Huazhong Ning

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Research Interests:

- Video search, cloud computing, computer vision;
- Pattern recognition, machine learning, and audio processing;

Education:

PH.D., University of Illinois at Urbana-Champaign, IL
Electrical & Computer Engineering, 12/2008
Thesis: Visual Action Search and Recognition
Advisor: Prof. Thomas S. Huang

M.E., Institute of Automation, Chinese Academy of Sciences, China
Electrical Engineering, 2003
Thesis: Model-based Tracking of Walking People
Advisor: Prof. Tieniu Tan

B.S., Special Class for Gifted Young, Univ. of Sci. & Tech. of China
Computer Science, 2000
Thesis: Protocol Conformance Testing Based on Labeled Transition System
Advisor: Prof. Fan Jiang

R&D Experiences:

AKiiRA Media Systems Inc., Palo Alto CA
Senior Research Scientist and Chief Architect, 12/2009-now

- Designed and implemented a video search engine that is focusing on professional long videos. Mainly involved in these projects.
- Fast nearest neighbor search. Learn random forest to fast generate hash code and leverage on Lucene to index and search. Used for searching similar video shots and face recognition.
- Face recognition. Train and test on LFW database (about 13K images with 6K people) and achieved the state-of-the-art performance.
- Leveraging on Hadoop, designed and implemented the video cloud computing platform (C++): representation/serialization/deserialization of objects, multithreading pipeline of video processing, unified map/reduce for the pipeline, Hadoop simulator for C pipes...
- Large scale distributed eig-decomposition. Compute top 1000 eigens of a 1M by 0.5M full matrix in about 2 days using 11 nodes.
- Video annotation. We segment videos into shots and classify each shot using SVM or other methods. Our major contribution is the visual feature.

AdCenter Labs, Microsoft, Redmond WA (The lab was closed in 2009)
Applied Researcher, 12/2008-12/2009

- Content ads for videos. It is a new delivery channel to sell AdCenter ads through video content. Solve the optimization problem: find the most relevant ad and overlay it on the video at the least intrusive spatial-temporal location.

- Automatic monitoring and diagnostics of the ad system. Ad system is extremely complex and any change of an internal or external factor may affect the revenue. We designed and implemented an automatic tool to locate the possible changes/errors and recommend solutions, using Bayesian net.

ECE Department, University of Illinois at Urbana-Champaign, IL
Research assistant with Prof. Thomas S. Huang, 2004-2008

- Technical leader of TRECVID evaluation on action detection/recognition. Proposed an LPCRF model for continuous action recognition in unsegmented video sequences.
- One of the core members of Star Challenge Competition on image/video retrieval. Proposed an approach to video search using spatial-temporal words. Our team is ranked top 3.
- One of three core members of ETISEO evaluation on event detection. Proposed jointly a tracking algorithm based on optimal dynamic fusion of multiple proposal distributions. Developed an efficient human detector.
- One of three core members of CLEAR evaluation on the task of multimodal Person ID (audio/video alone or joint). We are the champion.
- Developed a real-time shrug detection system for Yamaha R&D. The system was reported by several news websites.
- A core member of VACE II project on video content analysis. Proposed jointly a method of efficient nonparametric belief propagation and applied it to articulated body tracking.

NEC Laboratories America, Inc., USA
Research intern, 2005-2008 (4 summers)

- Action detection in Shopping Mall Project. Learn discriminative visual words for 3D human pose estimation.
- Tracking evolutionary virtual communities in web-blogs. Proposed an incremental spectral clustering algorithm.
- A live demo system for driving safety. Developed the core module – temporal difference learning to predict danger level. The system was highly praised by the Vice-President of Toyota.
- Developed an online speaker diarization system (“who spoke when”). A product division in NEC is currently transferring it to commercial system.

Mobile Solutions Division, Alcatel Shanghai Bell Co., Ltd., China
Technical Project Manager and 3G Software Engineer, 2003-2004

- Technical project manager of the project 3G-UAN (Uniform Access Number). The project was completed in time with high quality.
- Developed the GPRS part of 3G projects: 3G-VPN (Virtual Private Network) and 3G-PPS (Pre-Paid Service).

Institute of Automation, Chinese Academy of Sciences, China
Research Assistant with Prof. Tieniu Tan, 2000-2003

- Developed a model-based human tracking system. Proposed a kinematical approach and a probabilistic approach.
- Developed jointly a gait recognition system that fuses both static and dynamic body biometrics. Established the CASIA Gait Database.

Publications:

Book chapters

1 **Huazhong Ning**, Ying Shan, Junxian Wang, and Xu Liu, *Content and Attention Aware Overlay for Online Video Advertising*, book chapter of Online Multimedia Advertising, 2010. (accepted)

Journal papers

9 Xu Zhao, Yun Fu, **Huazhong Ning**, Yuncai Liu, and Thomas S. Huang, *Human Pose Estimation with Regression by Fusing Multi-View Visual Information*, IEEE Trans. on Circuits and Systems for Video Technology, 2010. (accepted)

8 **Huazhong Ning**, Wei Xu, Yue Zhou, Yihong Gong, and Thomas S. Huang, *A General Framework to Detect Unsafe System States from Multisensor Data Stream*, IEEE Transactions on Intelligent Transportation Systems, 2010.

7 **Huazhong Ning**, Wei Xu, Yun Chi, Yihong Gong, and Thomas S. Huang, *Incremental Spectral Clustering by Efficiently Updating the Eigen-System*, Pattern Recognition, 43(1), 2010.

6 **Huazhong Ning**, Tony X. Han, Dirk B. Walther, Ming Liu, and Thomas S. Huang, *Hierarchical Space-time Model Enabling Efficient Search for Human Actions*, IEEE Trans. on Circuits and Systems for Video Technology, 19(3), 2009.

5 **Huazhong Ning**, Tieniu Tan, Liang Wang, and Weiming Hu, *People Tracking Based On Motion Model and Motion Constraints with Automatic Initialization*, Pattern Recognition, 37(7), 1423-1440, 2004.

4 **Huazhong Ning**, Tieniu Tan, Liang Wang, and Weiming Hu, *Kinematics-based tracking of human walking in monocular video sequences*, Image and Vision Computing, 22(5), 429-441, 2004.

3 Liang Wang, **Huazhong Ning**, Tieniu Tan, and Weiming Hu, *Fusion of Static and Dynamic Body Biometrics for Gait Recognition*, IEEE Trans. Circuits and Systems for Video Technology, 14(2), 149-158, 2004.

2 Liang Wang, Tieniu Tan, **Huazhong Ning**, and Weiming Hu, *Silhouette Analysis Based Gait Recognition for Human Identification*, IEEE Trans. on Pattern Analysis and Machine Intelligence, 25 (12), 2003.

1 Liang Wang, Tieniu Tan, Weiming Hu, **Huazhong Ning**, *Automatic Gait Recognition Based on Statistical Shape Analysis*, IEEE Trans. on Image Processing, 12 (9), 2003.

Conference papers

20 Mert Dikmen, **Huazhong Ning**, Dennis J. Lin, Liangliang Cao, etc., *Surveillance Event Detection*, TRECVid 2008 Evaluation for Event Detection.

19 Tony X. Han, **Huazhong Ning**, and Thomas S. Huang, *Fusion by Optimal Dynamic Mixtures of Proposal Distributions*, Second IEEE Workshop on CVPR for Human Communicative Behavior Analysis, 2009.

18 Xu Zhao, **Huazhong Ning**, Yuncai Liu, and Thomas S. Huang**,** *Discriminative estimation of 3D human pose using Gaussian processes,* IEEE Int'l Conference on Pattern Recognition (ICPR), 2008.

17 **Huazhong Ning**, Wei Xu, Yihong Gong, and Thomas S. Huang, *Latent Pose Estimator for Continuous Action Recognition*, European Conference on Computer Vision (ECCV), 2008.

16 **Huazhong Ning**, Yuxiao Hu, and Thomas S. Huang, *Efficient Initialization of Mixtures of Experts for Human Pose Estimation*, IEEE Int'l Conference on Image Processing

(ICIP), 2008.

15 **Huazhong Ning**, Wei Xu, Yihong Gong, and Thomas S. Huang, *Discriminative Learning of Visual Words for 3D Human Pose Estimation*, IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR), 2008.

: 14 **Huazhong Ning**, Wei Xu, Yue Zhou, Yihong Gong, and Thomas S. Huang, *Temporal Difference Learning to Detect Unsafe System States*, IEEE Int'l Conference on Pattern Recognition (ICPR), 2008.

13 **Huazhong Ning**, Yuxiao Hu, and Thomas S. Huang, *Searching Human Behaviors Using Spatial-Temporal Words*, IEEE Int'l Conf. on Image Processing (ICIP), 2007.

12 **Huazhong Ning**, Wei Xu, Yun Chi, Yihong Gong, and Thomas S. Huang, *Incremental Spectral Clustering With Application to Monitoring of Evolving Blog Communities*, SIAM Int'l Conference on Data Mining, 2007.

11 Yue Zhou, Wei Xu, **Huazhong Ning**, Yihong Gong, and Thomas S. Huang, *Detecting Unsafe Driving Patterns using Discriminative Learning*, IEEE Int'l Conference on Multimedia & Expo (ICME), 2007.

10 **Huazhong Ning**, Tony X. Han, Yuxiao Hu, Zhenqiu Zhang, Yun Fu, and Thomas S. Huang, *A Realtime Shrug Detector*, IEEE Int'l Conference on Automatic Face and Gesture Recognition (FG), 2006.

9 Tony X. Han, **Huazhong Ning**, and Thomas S. Huang, *Efficient Nonparametric Belief Propagation with Application to Articulated Body Tracking*, IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR), 2006.

8 **Huazhong Ning**, Ming Liu, Hao Tang, and Thomas S. Huang, *A Spectral Clustering Approach to Speaker Diarization*, Int'l Conference on Spoken Language Processing (ICSLP), 2006.

7 Ming Liu, **Huazhong Ning**, Thomas S. Huang, Zhengyou Zhang, *A Novel Framework of Text-Independent Speaker Verification Based on Utterance Transform and Iterative Cohort Modeling*, Int'l Conference on Spoken Language Processing (ICSLP), 2006.

6 Ming Liu, Hao Tang, **Huazhong Ning**, and Thomas S. Huang, *Person Identification Based on Multichannel and Multimodality Fusion*, CLEAR Evaluation Workshop, 2006.

5 **Huazhong Ning**, Wei Xu, Yihong Gong, and Thomas S. Huang, *Improving Speaker Diarization by Cross EM Refinement*, IEEE Int'l Conference on Multimedia & Expo (ICME), 2006.

4 Liang Wang, **Huazhong Ning**, Tieniu Tan, Weiming Hu, *Fusion of Static and Dynamic Body Biometrics for Gait Recognition*, Int'l Conf. on Computer Vision (ICCV), 2003.

3 **Huazhong Ning**, Liang Wang, Weiming Hu, and Tieniu Tan, *Articulated Model Based People Tracking Using Motion Models*, IEEE Int'l Conference on Multimodal Interfaces (ICMI), 2002.

2 **Huazhong Ning**, Liang Wang, Weiming Hu, and Tieniu Tan, *Model-based Tracking of Human Walking in Monocular Image Sequences*, IEEE Region 10 Conference on Computers, Communications, Control and Power Engineering (TENCON), 2002.

1 Liang Wang, **Huazhong Ning**, Weiming Hu, and Tieniu Tan, *Gait Recognition Based on Procrustes Shape Analysis*, Int'l Conference on Image Processing (ICIP), 2002.

Patents:

- **Huazhong Ning**, Wei Xu, Yue Zhou, Yihong Gong, and Thomas S. Huang, *Systems and Methods for Detecting Unsafe Conditions*, No. 11/950,776, filed 04/2008
- **Huazhong Ning**, Wei Xu, and Yihong Gong, *Recovery Of 3D Human Pose By Jointly Learning Metrics And Mixtures Of Experts*, No. 12/277,284, filed 11/2008

- Ying Shan, Xu Liu, Junxian Wang, **Huazhong Ning**, and Jiayuan Huang, *Content Advertisements for Video*, No. 12/479,428, filed 06/2009

Teaching Experiences:

ECE Department, University of Illinois at Urbana-Champaign, IL

Teaching Assistant in *Multimedia Signal Processing*, Spring 2008

Lecture, Grading, Office Hour Q&A

Honors / Awards:

- First rank in recognizing events CellToEar and ObjectPut in TRECVID evaluation 2008.
- SIAM Conference on Data Mining Travel Award, 2006.
- First rank in CLEAR evaluation on Multimodal Person ID task, 2006.
- Award of Distinguished Student in Institute of Automation, CAS, 2002.
- Award of Distinguished Student in Chinese Academy of Sciences, 2001.
- Award of Distinguished Graduate in Anhui Province, 2000.
- Award of Distinguished Graduate in USTC, 2000.
- EastCom Scholarship, sponsored by Eastern Communications Co., Ltd., 1999.
- Champion of RoboCup of China, 1999.
- Excellent Student Scholarship in USTC, 1998.
- Huawei Scholarship, sponsored by Huawei Technologies Co., Ltd., 1997.

Skills:

- Proficient in C/C++, C#, STL and generic programming, Java, Perl, OpenCV, and Matlab.
- Proficient in code optimization and debugging.
- Very familiar with compiling technologies and multi-thread programming
- Familiar with DirectX, Python, and OpenGL.