Krishna Kumar Singh
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EDUCATION

- **University of California, Davis** (Fall, 2015 - Current)
    - PhD in Computer Science Advisor: **Prof. Yong Jae Lee**
- **Robotics Institute, Carnegie Mellon University, USA** (August 2013 – December 2014)
    - Masters in Robotics QPA: **4.05** Advisors: **Prof. Alexei Efros, Prof. Kayvon Fatahalian**
- **International Institute of Information Technology (IIIT), Hyderabad, India** (August 2009 – May 2013)
    - B.Tech (Honours) in Computer Science and Engineering GPA: **9.07/10** Advisor: **Prof. P. J. Narayanan**

INTERESTS

- **Computer Vision and Machine Leraning** *esp.* to develop large scale data driven methods for visual recognition systems with minimal human supervision.

PUBLICATIONS

- **MixNMatch: Multifactor Disentanglement and Encoding for Conditional Image Generation:** Yuheng Li, **Krishna Kumar Singh**, Utkarsh Ojha, Yong Jae Lee. Arxiv. [Project Page].
- **Elastic-InfoGAN: Unsupervised Disentangled Representation Learning in Imbalanced Data:** Utkarsh Ojha, **Krishna Kumar Singh**, Cho-Jui Hsieh, Yong Jae Lee. Arxiv. [Paper].
- **FineGAN: Unsupervised Hierarchical Disentanglement for Fine-Grained Object Generation and Discovery: Krishna Kumar Singh***, Utkarsh Ojha*, Yong Jae Lee. *in* IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2019 (Oral). [Project Page].
- **You reap what you sow: Generating High Precision Object Proposals for Weakly-supervised Object Detection: Krishna Kumar Singh**, Yong Jae Lee. *in* IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2019.
- **Hide-and-Seek: A Data Augmentation Technique for Weakly-Supervised Localization and Beyond: Krishna Kumar Singh,** Hao Yu, Aron Sarmasi, Gautam Pradeep, Yong Jae Lee. Arxiv. [Paper].
- **DOCK: Detecting Objects by transferring Common-sense Knowledge: Krishna Kumar Singh**, Santosh Divvala, Ali Farhadi, Yong Jae Lee. *Appeared in* European Conference on Computer Vision (ECCV), 2018. [Project Page]
- **Who Will Share My Image? Predicting the Content Diffusion Path in Online Social Networks:** Wenjian Hu, **Krishna Kumar Singh***, Fanyi Xiao*, Jinyoung Han, Chen-Nee Chuah, Yong Jae Lee. *Appeared in* ACM International Conference on Web Search and Data Mining (WSDM), 2018. [Paper] (* equal contribution)
- **Hide-and-Seek: Forcing a Network to be Meticulous for Weakly-supervised Object and Action Localization: Krishna Kumar Singh,** Yong Jae Lee. *Appeared in* International Conference on Computer Vision (ICCV), 2017. [Project Page]
- **Identifying First-Person Camera Wearers in Third-Person Videos:** Chenyou Fan, Jangwon Lee, Mingze Xu, **Krishna Kumar Singh**, Yong Jae Lee, David J. Crandall, Michael S. Ryoo. *Appeared in* IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2017. [Paper]
- **End-to-End Localization and Ranking for Relative Attributes: Krishna Kumar Singh,** Yong Jae Lee. *Presented in* European Conference on Computer Vision (ECCV), 2016. [Project Page]
- **Track and Transfer: Watching Videos to Simulate Strong Human Supervision for Weakly-Supervised Object Detection: Krishna Kumar Singh,** Fanyi Xiao, Yong Jae Lee. *Presented in* IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2016. [Project Page]
- **KrishnaCam: Using a Longitudinal, Single-Person, Egocentric Dataset for Scene Understanding Tasks: Krishna Kumar Singh,** Kayvon Fatahalian, Alexei A. Efros. *Presented in* Winter Conference on Applications of Computer Vision (WACV), 2016. [Project Page]
- **Storytelling Patches: Predicting Tourist Spots in a City:** Aayush Bansal, **Krishna Kumar Singh**. *Presented in* ECCV 2014, Workshop on Storytelling with Images and Videos (VisStory). [Paper]
- **Geometry Directed Browser for Personal Photographs:** Aditya Deshpande, Siddharth Choudhary, P J Narayanan, **Krishna Kumar Singh**, Kaustav Kundu , Aditya Singh and Apurva Kumar. *Appeared in* Eighth Indian Conference On Vision, Graphics And Image Processing (ICVGIP), 2012 (Oral). [Paper]

- **Hybrid Multi-Core Algorithms for Regular Image Filtering Applications:** Shrenik Lad, **Krishna Kumar Singh**, Kishore Kothapalli and P.J. Narayanan. *Appeared in* [International Conference on High Performance Computing (HiPC) Student Research Symposium, 2012](#). [[Paper](#)]

WORK AND TEACHING EXPERIENCE

- Research intern, Facebook AI (Summer, 2019). Advisors: **Dr. Deepti Ghadiyaram, Dr. Dhruv Mahajan, Dr. Matt Feiszli,** and **Prof. Kristen Grauman**. Worked on removing the context bias while doing object and attribute classification.
- Research intern, Allen Institute for Artificial Intelligence (AI2) (Summer, 2017) Advisors: **Dr. Santosh Divvala**, **Prof. Ali Farhadi**. Worked on improving object detection by transferring common-sense knowledge.
- Computer Vision intern at Intel Labs (Summer, 2015): Worked on video summarization and retrieval.
- Graduate Research Assistant at UC, Davis (Fall 2015 – Current) Advisor: **Prof. Yong Jae Lee**.
- Graduate Research Assistant at RI, CMU (Spring 2014 - 2015) Advisors: **Prof. Alexei Efros, Prof. Kayvon Fatahalian**.
- Research Scholar at RI, CMU (Summer, 2012) Advisor: **Prof. Martial Hebert**.
- Research Assistant at IIIT-Hyderabad (Summer 2011) and developed DLD virtual lab. Advisor: **Prof. P. J. Narayanan**.
- Teaching Assistant at IIIT-Hyderabad for Information Retrieval and Extraction, Data Structures and Cloud Computing.

PATENTS

- **Video Summarization Using Semantic Information** (with Intel Labs).
- **Visual Search and Retrieval Using Semantic Information** (with Intel Labs).

RESEARCH PROJECTS

- **Removing context bias from visual recognition:** Existing recognition models get biased toward the co-occurrence pattern between object/attribute and its context. We propose to decorrelate feature of an object from its co-occurring context which helps model to recognize an object without co-occurring context while maintaining overall performance. (Advisors: **Dr. Deepti Ghadiyaram, Dr. Dhruv Mahajan, Dr. Matt Feiszli, Prof. Kristen Grauman, Prof. Yong Jae Lee**)
- **MixNMatch: Multifactor Disentanglement and Encoding for Conditional Image Generation:** MixNMatch to generate a new image by combining background, shape, texture, and pose from different real images. (Advisor: **Prof. Yong Jae Lee**)
- **Unsupervised Disentangled Representation Learning in Imbalanced Data:** Use identity preserving image transformation constraints to learn disentangled representation in imbalanced data. (Advisors: **Prof. Yong Jae Lee**, **Prof. Cho-Jui Hsieh**)
- **FineGAN: Unsupervised Hierarchical Disentanglement for Fine-Grained Object Generation and Discovery:** We propose FineGAN, a novel unsupervised GAN framework, which disentangles the background, object shape, and object appearance to hierarchically generate images of fine-grained object categories. To disentangle the factors without any supervision, our key idea is to use information theory to associate each factor to a latent code, and to condition the relationships between the codes in a specific way to induce the desired hierarchy. FineGAN achieves the disentanglement for fine-grained classes of birds, dogs, and cars. Using FineGAN's learned features, we also cluster real images as a first attempt at solving the novel problem of unsupervised fine-grained object category discovery. (Advisor: **Prof. Yong Jae Lee**)
- **Hide-and-Seek: A Data Augmentation Technique for Weakly-Supervised Localization and Beyond:** A general purpose data augmentation technique in which training image patches are hidden randomly, in order to force the network to seek other relevant content when the most discriminative content is hidden. This improves object localization accuracy in the weakly-supervised setting. This idea generalizes to videos, as well as other recognition tasks like image classification, semantic segmentation, emotion recognition, age/gender estimation, and person re-identification. (Advisor: **Prof. Yong Jae Lee**)
- **Weakly-supervised Object Detection (WSOD) in Images by Using Video Based High Precision Object Proposals:** Train a weakly-supervised Region Proposal Network on the discovered video object regions to generate object proposals in weakly-labeled images. Significantly improves performance of state-of-the-art WSOD approaches. (Advisor: **Prof. Yong Jae Lee**)
- **Transferring Common-Sense Knowledge for Object Detection:** We transfer the common-sense knowledge from source categories to target categories for scalable object detection. Our key idea is to use similarity, attribute, and spatial common-sense to guide the detection algorithm. (Advisors**: Dr. Santosh Divvala, Prof. Ali Farhadi**, **Prof. Yong Jae Lee**)
- **Predicting the Content Diffusion Path in Online Social Networks:** Propose diffusion LSTM, a deep recurrent network that recursively predicts the entire diffusion path of an image through a social network. (Advisor: **Prof. Yong Jae Lee**)
- **Identifying First-Person Camera Wearers in Third-Person Videos:** Use a semi-siamese convolutional neural network architecture to establish person-level correspondences across first and third person videos by learning joint embedding space based on both spatial and motion cues. (Advisors: **Prof. Yong Jae Lee**, **Prof. David J. Crandall**, **Prof. Michael S. Ryoo**)

- **End-to-End Localization and Ranking for Relative Attributes:** Propose an end-to-end deep network to simultaneously rank and localize relative visual attributes. Unlike previous methods, our network jointly learns the attribute's features, localization, and ranker. Obtain state-of-the-art ranking results on relative attribute datasets. (Advisor: **Prof. Yong Jae Lee**)
- **Track and Transfer: Watching Videos to Simulate Strong Human Supervision for Weakly-Supervised Object Detection:** We transfer tracked object boxes from weakly-labeled videos to weakly-labeled images to automatically generate pseudo ground-truth boxes, which replace manually annotated bounding boxes. We obtain state-of-the-art weakly-supervised detection results on the PASCAL 2007 and 2010 datasets. (Advisor: **Prof. Yong Jae Lee**)
- **Data-Driven Prediction of Egocentric Camera Movement (Master's Thesis):** We record, and analyze, and present to the community, KrishnaCam, a large (7.6 million frames, 70 hours) egocentric video stream along with sensor data spanning nine months of my life. We explore and exploit the inherent redundancies to answer scene understanding questions such as: How much novel visual information does the student see each day? Given a single egocentric photograph of a scene, can we predict where the student might walk next? (Advisors: **Prof. Alexei Efros, Prof. Kayvon Fatahalian)**
- **Predicting Tourist Spots in a City:** Find tourist spot in the city by using Google street view images by assuming tourist spots have discriminative visual elements which are not present in rest of the city. We use mid-level patches based discriminative clustering approach to find these visual elements. We find tourist spots for Paris and Pittsburgh.
- **Object Recognition in Different Illumination Conditions:** Built a model which captures variations in colors due to different illumination conditions while doing object recognition by using distance from color convex hull as new distance measure for color based template matching. (Advisor: **Prof. Martial Hebert**) [Link to Poster]
- **Geometry Directed Browser for Personal Photographs:** Geometry directed photo browser that to browse personal pictures. Images are localized to the monument space using state-of-the-art fast localization method. (Advisor: **Prof. P. J. Narayanan**)

RELEVANT COURSEWORK

- **Graduate Coursework:** Computer Vision, Machine Learning, The Visual World as seen by the Neurons and Machines, Big Data Approaches in Computer Vision, Visual Recognition, Visual Computing Systems, Math Fundamentals for Robotics.
- **Undergraduate Coursework:** Computer Vision, Digital Image Processing, Machine Learning, Statistical Methods in Artificial Intelligence, Artificial Intelligence, Computer Graphics, Information Extraction and Retrieval.

TECHNICAL SKILLS

Programming/Scripting Languages	Python, C, C++, Java (basic), Lua
Vision/Deep Learning/Graphics	PyTorch , Caffe, Torch, OpenGL, Matlab, OpenCV(basic)
Miscellaneous	FFmpeg, Eclipse, Vim, Git, Hadoop, EC2, CudaC (basic), OpenMP, Web2py, HTML

ACADEMIC ACHIEVEMENTS AND AWARDS

- **Selected for ICCV 2019 Doctoral Consortium.**
- **UC Davis Best Graduate Researcher in Computer Science Award (Honorable Mention),** 2019
- **UC Davis Graduate Student Travel Award**, 2017.
- **Microsoft Azure Research Award**, 2017 and **AWS Research Grant**, Amazon Web Services, Inc., 2016.
- **Dean's List of Academic Excellence** for all the undergraduate academic years.
- **IIIT-H Research Award**, 2012 – in recognition of research contribution by an undergraduate.
- **Best Poster Award** (Using GPU technologies) from **Nvidia** in Student Research Symposium, **HiPC**, 2012.
- **All India Rank 1902 (99.8 percentile)** in All India Engineering Entrance Examination (AIEEE) 2009 (**962,119 candidate**s).

SERVICES

- Reviewer, CVPR, ICCV, ECCV, TPAMI, IJCV, AAAI, IJCAI, and ICVGIP.
- Program Committee: 4th Workshop on Egocentric (First-Person) Vision CVPR 2016, International Workshop on Assistive Vision ACCV 2016, International Workshop on Attention/Intention Understanding ACCV 2018.
- Mentored a high school student for the project "Fruit detection in the images using deep network" as part of Aggiementor program at UC Davis. Student won the first prize at the national level (among 12 universities).