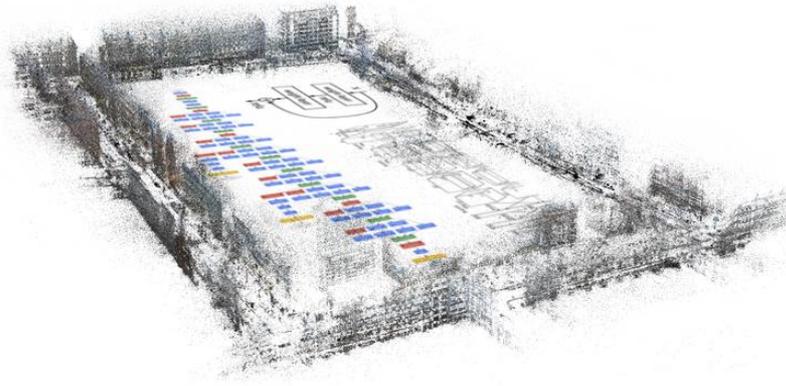


## BMVA Symposium: Geometry and Deep Learning



One Day BMVA symposium: BCS London, UK on 19th July, 2019

**Chairs:** Vassileios Balntas (Scape Technologies) and Krystian Mikolajczyk (Imperial College London)

This symposium aimed to explore the key challenges in addressing the geometry related tasks with end-to-end learning.

This meeting was well attended with around 70 participants. The programme included three keynote presentations, 6 contributed talks and 2 invited talks from researchers affiliated with the industry.

The meeting started at 09:30, with the first invited keynote by **Jiri Matas** from Czech Technical University, Prague. Prof. Matas discussed several issues related to image matching and local descriptors and presented recent work from his research group that analysed the performance of recent deep learning image matching methods, compared to the classical computer vision pipelines. He highlighted that standard methods are still very competitive against novel deep learning architectures.

After the coffee break, the first set of talks started, with **Ignas Budvytis** from University of Cambridge presenting his work on Large Scale Semantic Re-Localisation, which focused on novel methods of using segmentation masks from a semantically labelled image for the purpose of city-scale visual localisation.

Subsequently, **Ronnie Clark** from Imperial College London, gave a presentation titled “Deep Learning and Geometry: A Top-Down Approach”. This talk aimed at presenting a general framework for describing and analysing geometry and how they related to machine learning, and specifically the top-down inference approach.

The next talk was from **Armin Mustafa** (University of Surrey) titled “Semantically Coherent 4D Scene Flow of Dynamic Scenes”. She presented a method to generate 4d reconstruction and segmentation from multi-view video data, and presented possible applications of this method in VR systems.

Next, **Joao Miguel Vieira Cartucho** from Imperial College London presented his work on “Data Augmentation with 3D CG for Surgical Vision”. He analysed a novel method of synthesizing novel views of highly variable surgical views, using 3D models of the surgical scene that were created in Blender. This method is able to cope with challenges present on the surgical scenes such as reflections and occlusions.

**Daniyar Turmukhambetov & Michael Firman** from Niantic, gave the first Industry Invited Meeting, on their past and recent work on Monodepth, i.e. inferring depth information from RGB images. The talk included recent work on Monodepth 2.0, which is able to utilise information from traditional disparity maps, in order to improve the inference performance in the cases of thin structures.

After lunch, the afternoon sessions started with the second keynote from **Andrea Vedaldi** from University of Oxford and Facebook, which focused on Unsupervised Geometry. In particular, Vedaldi discussed ideas related to the correspondence problem, such as the relationship between landmarks and descriptors, and factorization & equivariance. In addition, he discussed a theoretical framework for sparse landmark detectors and descriptors.

The programme continued with two more contributed talks. **Jaime Spencer** from the University of Surrey presented his work on SAND: Feature Learning via Hierarchical Context Aggregation. The presented method introduces the scale-adaptive neural dense features, which is a learnt image representation for each image pixel, which can subsequently be used in standard image matching pipelines.

For the last contributed talk of the day, **Josh Harris** from the University of Southampton presented his work on Learning to infer 3D pose from 2D examples. This work discussed novel ways of learning representations that are able to infer human full 3d human poses from 2d images, using neural autoencoders.

The meeting continued with the second Industry invited talk, given by **Relja Arandjelović** from Deepmind, with a talk about novel ways of using deep networks

The meeting concluded with the last Keynote from **Stefan Leutenegger** at Imperial College London. His talk, titled “Spatial AI for Mobile Robots” was a general overview of several methods developed at his lab related to representations of 3D objects and 3D scenes. In addition, several demos were shown that illustrated several practical applications of the developed theoretical methods.

We would like to thank all the presenters, attendees, and Andrew Gilbert for their contributions to an enjoyable and thought-provoking meeting.

Vassileios Balntas & Krystian Mikolajczyk