Tomasz (Tom) Malisiewicz, Ph.D.

Email: tomasz.malisiewicz@gmail.com Cambridge, MA
Web: https://tom.ai

Research Statement

My research lies at the intersection of 3D Computer Vision, SLAM, and Deep Learning. My favorite applications are Augmented Reality (AR) and Robotics, which both require a high degree of spatial awareness. My work has been published at top research conferences (CVPR, ICCV, and ECCV).

Education

Carnegie Mellon University, Pittsburgh PA 2005 - 2011
Ph.D in Robotics
Advisor: Prof. Alexei A. Efros
Committee: Martial Hebert, Takeo Kanade, Pietro Perona
Thesis: Exemplar-based Representations for Object Detection, Association and Beyond

Carnegie Mellon University, Pittsburgh PA 2005 - 2008
M.S. in Robotics (GPA 4.00)

Rensselaer Polytechnic Institute, Troy NY 2001 - 2005
B.S. Computer Science and Physics Dual Major & Math Minor (GPA 4.00)

Skills

Languages: C/C++ (20+ years), Python, Javascript, Matlab, LaTeX
Frameworks: PyTorch, TensorFlow, Caffe, OpenCV, Pybind11, Ceres-Solver
Systems: Strong Unix Skills, Docker, Git
Blogging: Creator of Tombone's Computer Vision Blog. 100+ posts. 5 million+ views since 2005.

Experience

Meta Reality Labs, Redmond, WA 2021 - current
Research Scientist Manager

- At Meta Reality Labs, we work on the next generation of wearable computing.

Amazon Robotics AI, Cambridge, MA 2020 - 2021
Sr. Research Scientist

- The mission of Amazon Robotics AI is to advance the science of autonomous manipulation and autonomous mobility – to enable robots to interact safely, efficiently, and fluently with the clutter and uncertainty of real-world in fulfillment centers at Amazon scale. Directed by Prof. Sidd Srinivasa, the team develops AI algorithms to enable robots to learn continuously from their own experiences.
- We focus on computer vision, machine learning, control, navigation, and planning – some of our projects involve scene understanding, simultaneous localization and mapping, closed-loop control, active learning, reinforcement learning, and multi-agent path finding.

Magic Leap, Inc., Sunnyvale CA 2015 - 2020
Principal Engineer, Deep Learning

- Tech Lead for a Geometric Deep Learning group working on novel deep learning approaches for SLAM, camera localization, 3D mapping, and spatial perception
- Lead and organize a weekly Deep Learning Reading Group to discuss novel research results
- Invented novel Deep SLAM techniques (see SuperPoint, MagicPoint, SuperGlue papers) and supervised Daniel DeTone and Paul-Edouard Sarlin
- Supervised research internship projects and theses from idea formulation to publication
- Pioneered new convolutional neural networks for geometric tasks like homography estimation, optical flow, and relative pose estimation. Research on LSTMs for pose estimation and gesture

recognition. Developed 3D SLAM real-time visualization tools

Vision.ai, Boston MA 2013 - 2015
Co-Founder & CEO
- Pioneered the vision.ai real-time visual learning algorithm, which was the basis of our team's VMX real-time object detector training GUI and API Product
- SaaS business models, cloud-based software delivery, and real-time APIs
- Full-stack engineering and Product Development Strategy

MIT Media Lab, Massachusetts Institute of Technology, Cambridge MA Spring 2014
Computer Vision Consultant
- Research and prototype for a 3D-sensor based gesture recognition product

CSAIL, Massachusetts Institute of Technology, Cambridge MA 2011 - 2013
Postdoctoral Research Associate
- Large-scale recognition and learning using videos
- 3D reconstruction using RGB-D sensors and recognition on mobile devices
- Worked under the supervision of Prof. Antonio Torralba

Robotics Institute, Carnegie Mellon University 2005 - 2011
Graduate Research Assistant
- Developed object recognition and image segmentation algorithms
- Open sourced Exemplar-SVM framework for object detection: Exemplar-SVM on github
- Developed the Visual Memex algorithm for reasoning about object relationships
- Started the popular www.computervisionblog.com blog focusing on: computer vision, deep learning, and artificial intelligence research

Google, Mountain View CA Summer 2009
Software Engineering Intern in Computer Vision Research Group
- Discriminative Group Sparse Coding for Image Classification
- Worked under the supervision of Dr. Dennis Strelow

Google, Mountain View CA Summer 2008
Software Engineering Intern in Computer Vision Research Group
- Large Scale Segmentation and Recognition via MapReduce
- Worked under the supervision of Dr. Thomas Leung

Willow Research Team, The École Normale Supérieure, Paris France Spring 2008
Visiting Student Researcher
- Worked in beautiful Paris, France and interacted with researchers in Jean Ponce's Research Lab including Josef Sivic, Francis Bach, and Andrew Zisserman
- Collaborated with Prof. James Hayes on applying exemplar-learning to GPS-tagged images

Rensselaer Polytechnic Institute Computer Science Department 2004 - 2005
Undergraduate Research Assistant - Range Data Registration
- Development of range data registration algorithms in C++. Co-authored conference paper.
- Worked under the supervision of Prof. Charles Stewart

Rensselaer Polytechnic Institute Computer Science Department Summer 2003
Undergraduate Research Project - Retinal Image Segmentation
- Development of vasculature extraction algorithms in C++
- Cross-Platform Software Engineering using CMake and Medical Imaging/Image Processing using VXL/ITK C++ Libraries/Toolkits
- Worked with Prof. Daniel Freedman and Dr. Michal Sofka

Brookhaven National Laboratory, Upton NY — Summer 2002
Energy Research Undergraduate Laboratory Fellowship

- Modeled Relativistic Muons in Electromagnetic Rings via Object Oriented Techniques
- Studied Numerical Solutions to Partial Differential Equations
- Worked in the Physics Department under Dr. Yannis Semertzidis

Publications (**View on Web**)

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.

G. Yang, T. Malisiewicz, and S. Belongie. "Learning Data-Adaptive Interest Points through Epipolar Adaptation." In CVPR Workshops, 2019.

D. DeTone, T. Malisiewicz, and A. Rabinovich. "SuperPoint: Self-Supervised Interest Point Detection and Description." In CVPR Deep Learning for Visual SLAM Workshop, 2018.

C.Y. Lee, V. Badrinarayanan, T. Malisiewicz, and A. Rabinovich. "RoomNet: End-to-End Room Layout Estimation." In ICCV, 2017.

D. DeTone, T. Malisiewicz, and A. Rabinovich. "Deep Image Homography Estimation." In RSS Workshop on Limits and Potentials of Deep Learning in Robotics, 2016.

C. Vondrick, A. Khosla, H. Pirsiavash, T. Malisiewicz, and A. Torralba. "Visualizing object detection features." In IJCV, September 2016.

C. Tsuchiya, T. Malisiewicz, and A. Torralba. "Exemplar Network: A Generalized Mixture Model." In ICPR, 2014.

C. Vondrick, A. Khosla, T. Malisiewicz, A. Torralba. "HOGgles: Visualizing object detection features." In ICCV, 2013.

A. Khosla, T. Zhou, T. Malisiewicz, A. A. Efros, A. Torralba. "Undoing the Damage of Dataset Bias." In ECCV, October 2012.

T. Malisiewicz, A. Shrivastava, A. Gupta, and A. A. Efros. "Exemplar-SVMs for Visual Object Detection, Label Transfer and Image Retrieval." Extended Abstract, ICML, July 2012.

A. Shrivastava, T. Malisiewicz, A. Gupta, A. A. Efros. "Data-driven Visual Similarity for Cross-domain Image Matching." In SIGGRAPH ASIA, December 2011.

T. Malisiewicz, A.Gupta, A. A. Efros. "Ensemble of Exemplar-SVMs for Object Detection and Beyond." In ICCV, November 2011.

T. Malisiewicz, A. A. Efros. "Beyond Categories: The Visual Memex Model for Reasoning About Object Relationships." In NIPS, December 2009.

T. Malisiewicz, A. A. Efros. "Recognition by Association via Learning Per-exemplar Distances." In CVPR, June 2008.

T. Malisiewicz, A. A. Efros. "Improving Spatial Support for Objects via Multiple Segmentations." In BMVC, September 2007.

B. King, T. Malisiewicz, C. Stewart, R. Radke. "Registration of Multiple Range Scans as a Location Recognition Problem: Hypothesis Generation, Refinement and Verification." In 3DIM, June 2005.

Technical Reports

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

D. DeTone, T. Malisiewicz, and A. Rabinovich. "Toward Geometric DeepSLAM." arXiv Technical Report. July, 2017.

D. Dwibedi, T. Malisiewicz, V. Badrinarayanan, and A. Rabinovich. "Deep Cuboid Detection: Beyond 2D Bounding Boxes." arXiv Technical Report. November, 2016.

M. Gharbi, T. Malisiewicz, S. Paris and F. Durand. "A Gaussian Approximation of Feature Space for Fast Image Similarity." MIT CSAIL Technical Report. October, 2012.

T. Malisiewicz. "Exemplar-based Representations for Object Detection, Association and Beyond." CMU PhD Thesis. August, 2011.

T. Malisiewicz, J. C. Huang and A. A. Efros, "Detecting Objects via Multiple Segmentations and Latent Topic Models." CMU Technical Report, 2006.

J. C. Huang and T. Malisiewicz "Fitting a Hierarchical Logistic Normal Distribution." CMU Technical Report, 2006.

Recent Invited Talks(View on Web)

06/2022. New Orleans, LA. CVPR 2022. Image Matching: Local Features & Beyond Workshop.
06/2020. Seattle, WA. CVPR 2020. Joint Workshop on Long-Term Visual Localization, Visual Odometry and Geometric and Learning-based SLAM.
11/2019. Seoul, South Korea. ICCV 2019. 2nd Workshop on Deep Learning for Visual SLAM.
10/2018. New York, NY. Cornell Tech. Pixel Cafe.
09/2018. Warsaw, Poland. Warsaw University of Technology. Data Science Warsaw AR & SLAM.
09/2018. Munich, Germany. ECCV 2018. Geometry Meets Deep Learning Workshop.

Academic Activities and Awards

Reviewer for CVPR, ICCV, ECCV, PAMI, IJCV, AAAI, ICML, SIGGRAPH ASIA

National Science Foundation Graduate Research Fellowship	2006-2009
Rensselaer Polytechnic Institute Alumni Scholarship	08/2001
Rensselaer Polytechnic Institute Mathematics/Science Medal Scholarship	05/2000
Valedictorian of High School (550+ students)	06/2001
National Physics Team Semifinalist (approx 180 students in USA)	05/2001