Daniel **DeTone**

Deep Learning · Computer Vision · 3D Geometry

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Research Interests

My research interests lie at the intersection of Deep Learning, Computer Vision, 3D Geometry and their applications in Augmented Reality and Robotics. I enjoy studying how deep learning can be applied to computer vision problems including keypoint detection, image matching, relocalization, multi-view reconstruction, visual SLAM, depth estimation, homography estimation, camera calibration and bundle-adjustment.

Experience

Magic Leap — *Sunnyvale, CA*

Lead Research Engineer — *2015 - 2020*

- Invented novel Deep SLAM techniques (see MagicPoint, SuperPoint, SuperGlue)
- Invented robust camera calibration technique (see Deep ChArUco)
- Researched differentiable Bundle Adjustment in PyTorch for supervising neural networks
- Researched LSTMs for pose estimation and gesture recognition
- Researched CNNs for geometric tasks like homography estimation, optical flow, and relative pose estimation
- Built custom real-time SLAM backend from scratch with Ceres-Solver using both Python and c++
- Maintained internal fork of the Caffe library used by a team of 20+ engineers
- Supervised by Dr. Tomasz Malisiewicz and Dr. Andrew Rabinovich

DROP Lab — *Ann Arbor, MI*

Researcher — *Summer 2015*

- Explored the use of 3D spatial CNNs for 3D semantic segmentation
- Wrote custom CUDA kernels in Caffe to enable 3D convolutions on GPU
- Supervised by Prof. Johnson-Roberson

Occipital — *San Francisco, CA*

Computer Vision Intern — *Summer 2014*

- Developed and shipped core components of the Structure SDK 0.1.2 and 0.2 releases
- Build two iPad prototype apps leveraging RGBD Dense SLAM, SceneKit on iOS and OpenGL ES
- Supervised by Jeffery Powers

APRIL Robotics LAB — *Ann Arbor, MI*

Researcher — *Fall 2013 - Winter 2014*

- Led development of four person team for an automated lecture recording system
- Prototyped real-time object tracking systems using particle and Kalman filters in OpenCV + MATLAB
- Reduced system hardware costs from $15,000 to less than $3,000
- Supervised by Prof. Edwin Olson

Computer Vision Lab — *Ann Arbor, MI*

Researcher — *Summer 2013*

- Adapted the indoor PTAM SLAM framework for use in outdoor autonomous driving localization
- Improved localization accuracy from 85% to 98% 1m error in the KITTI dataset
- Supervised by Prof. Silvio Savarese

Education

University of Michigan — *Ann Arbor, MI*

M.S.E. in Electrical Engineering: Systems (Signal Processing and Intelligent Systems) — *2013 - 2015*

B.S.E. in Computer Engineering (Minor in International Studies) — *2008 - 2013*

Skills

Languages Python, C++, JavaScript, MATLAB, LaTeX

Frameworks PyTorch, Tensorflow, Caffe, Ceres-Solver, OpenCV

Publications

P.-E. Sarlin, **D. DeTone**, T. Malisiewicz, and A. Rabinovich. SuperGlue: Learning Feature Matching with Graph Neural Networks. *In CVPR, 2020*.

D. Hu, **D. DeTone**, and T. Malisiewicz.. Deep ChArUco: Dark ChArUco Marker Pose Estimation. *In CVPR, 2019*.

D. DeTone, T. Malisiewicz, and A. Rabinovich. Self-Improving Visual Odometry. *arXiv Technical Report. December, 2018*.

D. DeTone, T. Malisiewicz, and A. Rabinovich. SuperPoint: Self-Supervised Interest Point Detection and Description. *In CVPRW, 2018*.

D. DeTone, T. Malisiewicz, and A. Rabinovich. Toward Geometric Deep SLAM. *arXiv Technical Report. July, 2017*.

D. DeTone, T. Malisiewicz, and A. Rabinovich. Deep Image Homography Estimation. *In RSSW, 2016*.