Varsha Hedau

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Contact Information
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Overview:

- Strong background in Computer Vision, Image Processing, Deep Learning and Machine Learning

- Experience solving a variety of Computer Vision problems - image matching, retrieval, object detection/recognition, scene understanding, 3D modeling and reconstruction, augmented reality.

- Expertise in algorithms, software development, mathematics, optimization methods.

- Driven to create technology that makes impact. Passion to solve challenging technical problems.

- Experience producing high quality academic and industrial research work.

- Great interpersonal skills, delivered as both an independent contributor and a team player.

- Experience driving projects and delivering solutions in cross functional teams.

Educational Background:

- **University of Illinois at Urbana-Champaign (UIUC)** — Urbana, IL
  Ph.D., Electrical and Computer Engineering (GPA 3.91/4) — *2006-2011*
    - PhD Thesis: 3D Spatial Layout and Geometric Constraints for Scene Understanding.
      Thesis advisor: Prof. David Forsyth and Prof. Derek Hoiem.

- **Indian Institute of Technology, Kanpur (IITK)** — Kanpur, India
  Master of Technology, Department of Electrical Engineering (CPI 9.5/10) — *2004-2006*
    - Masters Thesis: Human Activity Representation, Analysis and Recognition.
      Thesis Advisor: Prof. K. Venkatesh.

- **Government College of Engg** — Pune, India
  Bachelor of Engineering in Electronics and Telecommunication (First class with Distinction) — *2000-2004*

Work Experience:

- **R&D Engineer**, Apple Inc, Sunnyvale, CA. (Jun 2015-Present).
  Research and development in areas of Computer Vision, Machine Learning and Deep Learning for future Apple products. Duties include proposing, implementing and delivering solutions for the products in above areas; end-to-end integration of developed solutions; collaboration and delivery in cross functional teams.

- **Research Scientist**, eBay Research Lab, San Jose, CA. (Oct 2014-Apr 2015).
  Conducting research on Computer Vision and machine learning targeted towards end user applications in e-commerce. Duties include writing research papers and prototyping for eBay's applications.

- **Scientist**, Microsoft Corp., Sunnyvale, CA. (Sep 2012-Oct 2014).
  Research and algorithm development for augmented maps and experiences. Duties include proposing and conducting research on novel concepts for the above application, involving Computer Vision and Machine learning.

- **Senior Researcher**, Nokia Research Center, Palo Alto, CA. (Sep 2011-Sep 2012).
  Research and algorithm development towards creating content for next generation mapping and navigation services. Duties include rapid prototyping in MATLAB and delivering product quality code in C++.

- **Research Assistant**, Thomas M. Siebel Center for Computer Science, Urbana, IL. (Prof. Derek Hoiem and Prof. David Forsyth, Sep 2010-Sep 2011).

- **Summer Intern**, Microsoft Research, Redmond, WA. (June 2010-Aug 2010).

- **Teaching Assistant and Research Assistant**, Computer Vision Course, Thomas M. Siebel Center for Computer Science, Urbana, IL. (Prof. Derek Hoiem and Prof. David Forsyth, 2010).

- **Research Assistant**, Thomas M. Siebel Center for Computer Science, Urbana, IL. (Prof. David Forsyth, 2008-2009).

- **Summer Intern**, Object Video, Inc. Reston, VA. (May 2008-Aug 2008).

- **Research Assistant**, Computer Vision and Robotics Lab, Beckman Institute for Advanced Science and Technology, Urbana, IL. (Prof. Narendra Ahuja, 2006-2008).

- **Teaching Assistant**, Computer Vision Course in Electrical Engineering Dept., IITK. (2005).

- **Teaching Assistant**, Basic Electronics Lab, Electrical Engineering Dept., IITK. (2004).

Publications:

1. Jingchen Liu, Thommen Korah, Varsha Hedau, Vasu Parameswaran, Radek Grzeszczuk, Yanxi Liu " *Entrance Detection from Street-View Images*", Scene Understanding Workshop SUNw 2014.

2. Timo Pylvanainen, Jerome Berclaz, Thommen Korah, Varsha Hedau, Mridul Aanjaneya and Radek Grzeszczuk *"3D City Modeling from Street-Level Data for Augmented Reality Applications"*, 3DIMPVT 2012.

3. Varsha Hedau, Sudipta Sinha, Larry Zitnick and Richard Szeliski *"A memory efficient discriminitive approach for location aided recognition"*, ECCV 2012 Workshop on Visual Analysis and Geo-localization of Large Scale Imagery.

4. Varsha Hedau, Derek Hoiem and David Forsyth *"Recovering Free Space of Indoor Scenes from a Single Image"*, in Proc. of IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2012).

5. Kevin Karsch, Varsha Hedau, David Forsyth and Derek Hoiem *"Rendering Synthetic Objects into Legacy Photographs"*, ACM Transactions on Graphics (Proceedings of SIGGRAPH Asia 2011).

6. Varsha Hedau, Derek Hoiem and David Forsyth *"Thinking Inside the Box: Using Appearance Models and Context Based on Room Geometry"*, in Proc. of the Eleventh European Conference on Computer Vision (ECCV 2010).

7. Varsha Hedau, Derek Hoiem and David Forsyth, *"Recovering the Spatial Layout of Cluttered Rooms"*, in Proc. of the Twelfth IEEE International Conference on Computer Vision (ICCV 2009).

8. Varsha Hedau, Himanshu Arora and Narendra Ahuja, *"Matching images under unstable segmentations"*, in Proc. of IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2008) [Oral presentation].

9. Varsha H Chandrashekhar and K. S. Venkatesh, *"Action energy images for reliable human action recognition "*, in Asian Symposium of Information Display (ASID 2006).

Patents:

1. Kevin Karsch, Varsha Hedau, David Forsyth, Derek Hoiem *"Inserting Objects into Content"*, US Patent Application 13/314,723.

2. Varsha Hedau, Sudipta Sinha, Charles Lawrence Zitnick and Richard Szeliski *"Location-Aided Recognition"*, US Patent Application 13/162,591.

3. Jingchen Liu, Thommen Korah, Varsha Hedau, Vasu Parameswaran, Radek Grzeszczuk, Yanxi Liu *"Entrance Detection from Street-Level Imagery"*, MS341502.01.

Research Projects:

- **Content Creation for Location Services.** 3D Reconstruction of Buildings from steetside LIDAR and image data. Detecting and recognizing road signs in street view images.

- **Physically Grounded Scene Interpretation.** Object detection consistent with scene geometry and other objects in the scene. Learning and inference of physical relations between objects, modeling support, occlusion, and other interactions towards a coherent interpretation of scene in terms of its objects, spatial layout and usable free space.

- **Location Recognition (Summer Intern, Microsoft Research.).** A method for recognizing location from an image captured by a mobile user, using a set of compact discriminitive classi?ers learned from a database of geo-tagged streetside images.

- **Physically grounded photo editing.** Transformation of a picture into a stage where user can insert and remove new objects or move them around with minimal interaction. Such a transformation requires scenes spatial layout, estimation of lighting in the scene and certain markups such as occluding contours of objects for specifying free space.

- **Spatial Layout of indoor scenes.** Estimation of *structural layout* of an *indoor scene* from a *single image*, in terms of extent of walls, floor, ceiling and objects therein; and employing image specific information towards removal of objects and inpainting for *empty room reconstruction.*

- **Water craft classification and identification (Summer Intern, Ojbectvideo Inc.).** A part based approach for *classification* of different types of watercrafts under view, illumination and pose variations. Robust image matching for ship *identification* and *retreival* of ship images.

- **Image Matching.** A novel framework to match region based representations of images encoded as *Region adjacency graphs*, to specifically handle segmentation ir-repeatabilities (region mergers/splits), using a *partial region registration* based match score.

- **Collocations of visual words for object category recognition.** A novel approach of describing object categories in terms of their *frequent and discriminitive* feature configurations, using data-mining techniques.

- **Tracking of weakly electric fish.** An interdisciplinary project in coordination with Electrosensory Signal Processing Lab UIUC, towards studying the processes in the biological electrosensory system of weakly electric fish.

- **Surface Reconstruction using Stereo Images.** A novel region based approach for stereo matching and 3D surface reconstruction using a tree matching algorithm.

- **Multicarrier DS CDMA.** A system with Frequency Spread coding using Fast Maximum Likelihood Decoding.

- **Automatic Fingerprint Verification System (FVS).** Fingerprint denoising and minutiae based fingerprint matching towards the development of a complete FVS along with user interface.

- **Speech Synthesis and Analysis** using linear predictive coder for speech.

- **Processing of Antenna Signals under GMRT (Giant Meter Wave Telescope/ National Centre for Radio and Astrophysics Pune) Pulsar console.** Implementation of various signal processing algorithms on the pulsar signals towards development of a novel automatic Radio Frequency Interference detection method.

- **GUI for Antenna Calibration (Summer project in GMRT).** An Antenna calibration GUI to facilitate the astronomers from GMRT with their observations.

- **Morse Code processor** using 8085 microprocessor.

- **Project of Social Educational Activity** on the topic of Television organized by PES/IAS chapter IEEE, undertaken in a team of 4 members.

Achievements:

- SSC (Secondary School Certificate examination) rank holder in Merit list.

- Secured 12th position in Merit List in Regional Mathematics Olympiad.

- Secured an All India Rank of 165 in GATE examination (99.55 percentile).

- Achieved 7th rank in University Merit List in 2nd Year Engg. Exams.

- Achieved 4th rank in University Merit List in 3rd Year Engg. Exams.

- Rank holder in University Merit List in 4th Year Engg. Exams.

Relevant Courses:

- **Under grad**: Digital Signal Processing, Image Processing, Communication Engg, Communication Systems, Communication Networks.

- **Grad IITK**: Introduction to signal Analysis, Biomedical Signal and Image processing, Representation and Analysis of Random Signals, Computer Vision and Document processing, Mathematical Structures of Signals and Systems, Statistical Signal processing, Wireless Communications, Neural Networks and Systems.

- **Grad UIUC**: Computer Vision, Pattern Recognition, Random Processes, Detection and Estimation Theory, Introduction to Optimization, Signals and AI, Real Variables, Optimization in Computer Vision.

Skills:

- **Operating Systems:** DOS, Windows, Linux, Mac.

- **Programming Languages:** C/C++, C#.

- **Scientific Applications:** Matlab/Simulink, Intel's OpenCV library.

- **Scripting Languages:** TCL Tool command language TK tool kit for GUI.

- **Special Skills:** DSP Workstations (ADSP 21XX), Neural Networks.

Affiliations and Extracurricular Activities:

- Student member of the IEEE.

- HAM (Hobby Amateur Radio) Enthusiast.

- Trained in Indian Classical Dance (Kathak). Passed 5 exams in Kathak including performance at many Regional, National level dance shows.

Languages:

- English, Hindi, and Marathi.

Nationality:

- Indian.

References

- Available upon request.