Joseph DeGol

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Education

Aug. 2012–Aug. 2018 **Ph.D. Computer Science: Computer Vision and Robotics**, *University of Illinois at Urbana-Champaign, Urbana, IL*, GPA 3.89, Committee: D. Hoiem (Chair), T. Bretl, M. Golparvar, D. Forsyth, S. Sinha.

June 2007–May 2012 **B.S. Computer Engineering; B.S. Mathematics**, *The Pennsylvania State University, University Park, PA*, GPA 3.92, High Distinction, Computer Engineering Student Marshal, Schreyer Honors Scholar.

Experience

Oct. 2023–Present **Chief Technology Officer**, *Steg AI, Irvine, California.*
I lead the technology team at Steg AI. This involves distilling customer needs into actionable technological updates, defining the technology road map for the company, and managing engineers and scientists to build products for our customers that work as intended.

Aug. 2018–Oct. 2023 **Principal Researcher**, *Microsoft, Redmond, Washington.*
I work on computer vision projects related to HoloLens, Azure Spatial Anchors, Sports Analytics, Robotic Process Automation, and Retail.

Dec. 2015–Aug. 2018 **Lead Computer Vision and Robotics Engineer**, *Reconstruct Inc, Champaign, Illinois.*
Reconstruct melds computer vision technology with civil engineering practices to improve logistics and planning on construction sites. The core idea is to use images and video on the construction site to map progress from week to week and provide a 3D representation of the site to customers in a web interface that they can use on the site.

Aug. 2012–Aug. 2018 **Research Assistant of Dr. Derek Hoiem and co-advised by Dr. Tim Bretl and Dr. Mani Golparvard-Fard**, *University of Illinois Urbana-Champaign.*
I am interested in using geometry alongside images or video for reasoning about objects and camera motion in a scene. This has lead to work in 3D Reconstruction, Visual Odometry and Camera Pose Estimation, and Geometry-Informed Recognition.

Aug. 2017–Dec. 2017 **Teaching Assistant of Computational Photography with Dr. Derek Hoiem** , *University of Illinois Urbana-Champaign.*
Taught workshop on MATLAB for Computer Vision and Computational Photography, held office hours, answered Piazza, and managed assignments.

Summer 2015 **Content Hyperlapse Research at Microsoft**, *Microsoft Research, Redmond, Washington.*
I created content aware Hyperlapse software that varied speed based on interesting and uninteresting content.

Summer 2014 **UAV Research at Microsoft**, *Microsoft Research, Redmond, Washington.*
I built a robot simulator for simulating dynamics, control, and planning for a quadrotor UAV. I also implemented RGBD visual odometry using a Microsoft Kinect camera.

Summer 2013 **Computer Vision Research at MIT Lincoln Lab**, *Massachusetts Institute of Technology Lincoln Laboratory.*
I developed a novel system for motion detection for scenes that are captured by a moving camera on board an aerial vehicle. I published this work at ICASSP 2014.

Summer 2012 **Internship with WIPRO in Bangalore, India**, *Bangalore, Karnataka, India.*
I Developed an iPhone application framework for displaying database search results in a GUI graph structure that was capable of expanding infinitely as new results were requested and displayed.

Aug. 2010–May. 2012 **Computer Vision Research with Dr. Robert Collins**, *The Pennsylvania State University.*
I worked on Multi-target tracking of pedestrians in crowded urban scenes using mean-shift belief propogation. Resulted in Schreyer Honors College Thesis: *Detection and Tracking of Multiple Targets in Crowded Scenes.* website: https://honors.libraries.psu.edu/paper/14160/

Fall 2011 **Teaching Assistant: iPhone Applications Programming under Dr. John Hannan**, *The Pennsylvania State University.*
I Created and administered assignments, held office hours, and occasionally taught lecture sections.

Summer 2011 **Computer Vision and Robotics Research with Dr. Ryan Eustice**, *The University of Michigan Summer Research Opportunities Program (SROP).*
I implemented a planar target tracker to track a model helicopter pad from an autonomous quadrotor's onboard camera for use in 3D pose estimation and autonomous quadrotor control.

Summer 2010 **Machine Learning Research with Dr. Patricio Vela**, *Georgia Tech Summer Undergraduate Research Experience (SURE) Program.*
I designed and implemented a matlab framework to apply machine learning techniques such as mean-shift and kernel principal component analysis to cluster flight patterns in the northern Atlanta airspace.

Summer 2009 **Human-Computer Interaction Research with Dr. Scott McCrickard**, *Virginia Tech Summer Research Experience for Undergraduates (REU) Program.*
I built an online storyboarding tool that leveraged claims (design elements represented by an image, description, and pros and cons) to provide an interface for the design of complex systems. This work resulted in a CHI '11 publication: *Don't drop it! Pick it up and storyboard.*

Patents

2024 **Pixel Correspondence via Patch-based Neighborhood Consensus**
Joseph DeGol, Jae Yong Lee, Sudipta Sinha, US Patent 12154312.

2023 **Camera Localization**
Sudipta Sinha, Ondrej Miksik, Joseph DeGol, Do Tien, US Patent App 17/592500.

2023 **Fiducial Web for Computer Vision**
Joseph DeGol, Brent Ellwein, Yashar Bahman, US Patent 11600015.

2022 **Computation of point clouds and joint display of point clouds and building information models with project schedules for monitoring construction progress, productivity, and risk for delays**
Mani Golparvar-Fard, Derek Hoiem, Jacob Je-Chian Lin, Kook In Han, Joseph DeGol, US Patent 11288412.

Publications

2023 **A Neurosymbolic Approach to Adaptive Feature Extraction in SLAM**
Yasra Chandio, Momin A Khan, Khotso Selialia, Luis Garcia, Joseph DeGol, Fatima M Anwar, 2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).

2023 **Addressing Low-Shot MVS by Detecting and Completing Planar Surfaces**
Rajbir Kataria, Zhizhong Li, Joseph DeGol, Derek Hoiem, 2024 International Conference on 3D Vision (3DV '24).

2023 **Optimizing Fiducial Marker Placement for Improved Visual Localization**
Qiangqiang Huang, Joseph DeGol, Victor Fragoso, Sudipta Sinha, John Leonard, 2023 IEEE Robotics and Automation Letters (RAL '23).

2022 **Learning to Detect Scene Landmarks for Camera Localization**
Tien Do, Ondrej Miksik, Joseph DeGol, Hyun Soo Park, Sudipta Sinha, 2022 Conference on Computer Vision and Pattern Recognition (CVPR '22).

2021 Oral Paper (13%)
PatchMatch-RL: Deep MVS with Pixelwise Depth, Normal, and Visibility
Jae Yong Lee, Joseph DeGol, Chuhang Zou, Derek Hoiem, 2021 International Conference on Computer Vision (ICCV '21).

2021 **PatchMatch-Based Neighborhood Consensus for Semantic Correspondence**
Jae Yong Lee, Joseph DeGol, Victor Fragoso, Sudipta Sinha, 2021 Conference on Computer Vision and Pattern Recognition (CVPR '21).

2020 Oral Paper (13.2%)
Improving Structure from Motion with Reliable Resectioning
Rajbir Kataria, Joseph DeGol, Derek Hoiem, 2020 International Conference on 3D Vision (3DV '20).

2020 **gDLS*: Generalized Pose-and-Scale Estimation Given Scale and Gravity Priors**
Victor Fragoso, Joseph DeGol, Gang Hua, 2020 Conference on Computer Vision and Pattern Recognition (CVPR '20).

2018 Doctoral Thesis
Towards Vision Based Robots For Monitoring Built Environments
Joseph DeGol, University of Illinois, Urbana-Champaign, IL, August 2018.

2018 **Improved Structure from Motion Using Fiducial Marker Matching**
Joseph DeGol, Timothy Bretl, Derek Hoiem, Springer European Conference on Computer Vision (ECCV '18).

2018 **FEATS: Synthetic Feature Tracks for Structure from Motion Evaluation**

Joseph DeGol, Jae Yong Lee, Rajbir Kataria, Daniel Yuan, Timothy Bretl, Derek Hoiem, 2018 International Conference on 3D Vision (3DV '18).

2018 **Geometry and Appearance Based Reasoning of Construction Progress Monitoring**
Kevin Han, Joseph DeGol, Mani Golparvar-Fard, ASCE Journal of Construction Engineering and Management.

2017 **ChromaTag: A Colored Marker and Fast Detection Algorithm**
Joseph DeGol, Tim Bretl, Derek Hoiem, 2017 International Conference on Computer Vision (ICCV '17).

2016 Best Student Paper Award (3rd Place)
Automatic Grasp Selection using a Camera in a Hand Prosthesis
Joseph DeGol, Aadeel Akhtar, Bhargava Manja, Tim Bretl, 2016 International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC '16).

2016 Spotlight Paper (9.7%)
Geometry-Informed Material Recognition
Joseph DeGol, Mani Golparvar-Fard, Derek Hoiem, 2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR '16).

2015 **A Passive Mechanism for Relocating Payloads with a Quadrotor**
Joseph DeGol, David Hanley, Navid Aghasadeghi, Tim Bretl, 2015 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS '15).

2013 **A Clustering Approach for Detecting Moving Objects Captured by a Moving Aerial Vehicle**
Joseph DeGol and Myra Nam, 2014 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP '14).

2012 **Detection and Tracking of Multiple Targets in Crowded Scenes**
Joseph DeGol, The Pennsylvania State University Schreyer Honors College. Electronic Honors Theses: https://honors.libraries.psu.edu/paper/14160/.

2011 **Don't drop it! Pick it up and storyboard**
Shahtab Wahid, Scott McCrickard, Joseph DeGol, Nina Elias, Steve Harrison, 2011 ACM Conference on Human Factors in Computing Systems (CHI '11).

Achievements and Awards

Spring 2016 **$10,000 Cozad New Venture Competition Award**, *I created an elevator pitch, business plan, slide deck, and did a presentation to represent Reconstruct Inc. We won second place worth $10,000.*, http://researchpark.illinois.edu/news/winners-2016-cozad-new-venture-competiton-announced.

Spring 2016 **Turner Innovation Award**, *http://cs.illinois.edu/news/interdisciplinary-team-receives-turner-innovation-award-0.*

Spring 2014 **National Defense Science and Engineering Graduate (NDSEG) Fellowship**.

Spring 2014 **National Science Foundation Graduate Research Fellowship Program - Honorable Mention**.

Spring 2013 **3M Foundation Fellowship Winner**.

Spring 2013 **National Science Foundation Graduate Research Fellowship Program - Honorable Mention**.

May 2012 **Penn State Computer Engineering Student Marshal**, *Highest cumulative GPA of Computer Engineers that graduated in Spring 2012.*

May 2012 **Penn State College of Engineering High Distinction**, *Graduated within top 6% of all College of Engineering graduates for Spring 2012.*

May 2012 **Penn State Eberly College of Science High Distinction**, *Graduated within top 6% of all Eberly College of Science graduates for Spring 2012.*

Fall 2009 – Spring 2012 **Penn State Schreyer Honors Scholar**, *Graduated as a Schreyer Scholar and completed thesis requirement.*

All Semesters **Dean's List**.

Fall 2009 **Lockheed Martin Scholarship Award**.

Spring 2008 **President's Freshman Award**.

Extracurricular Activities and Outreach

Fall 2014 – Spring 2017 **Illinois Scholars Undergraduate Research Program**, *I mentored undergraduate students to complete research related to computer vision and robotics. Students were required to meet weekly and present their results in a final presentation..*

Summer 2016 **Illinois Summer Research Opportunities Program**, *I mentored undergraduate students to complete research related to computer vision and robotics. Students were required to meet weekly and present their results in a final presentation..*

Fall 2012 – Fall 2014 **University of Illinois PURE Program Mentor**, *I mentored undergraduate students to complete research related to computer vision and robotics. Students were required to meet weekly and present their results in a final presentation..*

Fall 2007– Spring 2009 **Penn State Altoona NCAA Men's Soccer**.

Summer 2007, 2008, 2009, 2010 **Penn State Altoona NCAA Men's Soccer Youth Camp Coach**.