

Uday Kusupati

Ph.D. applicant in 3D Vision
Department of Computer Science
The University of Texas at Austin

uday@cs.utexas.edu
<https://cs.utexas.edu/~uday>
Google Scholar

RESEARCH INTERESTS

3D Vision, Geometry Processing & Computer Graphics

PUBLICATIONS

1. Normal Assisted Stereo Depth Estimation

Uday Kusupati, Shuo Cheng, Rui Chen and Hao Su
Computer Vision and Pattern Recognition (CVPR), 2020

2. Learning 3D Human Pose from Structure and Motion

Rishabh Dabral, Anurag Mundadha, Uday Kusupati, Safeer Afaque, Abhishek Sharma and Arjun Jain
European Conference on Computer Vision (ECCV), 2018.

EDUCATION

The University of Texas at Austin

Master's in Computer Science, GPA: **4.0/4.0**

Aug 2018 - May 2020

Indian Institute of Technology Bombay

B.Tech (Honours) in Computer Science and Engineering with Minor in Mathematics, GPA: **9.0/10.0**

Jul 2014 - May 2018

RESEARCH EXPERIENCE

Joint Depth and Normal estimation from multi-view images

Advisor: Prof. Hao Su, *University of California San Diego*

May 2019 - Present

[CVPR '20]

- Exploited easier-to-predict geometric information like normals for improving multi-view depth estimation to tackle challenges due to planar & textureless surfaces.
- Demonstrated effectively that joint multi-view estimation of depth & normal helps improve dense-stereo by implicitly regularizing the cost-volume.
- Proposed a novel consistency loss which can be independently used for any depth-refinement that uses normals.
- Results on MVS, SUN3D, RGBD, Scenes11 and SceneFlow datasets demonstrate state-of-the-art performance.

Topology aware single-view Mesh Reconstruction

Advisor: Prof. Qixing Huang, *UT Austin*

Aug 2018 - Dec 2018, Sep 2019 - Present

- Proposed a topology aware method for 3D reconstruction from single RGB image.
- A reinforcement-learning agent chooses actions such as deforming the existing mesh (using Graph CNNs) to align with the image along with creating holes in the mesh when necessary at the appropriate locations.
- We obtained promising results on a smaller task of 1D to 2D reconstruction of shapes and working on multiple-directions of scaling the idea to 3D as well as polygon-based image segmentation.

Learning 3D Human Pose from Structure and Motion

Advisor: Prof. Arjun Jain, *IIT Bombay*

Jul 2017 - May 2018

[ECCV '18]

- Proposed a semi-supervised learning method using a structure-aware loss function along with a temporal network which uses additional context in pose sequences and works real-time.
- Our structure-aware loss function outperforms the published state-of-the-art in terms of Mean-Per-Joint-Position-Error (MPJPE) by **7%** & **2%** on Human3.6M and MPI-INF-3DHP, respectively.
- We report an additional **7%** improvement on Human3.6M with the use of our temporal model.

Visual Parsing & Reconstruction with Stochastic Grammars & Recursive NNs

Advisor: Prof. Siddhartha Chaudhuri - *Undergraduate Thesis, IIT Bombay*

Jul 2017 - May 2018

- We parse a given scene constituted and labeled incompletely with a learnt probabilistic grammar so that we can decipher the hierarchical structure as well as reconstruct the entire scene.
- Analysed probabilistic graphical models and recursive neural networks to model the conditional relationships to parse and there-after reconstruct the complete hierarchy along with the node features.
- Demonstrated very accurate results on a few synthetic datasets generated from simple context-free grammars.

Text Supervision for 3D Human Pose estimation in noisy images

Advisor: Prof. Qixing Huang, *UT Austin*

Jan 2019 - May 2019

- We intend to exploit text/action based priors for single-view 3D human pose estimation in noisy and dark images.
- We experiment multiple approaches using action as co-input or action-recognition as auxiliary supervision to the pose-estimation network but do not achieve significant improvement.
- The task is hard because of lack of extensive video datasets with action/caption and 3D pose labeling and we intend to explore further approaches that deal with multi-modal semantics.

Affordance-based Furniture Generation

Jan 2017 - Apr 2017

Advisor: Prof. Siddhartha Chaudhuri, IIT Bombay

- Proposed a novel approach to calculate the bio-mechanical joint torques for a particular posture, and use it to do a biased sampling of point clouds to support a human 3D skeleton.
- Solved a constrained optimization problem using gradient descent to generate a height field for a single posture.

Computing Delaunay Complexes using distance-only computations

May 2016 - Jul 2016

Advisor: Dr. Jean-Daniel Boissonnat, DATASHAPE team, Inria Sophia Antipolis

- Worked on improving a probabilistic approach to reduce algebraic complexity of Delaunay Triangulations.
- Contributed to the GUDHI library with a C++ implementation to compute Delaunay complexes, with several optimizations and predicate based pruning that would reduce the computation time.

SELECTED AWARDS AND HONORS

- All India Rank 11 in JEE Advanced (IIT-JEE) 2014 among 150,000 students 2014
- Awarded AP Grade for exceptional performance in Engineering Graphics & Drawing, IIT Bombay 2014
- Prestigious KVPY Fellowship from the Government of India 2013
- Among top 1% (300) students in Indian National Physics, Astronomy and Junior Science Olympiads [’13, ’13, ’10]

TEACHING & RESPONSIBILITIES

- Graduate Teaching Assistant, UT Austin
 - Natural Language Processing, Prof. Greg Durrett Fall 2019
 - Computer Graphics (Honors), Prof. Etienne Vouga Spring 2019
- Undergraduate Teaching Assistant, IIT Bombay
 - Computer Programming and Utilisation, Prof. Krishna S., Prof. Umesh Bellur Spring ’18, Autumn ’17
 - Data Structures and Algorithms, Prof Milind Sohoni Spring 2017
- Graduate Research Assistant, Prof. Kishore Gawande, McCombs School of Business, UT Austin Fall 2018
 - Worked on a predictive model for the export turnover of a firm given the firm financial data
- Department Academic Mentor, CSE, IIT Bombay 2017-18
 - Mentor to 6 sophomores for their academic and general concerns, and helping them cope with the curriculum
- Department Newsletter Founding Panelist, CSE, IIT Bombay 2015-16

SELECTED ACADEMIC PROJECTS

Role of structured information for answering questions on data visualizations Sep 2018 - Dec 2018

Deep Learning Seminar, Advisor: Prof. Philipp Kraehenbuhl, UT Austin [Report]

- We exploit the structural information within bar graphs and use a multi head attention on top of features extracted specific to each type of information like bars, text, etc.
- We show that our approach outperforms the best performing baseline SANDY by a significant margin.

Natural Language to Code using Transformers

Sep 2018 - Dec 2018

Natural Language Processing, Advisor: Prof. Greg Durrett, UT Austin

[Report]

- We analyse the effectiveness of Transformers for the natural language to code translation task and also experiment with techniques like back translation and cycle consistency.
- We achieve a BLEU score of 16.99 beating the previously reported baseline of the CoNaLa challenge.

Robust Cloth Simulation

Jan 2019 - May 2019

Physical Simulation, Advisor: Prof. Etienne Vouga, UT Austin

[Report]

- We implement cloth simulation, handling collisions between the cloth and rigid bodies as well as itself along with friction along the contact surfaces.
- Combined Bridson et al.’s method with a position based dynamics model of cloth.

Shape Segmentation and Retrieval using Global Point Signatures

Jan 2017 - Apr 2017

Digital Geometry Processing, Advisor: Prof. Siddhartha Chaudhuri, IIT Bombay

[Report]

- Implemented the isometry invariant Global Point Signature (GPS) descriptor for shapes using the Laplace-Beltrami eigenfunctions and used k-means clustering in the spectral space for shape segmentation.

RELEVANT COURSEWORK

• UT Austin:

- Physical Simulation, Numerical Optimization for Graphics & AI, Deep Learning Seminar, Natural Language Processing, Reinforcement Learning, Unconventional Computation

• IIT Bombay:

- Computer Vision, Computer Graphics, Digital Geometry Processing, Digital Image Processing of Remotely Sensed Data, Advanced Machine Learning, Artificial Intelligence, Information Retrieval and Web Mining
- Real Analysis, Complex Analysis, Basic Algebra, General Topology