QIAN GE

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EDUCATION

North Carolina State University Raleigh, NC, USA
Ph.D. in Electrical Engineering. GPA: 4.0/4.0 *May 2019 (expected)*

University of Electronic Science and Technology of China Chengdu, P.R. China
M.S. in Electrical Engineering. GPA: 3.69/4.0 *Jun. 2011*
B.S. in Electrical Engineering. GPA: 3.76/4.0 *Jul. 2008*

SKILLS

Computer Languages	Python, MATLAB, C/C++
Framework/Tools	TensorFlow, Numpy, Pandas, Scikit-learn, OpenCV, Git
Professional	Computer Vision, Image Segmentation and Classification, Object Detection Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Generative Adversarial Networks (GANs), Visual Attention Models

WORK EXPERIENCE

Research Aid Intern, Argonne National Laboratory, Lemont, IL, USA Jan 2018 – May 2018

- Primarily worked on validation of power system models and design of load forecasting models.
- **Data Cleaning.** Cleaned and aligned raw data from multiple resources including historical load demands, climate data and weekdays/holidays.
- **Load Forecasting.** Designed a Sequence-to-Sequence-based model for load demand forecasting, and proposed a rich feature learning process to improve model performance and interpretability. Achieved better or comparable performance to state-of-the-art load forecasting models on three public dataset.

SELECTED OPEN SOURCE PROJECTS (Click [name] to access the code and detailed results.)

YOLOv3 for Object Detection [yolov3]

- TensorFlow implementation of YOLOv3 object detection for both inference and training.
- Provided customized training blocks, including bounding box clustering, data augmentation and multi-scale training.
- Trained on PASCAL VOC object detection dataset for 20 object classes detection on natural images.

Human Face Generation using GANs [tf-gans]

- Implemented GAN models for human face generation, including DCGAN, LSGAN and InfoGAN.
- Generated face images with controlled context, such as emotion, hairstyle and azimuth, using InfoGAN.

Attention-based Image Classification [recurrent-attention-model]

- Implemented a recurrent visual attention model for image classification, which reduces the computational complexity by only paying attention to a sequence of small regions of the image.
- Achieved 97.82% accuracy on 60×60 translated MNIST and provided interpretation of the classification results by visualizing the attention regions during inference.

Interpretation of Trained CNN Models through Visualization [CNN-Visualization]

- Provided interpretation of trained CNN models by visualizing the learned features and the image regions where the models pay attention to.
- Transposed convolutional network and guided back propagation were applied for feature visualization.
- Class Activation Mapping and Gradient-weighted Class Activation Mapping were applied for attention region visualization.

Image Transformation with Conditional GANs and Fast Style Transfer [pix2pix][fast-style-transfer]

- Reconstructed building facade photos from label maps and generated shoes photos from sketches using pix2pix conditional GANs.
- Transferred images and videos to a specific artistic style in nearly real-time using an image transformation network trained to combine the content and artistic style from two images.

Adversarial Autoencoders [adversarial-autoencoders]

- Provided an implemented of adversarial autoencoders (AAE) which utilize GAN framework as a variational inference algorithm.
- Applied AAEs for semi-supervised learning and generating controlled style images.

SELECTED RESEARCH EXPERIENCE

A Visual System for Foraminifera (Forams) Species Identification [Project Page]

- **Data Collection and Augmentation.** Leaded the creation of a forams image dataset containing 1437 samples and 457 manually segmentation samples. Created synthetic images refined by GANs for data augmentation.
- **Iterative Refinement Edge Detection.** Developed a coarse-to-fine fully convolutional edge detection network which iteratively applies edge detection modules on predicted edge maps. Achieved 0.91 edge F1 score on the forams dataset for finding vague edges between forams chambers.
- **Topology-Aware Edge Detection.** Designed a metric measuring the structural difference between two edge maps to train an edge detection network which focuses on preserving topological structures of edges. Improved edge F1 score from 0.91 to 0.93 and edge-based segmentation IoU from 0.80 to 0.82.
- **Species Identification.** Built a transfer learning process for identification of six forams species using features extracted from pre-trained VGG, Inception and ResNet.

Robust Traffic Scenes Obstacle Detection and Image Segmentation [Presentation]

- **Robust Segmentation Framework.** Proposed a persistent homology based image segmentation framework which is robust to image qualities and parameter selection.
- **Robust Obstacle Detection.** Designed a pipeline for traffic scene obstacle detection based on this framework to robustly extract obstacle regions in occupancy grids computed from disparity maps. Demonstrated that the detection results are robust to input image quality through experiments on KITTI dataset.
- **Consensus-based Image Segmentation.** Designed a consensus-based image segmentation based on this framework to robustly extract consensus information from a segmentation result set generated by different segmentation algorithms. Achieved better performance over a wide range of parameters than any input algorithm with its best parameter setting on Berkeley Segmentation Database.

Exploring Victorian Newspapers through Computer Vision Techniques [Project Page]

- **Dataset Creation.** Created a Victorian newspaper illustration dataset by extracting illustration regions from scanned newspaper pages with high accuracy.
- **Halftone Image Detection.** Developed a Fourier transform based feature to distinguish line engravings and halftone images for tracking the presence of halftone images in late nineteenth-century British newspapers.

SELECTED PUBLICATIONS

1. **Q. Ge**, DB. Zhao "Short-Term Load Demand Forecasting through Rich Features using Recurrent Neural Networks" *(Preparation)*
2. **Q. Ge**, E. Lobaton, "Obstacle Detection in Outdoor Scenes based on Multi-Valued Stereo Disparity Maps" *IEEE Symp. Series Comput. Intell.,* Dec., 2017
3. **Q. Ge**, B. Zhong, B. Kanakiya, R. Mitra, T. Marchitto, E. Lobaton, "Coarse-to-Fine Foraminifera Image Segmentation through 3D and Deep Features" *IEEE Symp. Series Comput. Intell.,* Dec., 2017
4. B. Zhong, **Q. Ge**, B. Kanakiya, R. Mitra, T. Marchitto, E. Lobaton, "A Comparative Study of Image Classification Algorithms for Foraminifera Identification" *IEEE Symp. Series Comput. Intell.,* Dec., 2017
5. **Q. Ge**, E. Lobaton, "Consensus-Based Image Segmentation via Topological Persistence" *IEEE Conf. on Comput. Vis. Pattern Recognit. Workshops (CVPRW),* July, 2016
6. CP. Wei, **Q. Ge**, S. Chattopadhyay, E. Lobaton, "Robust Obstacle Segmentation based on Topological Persistence in Outdoor Traffic Scenes" *IEEE Symp. Series Comput. Intell.,* Dec., 2014
7. **Q. Ge**, N. Lokare, E. Lobaton, "Non-Rigid Image Registration under Non-Deterministic Deformation Bounds" *10th International Symposium on Medical Information Processing and Analysis,* Oct., 2014