NeRF seminar abstract

NeRFs (neural radiance fields) present a very exciting way of using multi-layer perceptron networks. NeRFs don't care about generalization - they want to overfit themselves on a scene so it can be reconstructed from different viewpoints. This is a double-edged sword because in this case, you need very precise and good data (in the original paper at least, later works improve the robustness of nerfs). Those rays combined with "old" computer vision algorithms result in very accurate meshes of objects you trained the NeRF on. COLMAP is also a critical part of training NeRFs on real-world data. Due to this raytracing-like approach NeRFs are, without even trying - very good for depth estimation. The authors of the original paper use several weird tricks to make their renders look better than just a naive NeRF. One of them is their use of positional encoding where instead of taking (x,y,z) as input coordinates they apply the Fourier transform to that point and use that as input. The other is hierarchical volume sampling, training a coarse and a fine-level network. This is used for localizing which parts of the ray you want rendered precisely, and which are empty space.

They are also very memory efficient and can be trained quickly on "simple" hardware - instant-ngp