Dr. Tolga Birdal

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Department of Computing ◇ Imperial College London

tolgabirdal.github.io

scholar.google.com/citations?user=_Bxd5ggAAAAJ

Academic Positions

2022–Present	**Assistant Professor (Lecturer)** & UKRI Future Leaders Fellow, Imperial College London, UK
2019–2021	**PostDoc.**, Geometric Computing Group, Stanford University, Stanford CA
2014–2018	**Ph.D.**, Chair of Computer Aided Medical Procedures, TU Munich, Germany
	Doctoral thesis: *Geometric Methods for 3D Reconstruction from Large Point Clouds*
2008–2011	**M.Sc.**, Computational Science & Engineering, TU Munich, Germany
	Master's thesis: *3D Deformable Surface Recovery Using RGBD Cameras*
2004–2008	**B.Sc.**, Electronics Engineering, Sabancı University, Turkey

Industrial Positions and Entrepreneurship

2011–2022	**Consultant** for numerous startups including Shape, Fantasmo, Carbon, Parcelist and Hover
	◇ Fantasmo acquired by Tier Mobility in 2022
2014–2018	**Doktorand**, Siemens Corporate Technology Munich, Germany
2011–2014	**Co-Founder/CEO**, Gravi Information Technologies Ltd. Istanbul, Turkey
2008–2011	**Co-Founder/CTO**, Befunky Inc. (befunky.com), Portland CA
	Finalist in GTS Tech Start-up Competition and TechCrunch40 Disrupt
	◇ Acquired by Tiny Capital in 2022 (> $ 19M)

Funding (£ 1.75M as PI, £ 1.3M as co-PI)

2024	**UKRI Future Leaders Fellowship** [PI, £ 1.6M] for UNTOLD: Unifying Foundations for Topological Deep Learning
2024	**Amazon AWS Cloud Credit Awards** [PI, £ 42,765] for Topological deep learning in drug discovery
2024	**Royal Society Research Grant** [PI, £ 70,000] for TODDLE: Topological deep learning in drug discovery
2023	**Meta (Facebook) Research Award** [PI, $ 50,000] for perception of hand interactions in 2D and 3D scenes
2023	**D-Wave Quantum Cloud Service Gift** [PI, £ 3,600] for training neural networks on quantum computers
2022	**EPSRC Grant (EP/X011364/1)** [Co-PI, £ 1M] for GNOMON: Deep non-Euclidean Generative Models
2022	**Google Cloud Research Credit** [PI, $ 17,000] for building 3D generative models
2022	**Google University Gift** [PI, $ 10,000] for characterizing the geometry of latent spaces of generative models
2021	**US Navy Office of Naval Research Grant** [Co-PI, $ 125,000] for modeling uncertainty in self-navigation
2019	**Google Daydream University Research Gift** [Co-PI, $ 80,000] for semantic point cloud understanding

Awards

2020	**Outstanding Reviewer**, in NeurIPS, CVPR and ECCV
2019	**Best Paper Finalist**, Conference on Computer Vision and Pattern Recognition (CVPR)
2017	**Best Student Paper Award**, ICCV Workshop on Multiview Relationships in 3D Data (MVR3D)
2016	**Young Professional Award** by European Machine Vision Association (EMVA) for my Ph.D. work

Selected Keynotes & Invited Talks (out of a pool of 25 talks, excluding contributed conference presentations)

Keynotes	Workshop on Deep Learning & Geometric Computing, (**CVPR 2022**)
	Workshop on Shape Recovery from Partial Textured 3D Scans (**CVPR 2022**)
	International Workshop on Recovering 6D Object Pose (**ECCV 2022**)
Talks in Industry	Intel ('23), Twitter ('22), Huawei ('21), MagicLeap ('21), DLR ('21), Google ('19), Autodesk ('19)
Talks in Academia	Oxford (2022, 2024), University of Maryland (2022), KAUST (2022), École des Ponts (2021)
	NYU (2021), University of Amsterdam (2021), Telecom Paristech (2020)

Academic Services

Associate editor	Journal of Real-Time Image Processing and The Visual Computer
Area chair	IEEE / CVF Computer Vision and Pattern Recognition Conference (CVPR) 2024,
	European Conference on Computer Vision (2024), 3D Vision (3DV) 2024
	International Conference on Computer Vision (ICCV) 2023
Program committee	More than 20 times for the selected journals and conferences:
	T-PAMI, IJCV, NeurIPS, ICML, ICLR, CVPR, ICCV, ECCV, ICLR, SIGGRAPH, 3DV, BMVC
Organizations	**CVPR'23 / ECCV'24 Workshops** on Quantum Computer Vision & Machine Learning (qcvml.github.io)
	CVPR 2020 Tutorial on Synchronization and Cycle Consistency (synchinvision.github.io)
	ICCV 2017 Workshop on Multiview Relationships in 3D Data (mvr3d.github.io)

Educational Activities

Teaching	Non-Euclidean Methods in Machine Learning, **Stanford University**, CA (cs468.stanford.edu)
	Non-Euclidean Methods in Machine Learning, **Bosphorus University**, Istanbul (CMPE58L01)
Supervision	**10 Ph.D. students** (4 completed, 6 ongoing), **14 masters students** (8 completed, 6 ongoing)
Outreach	Mentor at MIT **Summer Geometry Institute** (sgi.mit.edu)
	Mentor at **London Geometry & Machine Learning** Summer School (logml.ai)
	Regular teachings on AI/ML at **Nesin Mathematics Village** and **Arkhé Project**

Selected Publications (drawn from a larger pool of **>70** publications, **30** of which are lead-authored)

A curated list, which garnered **>3500 citations** with an **h-index of 28** (as per Google Scholar) (* *equal contribution*):

◇ Theo Papamarkou, **Tolga Birdal** *et al.*: *Challenges and Opportunities in Topological Deep Learning*, ICML 2024

◇ Rembert Daems, Manfred Opper, Guillaume Crevecoeur & **Tolga Birdal**: *Variational Inference for SDEs Driven by Fractional Noise*, ICLR 2024 [**spotlight**] [webpage]

◇ Yannan He, Garvita Tiwari, **Tolga Birdal**, Garvita Tiwari & Gerard Pons-Moll: *NRDF: Neural Riemannian Distance Fields for Learning Articulated Pose Priors*, CVPR 2024 [**spotlight**] [webpage]

◇ Nathan Mankovich & **Tolga Birdal**: *Fun with Flags: Robust Principal Directions via Flag Manifolds*, CVPR 2024

◇ Zhiying Leng, **Tolga Birdal**, Xiaohui Liang, Federico Tombari: *HyperSDFusion: Bridging Hierarchical Structures in Language and Geometry for Enhanced 3D Text2Shape Generation*, CVPR 2024

◇ Nathan Mankovich & **Tolga Birdal**: *Chordal Averaging on Flag Manifolds and Its Applications*, ICCV 2023 [**oral**]

◇ Jiahui Huang, **Tolga Birdal**, Zan Gojcic, Leonidas Guibas & Shi-Min Hu: *Multiway Non-rigid Point Cloud Registration via Learned Functional Map Synchronization*, T-PAMI 2022 [webpage]

◇ Yongheng Zhao, Guangchi Fang, Yulan Guo, Leonidas Guibas, Federico Tombari & **Tolga Birdal**: *3DPointCaps++: Learning 3D Representations with Capsule Networks*, IJCV 2022 [webpage]

◇ Haowen Deng, Mai Bui, Nassir Navab, Leonidas Guibas, Slobodan Ilic & **Tolga Birdal**: *Deep Bingham Networks: Dealing with Uncertainty and Ambiguity in Pose Estimation*, IJCV 2022 [webpage]

◇ Jiayi Chen, Yingda Yin, **Tolga Birdal**, Baoquan Chen, Leonidas Guibas & He Wang: *Projective Manifold Gradient Layer for Deep Rotation Regression*, CVPR 2022 [code]

◇ **Tolga Birdal**, Aaron Lou, Leonidas Guibas & Umut Simsekli: *Intrinsic Dimension, Persistent Homology and Generalization in Neural Networks*, NeurIPS 2021 [code]

◇ Davis Rempe, **Tolga Birdal**, Aaron Hertzmann, Jimei Yang, Srinath Sridhar & Leonidas Guibas: *HuMoR: 3D Human Motion Model for Robust Pose Estimation*, ICCV 2021 [**oral presentation**] [webpage]

◇ **Tolga Birdal**, Vladislav Golyanik, Christian Theobalt & Leonidas Guibas: *Quantum Permutation Synchronization*, CVPR 2021 [webpage]

◇ Zan Gojcic, Or Litany, Andreas Wieser, Leonidas Guibas & **Tolga Birdal**: *Weakly Supervised Learning of Rigid 3D Scene Flow*, CVPR 2021 [**oral presentation**] [webpage]

◇ Jiahui Huang, He Wang, **Tolga Birdal**, Minhyuk Sung, Federica Arrigoni, Shi-Min Hu & Leonidas Guibas: *MultiBodySync: Multi-Body Segmentation and Motion Estimation via 3D Scan Synchronization*, CVPR 2021 [**oral**]

◇ Davis Rempe, **Tolga Birdal**, Yongheng Zhao, Zan Gojcic, Srinath Sridhar & Leonidas Guibas: *CaSPR: Learning Canonical Spatiotemporal Point Cloud Representations*, NeurIPS 2020 [**spotlight**] [webpage]

◇ **Tolga Birdal**, Michael Arbel, Umut Simsekli & Leonidas Guibas: *Synchronizing Probability Measures on Rotations via Optimal Transport*, CVPR 2020 [webpage]

◇ Zan Gojcic, Caifa Zhou, Jan D Wegner, Leonidas J Guibas & **Tolga Birdal**: *Learning Multiview 3D Point Cloud Registration*, CVPR 2020 [code]

◇ **Tolga Birdal***, Yongheng Zhao*, Jan Eric Lenssen, Emanuele Menegatti, Leonidas Guibas & Federico Tombari: *Quaternion Equivariant Capsule Networks for 3D Point Clouds*, ECCV 2020 [**oral**] [code]

◇ Mai Bui, **Tolga Birdal**, Haowen Deng, Shadi Albarqouni, Leonidas Guibas, Nassir Navab & Slobodan Ilic: *Multimodal 6D Camera Relocalization via Bingham Mixture Models*, ECCV 2020 [webpage]

◇ **Tolga Birdal** & Umut Simsekli: *Probabilistic Permutation Synchronization using the Riemannian Structure of the Birkhoff Polytope*, CVPR 2019 [**best paper finalist**] [webpage]

◇ Haowen Deng, **Tolga Birdal** & Slobodan Ilic: *3D Local Features for Direct Pairwise Registration*, CVPR 2019

◇ **Tolga Birdal***, Yongheng Zhang*, Haowen Deng & Federico Tombari: *3D Point Capsule Networks*, CVPR 2019

◇ **Tolga Birdal**, Benjamin Busam, Nassir Navab, Slobodan Ilic & Peter Sturm: *Generic Primitive Detection in Point Clouds Using Novel Minimal Quadric Fits*, T-PAMI, 2019

◇ **Tolga Birdal**, Umut Simsekli, Onur Eken & Slobodan Ilic: *Bayesian Pose Graph Optimization via Bingham Distributions and Tempered Geodesic MCMC*, NuerIPS 2018

◇ Haowen Deng, **Tolga Birdal** & Slobodan Ilic: *PPF-Foldnet: Unsupervised Learning of Rotation Invariant 3D Local Descriptors*, ECCV 2018

◇ Haowen Deng, **Tolga Birdal** & Slobodan Ilic: *PPFNet: Global Context Aware Local Features for Robust 3D Point Matching*, CVPR 2018 [**spotlight**]