ANURAG RANJAN

PROFILE

Researcher at Apple Machine Intelligence.
PhD in Computer Science from Max Planck Institute, Germany.
Research focus on modelling the structure of the world (data) by imposing physical constraints (geometry) for better prediction.

NOTABLE WORKS

SpyNet – Fastest and smallest neural network for Optical Flow at the time of release.
Convolutional Mesh Autoencoders – First work to apply convolutions on meshes.
Competitive Collaboration – Neural networks train by competing and collaborating for unsupervised learning of Structure-from-Motion.
MORPHGAN – The first work to drive facial avatars using a GAN *from a single image*.

CODE

My team was ranked 2nd in India during the IEEE Xtreme Programming Competition 2011. I host and maintain several repositories on Github that are popular and are widely used among researchers and engineers alike. These repositories use deep learning frameworks like Torch, Pytorch and Tensorflow with Python, C, C++ and CUDA. I maintained the Max Planck's mesh library hosted publicly on Github that supports several projects involving 3D mesh processing in Python.

RESEARCH COMMUNITY

I was Area Chair for British Machine Vision Conference 2021. I have reviewed for international conferences and journals - CVPR 2018, CVPR 2019, CVPR 2020, AAAI 2020, TPAMI and IJCV.

EXPERIENCE

RESEARCHER, APPLE, CUPERTINO, CA – SINCE JANUARY 2020

I research on novel methods for developing fundamental algorithms to model structure and geometry of the world. I have multiple collaborations within Apple across teams and orgs that ingest my research to support their products. Some mentionable works include:
MORPHGAN – The first work to drive facial avatars using a GAN from a single image.
HYPERSIM – A large dataset of the most photorealistic indoor scenes ever created for research. This enabled learning new tasks for which labels are scarce.
TOKEN POOLING – A new layer that obtains the most efficient Transformers ever achieving same accuracy with 42% fewer computations.
COMPRESSIBLE SPACES – Learning a space of networks for realtime compression at inference time, this is the first, and so far only work do so in unconstrained setting.

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RESEARCH INTERN, NVIDIA RESEARCH, WESTFORD, MA – FALL 2018

UNSUPERVISED LEARNING – I worked on joint unsupervised learning of depth, camera motion, optical flow and motion segmentation. I developed *Competitive Collaboration*, a general framework that facilitates competition and collaboration between different networks so that they learn from each other.

RESEARCH INTERN, FACEBOOK RESEARCH, MENLO PARK, CA – SUMMER 2017

UNSUPERVISED OBJECT SEGMENTATION – I developed a method which can learn to segment objects by using correspondences between video frames. We filed a US Patent on the concepts developed during the internship.

SOFTWARE DEVELOPER, MASHUP MACHINE, VANCOUVER – FALL 2015

I developed deep learning modules using Theano and Tensorflow that supported several systems at Mashup, including movie dialogue and story board prediction.

EDUCATION

MAX PLANCK INSTITUTE FOR INTELLIGENT SYSTEMS, GERMANY – PH.D, 2019
SUMMA CUM LAUDE (MIT AUSZEICHNUNG, WITH HONOR, ~TOP 5%)

THESIS – Deep Geometric Learning, an exploration on how geometric constraints can lead to better learning in deep network, particularly in an unsupervised setting.

THE UNIVERSITY OF BRITISH COLUMBIA, VANCOUVER BC – M.SC, 2015

DISSERTATION – Learning Periorbital Soft Tissue Motion, a neural network approach to learning a model for the motion of the upper face which can be used for VFX.

NATIONAL INSTITUTE OF TECHNOLOGY, KARNATAKA INDIA – B.TECH, 2013

SELECTED WORKS AND PUBLICATIONS
MORE ON GOOGLE SCHOLAR

A RANJAN, J Janai, A Geiger, MJ Black
Attacking Optical Flow. ICCV 2019

A RANJAN, V Jampani, K Kim, D Sun, J Wulff, MJ Black
Competitive Collaboration: Joint Unsupervised Learning of Depth, Camera Motion, Optical Flow and Motion Segmentation. CVPR 2019

A RANJAN, MJ Black
Optical flow estimation using a spatial pyramid network. CVPR 2017

A RANJAN, T Bolkart, S Sanyal, MJ Black
Generating 3D faces using Convolutional Mesh Autoencoders. ECCV 2018

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A RANJAN, J Romero, MJ Black
Learning Human Optical Flow. BMVC 2018

J Janai, F Güney, A RANJAN, MJ Black, A Geiger
Unsupervised Learning of Multi-Frame Optical Flow with Occlusions. ECCV 2018

MEDIA COVERAGE

Why this Dot is dangerous for self-driving cars *DW Shift*

Farbfleck stört autonome Fahrzeug (Color spot disturbs autonomous vehicle) *aired on BR Mediathek*

Patch of color could throw autopilots off course *Innovation Origins*

Ist das wirklich ein Toaster? (Is this really a toaster?) *Die Zeit*

Farbkleckse bringen selbstfahrende Autos durcheinander *Der Spiegel*

Farbflecken könnten selbstfahrende Autos stören (Color patch could disturb self-driving cars) *Die Welt*

Farben und Muster können selbstfahrende Autos verwirren (Color patterns can confuse self-driving cars) *Bayerischer Rundfunk*

Les véhicules autonomes faciles à berner, selon une étude (Autonomous vehicles easy to fool, according to a study) *La Presse*

So kann ein Farbpunkt autonome Autos verwirren (How a color patch can confuse autonomous cars) *t3n*

Generating Character Animations from Speech with AI *NVIDIA Developer News*

Build Realistic Human Speech Animations with the New VOCA Model and 4D Face Dataset *Synced*

Zu bunt für autonome Autos (Too colorful for autonomous cars) *Süddeutsche Zeitung*

Selbstfahrende Autos lassen sich irritieren *SWR*

NVIDIA NVAIL Partners Present their Research at CVPR 2019 *NVIDIA Developer News*

AWARDS

Mitacs Globalink Graduate Fellowship that supported my tuitions and living at The University of British Columbia, for Master of Science program.

I received an appreciation letter from the Canadian Prime Minister's office during my research exchange at Ecole Polytechnique de Montreal.

IBM Web Technical Contest Award for Interpretation of Behaviour of Autistic Individuals using Gesture Recognition and Tracking with Depth Sensor camera.

WHAT ELSE DO I DO

I like astronomy. I was the Tech Coordinator at Astronomy Club in my undergrad.
I play Football (European) for fun, and won some internal leagues.