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Yixin Gao

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SUMMARY

Research Interests: machine learning (deep learning, graphical models, sequence learning), automatic speech recognition, natural language processing, computer vision, robotics, etc.

Programming Languages and Tools: C/C++, Python, Matlab, Shell script, Java, R, html, Theano, git, svn, etc.

EDUCATION

Ph. D. in Computer Science, Johns Hopkins University (JHU) 08/2017 (expected)

M. S. in Computer Science, Johns Hopkins University 08/2011

M. S. in Electrical Engineering, Xi'an Jiaotong University (XJTU) 07/2009

B. S. in Electrical Engineering, Xi'an Jiaotong University 07/2006

EXPERIENCES

Machine Learning Scientist Intern, Amazon, Boston, MA 10/2016-01/2017

- Worked on Alexa speech recognition.

Data Scientist Intern, Intuitive Surgical, Sunnyvale, CA 06/2016-08/2016

- Worked clustering methods of event sequence data from da Vinci robotic surgery platform.

Research Assistant, CIRL Lab, JHU, Baltimore, MD 01/2012 -

- **Unsupervised temporal pattern discovery in surgical data**

Proposed a graphical approach for pattern discovery in surgical motion data using Gaussian posterior representation and segmental dynamic time warping (DTW).

- **Query-by-example surgical activity detection**

Proposed an information retrieval approach to detect dexterous motion snippets using a novel asymmetric subsequence dynamic time warping (AS-DTW) method on stacked denoising autoencoder (SDAE) representation.

- **Unsupervised surgical activity alignment with deep representation**

Proposed an unsupervised surgical motion alignment framework based on non-linear representation learning (SDAE) and DTW with recognition accuracy comparable to supervised method.

- **A reparametrization approach to surgical activity alignment**

Proposed a novel approach to surgical motion alignment via optimizing the total SE(3) distance on a reparametrized time scale.

- **HMM toolkit for time-series classification**

Created a discrete hidden Markov model C++ toolkit embedded with linear discriminant analysis and vector quantization with applications to surgical gesture classification.

- **Administrator of the JIGSAWS:** dataset maintenance, web management.

Teaching Assistant, Dept. of Computer Science, JHU 2013 - 2016

- Courses: Introduction to Algorithms, Algorithms for Sensor-based Robotics, Computational Theory and Automata, Information Retrieval
- Won Outstanding Teaching Award

Research Assistant, VISR Lab, JHU, Baltimore, MD 09/2009 - 12/2011

- Developed a prototype framework for cross-platform surgical training and evaluation.
- Developed an teleoperation system for human-robot cooperative cell manipulation with vision and force augmentations. Assembled the hardware and developed the GUI based on FLTK.

Research Assistant, SigPro Lab, XJTU, Xi'an, China 09/2006 - 08/2009

- Designed and implemented a Unified Speech & Audio Coding System in C.
- Proposed a time-frequency analysis tool: biorthogonal frequency-varying modulated lapped transform.
- Proposed an ROI-based error resilient coding scheme of H.264 for conversational video communication with improved rate distortion.

SELECTED PUBLICATIONS & PATENTS

- **Y. Gao**, S. Vedula, G. Lee, M. Lee, S. Khudanpur and G. Hager, *Query-by-Example Surgical Activity Detection*, International Journal of Computer Assisted Radiology and Surgery, 2016
- **Y. Gao**, S. Vedula, G. Lee, M. Lee, S. Khudanpur and G. Hager, *Unsupervised Surgical Data Alignment with Application to Automatic Activity Annotation*, IEEE International Conference on Robotics and Automation (ICRA) 2016
- N. Ahmidi, L. Tao, S. Sefati, **Y. Gao**, C. Lea, B. Bejar, L. Zappella, S. Khudanpur, R. Vidal, G. Hager, A Dataset and Benchmarks for Segmentation and Recognition of Gestures in Robotic Surgery, Transaction of Biomedical Engineering, 2017
- S. Vedula, A. Malpani, L. Tao, G. Chen, **Y. Gao**, P. Poddar, N. Ahmidi, C. Paxton, R. Vidal, S. Khudanpur, G. Hager, C. Chen, *Analysis of the structure of surgical activity for a suturing and knot-tying task*, PLoS ONE, 2016
- **Y. Gao**, S. Vedula, C. Reiley, N. Ahmidi, B. Varadarajan, H. Lin, L. Tao, L. Zappella, B. Bejar, D. Yuh, C. Chen, R. Vidal, S. Khudanpur and G. Hager, *The JHU-ISI Gesture and Skill Assessment Working Set (JIGSAWS): A Surgical Activity Dataset for Human Motion Modeling*, In Modeling and Monitoring of Computer Assisted Interventions Workshop, 2014.
- N. Ahmidi, **Y. Gao**, B. Bejar, S. Vedula, S. Khudanpur, R. Vidal, G. Hager, *String Motif-Based Description of Tool Motion for Detecting Skill and Gestures in Robotic Surgery*, Medical Image Computing and Computer-assisted Intervention (MICCAI) Sept. 2013: 26-33.
- R. Kumar, G. Hager, A. Jog, **Y. Gao**, M. Liu, S. Dimaio, B. Itkowitz, M. Curet, *Method and system for analyzing a task trajectory*, Patent Publication No. WO2012151585 A3.
- **Y. Gao**, M. Sedef, A. Jog, G. Hager, J. Berkley and R. Kumar, *Towards validation of robotic surgery training assessment across training platforms* IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), San Francisco, Sept. 2011.
- F. Li and **Y. Gao**, *ROI-Based Error Resilient Coding of H.264 for Conversational Video Communication*, 7th International Wireless Communications and Mobile Computing Conference (IWCMC2011), Istanbul, Turkey, July 2011.
- **Y. Gao**, R. Taylor and R. Kumar, *A modular architecture for biomanipulation*, International Workshop on Systems and Architectures for Computer Assisted Interventions, Sept. 2010.
- **Y. Gao** and G. Liu, "Biorthogonal frequency-varying modulated lapped transform", Multimedia and Expo, IEEE International Conference on, pp. 209-212, June 2009.

SELECTED AWARDS & ACTIVITIES

Outstanding Teaching Assistant, Johns Hopkins University	05/2014
Committee of Women of Whiting (WoW), Johns Hopkins University	2011-2013
Dean Robert H. Roy Fellowship, Johns Hopkins University	09/2010
North American Surgical Robotics Summer School	08/2010
Graduate Innovation Scholarship for all academic years, Xi'an Jiaotong University	2007-2009
Chiang Chen Industrial Charity Foundation Overseas Graduate Fellowship (\$50,000)	12/2008
First Prize in China National Graduate Mathematical Modeling Contest (1%)	11/2008
Outstanding Graduate of Shaanxi Province (1%)	01/2006
Outstanding Scholarship for all academic years, Xian Jiaotong University	2002-2006
Intern, China Unicom Ltd., Xian, China	08/2005
Minister of Student's Science and Technology Club, Xian Jiaotong University	2003-2004

RELATED COURSES

Machine Learning, Advanced Topics in Machine Learning, Representation Learning, Computer Vision, Information Extraction from Speech and Text, Compressed Sensing, Algorithms, Object Oriented Software Engineering, Database Systems, Probability Theory, Statistical Theory, Optimization, Matrix Analysis.