

# XIAOFENG REN

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## EDUCATION

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Ph.D. in Computer Science	Dec 2006	University of California, Berkeley, CA
Thesis: Probabilistic Models for Mid-level Vision		
Advisor: Prof. Jitendra Malik		
M.S. in Computer Science	Jun 2000	Stanford University, Stanford, CA
B. S. in Computer Science	Jun 1997	Zhejiang University, Hangzhou, China

## POSITIONS

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2008 – present	Research Scientist Intel Labs Seattle
2010 – present	Affiliate Assistant Professor Department of Computer Science and Engineering University of Washington
2006 – 2008	Research Assistant Professor Toyota Technological Institute at Chicago
2000 – 2006	Graduate Student Researcher Computer Vision Group, University of California, Berkeley

## SELECTED PROJECTS

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- **Real-time interactive 3D mapping using RGB-D cameras:** to allow a non-technical user to hold a Kinect-style RGB-D camera (color+depth) in hand to scan indoor environments (collaboration with U Washington). Developed algorithms and software to register RGB-D frames and visualize partial maps at real-time. Allowed users to easily track the mapping progress and recover from failures <http://ils.intel-research.net/rgbd-mapping-modeling>
- **Robust recognition of everyday objects using RGB-D cameras:** to enable robust object recognition in real-world conditions and everyday life scenarios (collaboration with U Washington). Collected a large dataset (300 objects, 250K views) with RGB-D cameras. Evaluated a range of state of the art recognition algorithms. Developed new visual features (kernel descriptors) and new learning algorithms (sparse exemplar distance learning). Demo at CES (underlying Intel OASIS). <http://ils.intel-research.net/everyday-object-recognition>
- **Recognition of hand-held objects from egocentric cameras:** to recognize objects that a user manipulates in his/her hands, using wearable/egocentric cameras (collaboration with UC Berkeley and Georgia Tech). Collected two large datasets, one object-centric, one activity-centric. Developed

a motion-segmentation algorithm that reliably extracts foreground objects from egocentric videos. Showed a huge boost in object recognition (reaching 90% accuracy) by using segmentation.

<http://seattle.intel-research.net/~xren/egovision09/>

- **Detecting and tracking people in videos** (mobile cameras and movies): to jointly solve detection, tracking and segmentation of people with moving cameras. Developed algorithms that reliably tracks people in sports videos under complex body motions and large camera movements. Showed robust detection and tracking of people in black-white movies.  
[http://seattle.intel-research.net/~xren/research/cvpr2007\\_tracking/](http://seattle.intel-research.net/~xren/research/cvpr2007_tracking/)  
[http://seattle.intel-research.net/~xren/research/cvpr2008\\_casablanca/](http://seattle.intel-research.net/~xren/research/cvpr2008_casablanca/)
- **Figure-ground assignment of boundaries and extraction of objects**: to study and solve figure-ground organization in real-world images. Developed a series of figure-ground models that, for the first time, works on natural images. Combined a rich set of visual cues to extract objects of interest.  
<http://seattle.intel-research.net/~xren/research/nips2005/>  
<http://seattle.intel-research.net/~xren/research/eccv2006/>
- **Superpixels: efficiently image representation using coherent regions**: invented the concept of superpixels that is now prevalent in computer vision research and applications. Showed that superpixels lead to a dramatic reduction in representational and computational complexities while retaining most structures in natural images. Used superpixels for people detection.  
<http://seattle.intel-research.net/~xren/research/superpixel/>  
<http://seattle.intel-research.net/~xren/research/cvpr2004/>

## **PUBLICATIONS**

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### **Refereed Publications**

- Liefeng Bo, Kevin Lai, Xiaofeng **Ren** and Dieter Fox. “Object Recognition with Hierarchical Kernel Descriptor”, in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Colorado Springs, 2011.
- Alireza Fathi, Xiaofeng **Ren** and James Rehg. “Learning to Recognize Objects in Egocentric Activities”, in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Colorado Springs, 2011.
- Michael Krainin, Peter Henry, Xiaofeng **Ren**, Dieter Fox. “Manipulator and Object Tracking for In Hand Model Acquisition”, in *International Journal of Robotics Research (IJRR)*, 2011.
- Kevin Lai, Liefeng Bo, Xiaofeng **Ren**, Dieter Fox. “A Large-Scale Hierarchical Multi-View RGB-D Object Dataset”, in *International Conference on Robotics and Automation (ICRA)*, Shanghai, 2011.
- Kevin Lai, Liefeng Bo, Xiaofeng **Ren**, Dieter Fox. “Sparse Distance Learning for Object Recognition Combining RGB and Depth Information”, in *International Conference on Robotics and Automation (ICRA)*, Shanghai, 2011.
- Evan Herbst, Xiaofeng **Ren**, Dieter Fox, “Toward Object Discovery and Modeling via 3-D Scene Comparison”, in *International Conference on Robotics and Automation (ICRA)*, Shanghai, 2011.
- Eric Larson, Gabe Cohn, Sidhant Gupta, Xiaofeng **Ren**, Beverly Harrison, Dieter Fox, Shwetak N. Patel. “HeatWave: Thermal Imaging for Surface User Interaction”, in *ACM Conference on Human Factors in Computing Systems (CHI)*, Vancouver, 2011.
- Liefeng Bo, Xiaofeng **Ren** and Dieter Fox. “Kernel Descriptors for Visual Recognition”, in *Advances in Neural Information Processing Systems (NIPS)*, Vancouver, 2010.

- Peter Henry, Michael Krainin, Evan Herbst, Xiaofeng **Ren** and Dieter Fox. “RGB-D Mapping: Using Depth Cameras for Dense 3D Modeling of Indoor Environments”, in *International Symposium on Experimental Robotics (ISER)*, New Delhi, 2010.
- Chunhui Gu and Xiaofeng **Ren**. “Discriminative Mixture-of-Templates for Viewpoint Classification”, in *European Conference on Computer Vision (ECCV)*, Crete, 2010.
- Xiaofeng **Ren** and Chunhui Gu. “Figure-Ground Segmentation Improves Handled Object Recognition in Egocentric Video”, in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, San Francisco, 2010.
- Xiaofeng **Ren**. “Multi-scale improves boundary detection in natural images”, in *European Conference on Computer Vision (ECCV)*, Marseille, 2008.
- Xiaofeng **Ren**, “Finding People in Archive Films through Tracking”, in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Anchorage, 2008.
- Xiaofeng **Ren**, “Local Grouping for Optical Flow”, in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Anchorage, 2008.
- Xiaofeng **Ren**, Charless Fowlkes and Jitendra Malik, “Learning Probabilistic Models for Contour Completion in Natural Images”, *International Journal on Computer Vision (IJCV)*, 2008.
- Xiaofeng **Ren** and Jitendra Malik, “Tracking as Repeated Figure/Ground Segmentation”, in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Minneapolis, 2007.
- Xiaofeng **Ren**, “Learning and Matching Line Aspects for Articulated Objects”, in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Minneapolis, 2007.
- Xiaofeng **Ren**, Charless Fowlkes and Jitendra Malik. “Figure/Ground Assignment in Natural Images”, in *European Conference on Computer Vision (ECCV)*, Graz, 2006.
- Xiaofeng **Ren**, Charless Fowlkes and Jitendra Malik. “Cue Integration in Figure/Ground Labeling”, in *Advances in Neural Information Processing Systems (NIPS)*, Vancouver, 2005.
- Xiaofeng **Ren**, Alexander Berg and Jitendra Malik. “Recovering Human Body Configurations using Pairwise Constraints between Parts”, in *IEEE International Conference on Computer Vision (ICCV)*, Beijing, 2005.
- Xiaofeng **Ren**, Charless Fowlkes and Jitendra Malik. “Scale-Invariant Contour Completion using Conditional Random Fields”, in *IEEE International Conference on Computer Vision (ICCV)*, Beijing, 2005.
- Gregory Mori, Xiaofeng **Ren**, Alexei A. Efros and Jitendra Malik. “Recovering Human Body Configurations: Combining Segmentation and Recognition”, in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Washington, DC, 2004.
- Xiaofeng **Ren** and Jitendra Malik. “Learning a Classification Model for Segmentation”, in *IEEE International Conference on Computer Vision (ICCV)*, Nice, 2003.
- Xiaofeng **Ren** and Jitendra Malik. “A Multi-Scale Model for Contour Completion based on Image Statistics”, in *European Conference on Computer Vision (ECCV)*, Copenhagen, 2002.

#### **Other Publications**

- Kevin Lai, Liefeng Bo, Xiaofeng **Ren** and Dieter Fox. “Sparse Distance Learning for Object Recognition Combining RGB and Depth Information”, in *Workshop on RGB-D: Advanced Reasoning with Depth Cameras*, in conjunction with RSS 2010.
- Peter Henry, Michael Krainin, Evan Herbst, Xiaofeng **Ren** and Dieter Fox. “RGB-D Mapping: Using Depth Cameras for Dense 3D Modeling of Indoor Environments”, in *Workshop on RGB-D: Advanced Reasoning with Depth Cameras*, in conjunction with RSS 2010.

- Michael Krainin, Peter Henry, Xiaofeng **Ren** and Dieter Fox. “Manipulator and Object Tracking for In Hand Model Acquisition”, in *Mobile Manipulation and Best Practices in Robotics Workshops*, in conjunction with ICRA 2010.
- Xiaofeng **Ren** and Matthai Philipose. “Egocentric Recognition of Handled Objects: Benchmark and Analysis”, in *CVPR Workshop on Egocentric Vision*, Miami, 2009.
- Xiaofeng **Ren**. “Multi-Scale Boundary Detection in Natural Images”, Tech Report TR-2008-05, Department of Computer Science, University of Chicago, 2008.
- Xiaofeng **Ren**, Charless Fowlkes and Jitendra Malik. “Familiar Configuration Enables Figure-Ground Assignment in Natural Images”, in *Vision Science Society Meeting (VSS)*, Sarasota, 2005.
- Xiaofeng **Ren**, Charless Fowlkes and Jitendra Malik. “Mid-level Cues Improve Boundary Detection”, Tech Report CSD-05-1382, Computer Science Division, UC Berkeley, 2005.
- Xiaofeng **Ren** and Jitendra Malik. “The Ecological Statistics of Good Continuation: Multi-scale Markov Models for Contours”, in *Vision Science Society Annual Meeting (VSS)*, Sarasota, 2002.

## **PROFESSIONAL ACTIVITIES**

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### **Conference Program Committees:**

IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2005-2011  
 IEEE International Conference on Computer Vision (ICCV) 2007-2011  
 European Conference on Computer Vision (ECCV) 2006-2010  
 IEEE International Conference on Pattern Recognition (ICPR) 2008  
 International Joint Conference on Artificial Intelligence (IJCAI) 2009  
 Asian Conference on Computer Vision (ACCV) 2009

### **Workshop Organizer / Chair:**

First Workshop on Egocentric Vision (Egovision 09), in conjunction with CVPR 2009  
 Workshop on RGB-D: Advanced Reasoning with Depth Cameras, in conjunction with RSS 2010  
 2<sup>nd</sup> Workshop on RGB-D: Advanced Reasoning with Depth Cameras, in conjunction with RSS 2011

### **Journal Reviewer:**

International Journal on Computer Vision (IJCV), IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), Computer Vision and Image Understanding (CVIU), Pattern Analysis and Applications (PAA), Image and Visual Computing (IVC)

### **Panels:**

NSF Review Panel, 2009

## **PRESENTATIONS**

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- RGB-D Perception: Depth Cameras Usages Beyond Gesture and Gaming, Google Research, 2011
- RGB-D Perception: Depth Cameras Usages Beyond Gesture and Gaming, CSE Departmental Colloquium, University of Washington, Seattle, 2010
- RGB-D Perception, WILLOW Seminar, Ecole Normale Supérieure / INRIA, Paris, 2010
- RGB-D Perception, Grail Seminar, University of Washington, Seattle, 2010
- Mid-level Vision: Representation, Probabilistic Modeling and Applications, Grail Seminar, University of Washington, Seattle, 2009
- Image Parsing: a Gestalt Approach, University of Massachusetts, Amherst, 2008

- Image Parsing: a Gestalt Approach, Pennsylvania State University, State College, 2008.
- Mid-level Vision: Representation, Probabilistic Modeling and Applications, MIT, Boston, 2007
- Mid-level Vision: Representation, Probabilistic Modeling and Applications, Univ. of Pennsylvania, Philadelphia, 2007
- Segmentation, Tracking and Recognition: A Visual Trio, VASC Seminar, Carnegie Mellon University, Pittsburgh, 2007
- Segmentation, Tracking and Recognition: A Visual Trio, PAML Seminar, UIUC, Urbana, 2007
- Finding, Tracking, and Segmenting People in Video, Microsoft Research, Redmond, 2007
- Probabilistic Models for Image Parsing, VASC Seminar, Carnegie Mellon University, Pittsburgh, 2006
- Figure/Ground Assignment in Natural Images, European Conference on Computer Vision (ECCV), Graz, 2006
- Probabilistic Models for Parsing Images, Toyota Technological Institute at Chicago, Chicago, 2006
- Probabilistic Models for Parsing Images, Microsoft Research, Redmond, 2006
- Probabilistic Models for Parsing Images, BASiCS Group, UC Berkeley, Berkeley, 2006
- Scale-Invariant Random Fields for Mid-level Vision, State Key Lab. of CAD&CG, Zhejiang University, Hangzhou, 2005
- Learning Scale-Invariant Contour Completion, DAGS Group, Stanford University, Stanford, 2005
- Learning a Scale-Invariant Model for Curvilinear Continuity, MSRI Workshop on Perceptual Organization, Berkeley, 2005
- Learning a Classification Model for Segmentation, International Conference on Computer Vision (ICCV), Nice, 2003

## **TEACHING EXPERIENCES**

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- Co-instructor, CSE 590K Research Seminar, RGB-D Perception: Advanced Reasoning with Depth Cameras, Fall 2010, Computer Science & Engineering, University of Washington
- Organizer, RGB-D Seminars, 2008-present, Intel Labs Seattle
- Guest Speaker, Computer Vision, CSE 455, Spring 2010, University of Washington
- Guest Speaker, Computer Vision, CSE 455, Fall 2009, University of Washington
- Guest Speaker, Introduction to Computer Vision, CMSC 35040, Spring 2007, University of Chicago
- Graduate Student Instructor, CS188 Introduction to Artificial Intelligence, Fall 2000, UC Berkeley
- Teaching Assistant, CS205 Mathematical Methods in Robotics and Vision, Spring 1999, Stanford
- Teaching Assistant, CS249 Objected-Oriented Programming, Winter 1999, Stanford
- Teaching Assistant, Introduction to Mathematical Analysis, Spring 1997, Zhejiang University