- Reviewer : IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2018.
- Reviewer : Asian Conference on Computer Vision (ACCV), 2018.
- Reviewer : International Journal of Computer Vision (IJCV).
- Reviewer : Neurocomputing.
- Reviewer : IEEE Access.
- Reviewer : International Journal of Multimedia Information Retrieval (IJMIR).

Honors & Awards

- Best Paper Award at MMM 2017.
- ICMR 2015 Student Travel Scholarship.
- Winning Prize of the NVIDIA CUDA Campus Application Design Contest, China, 2012.
- Outstanding Graduate, Dalian University of Technology, 2011.
- 2nd Prize of Undergraduate Mathematical Contest on Modeling, 2008.

Skills

- **Computer Programming** Matlab, C/C++, Python, LaTeX
- **Deep Learning Toolboxes** Caffe, TensorFlow
- **Personnal Qualities** Reliable, Hardworking, Teamwork, Good listening