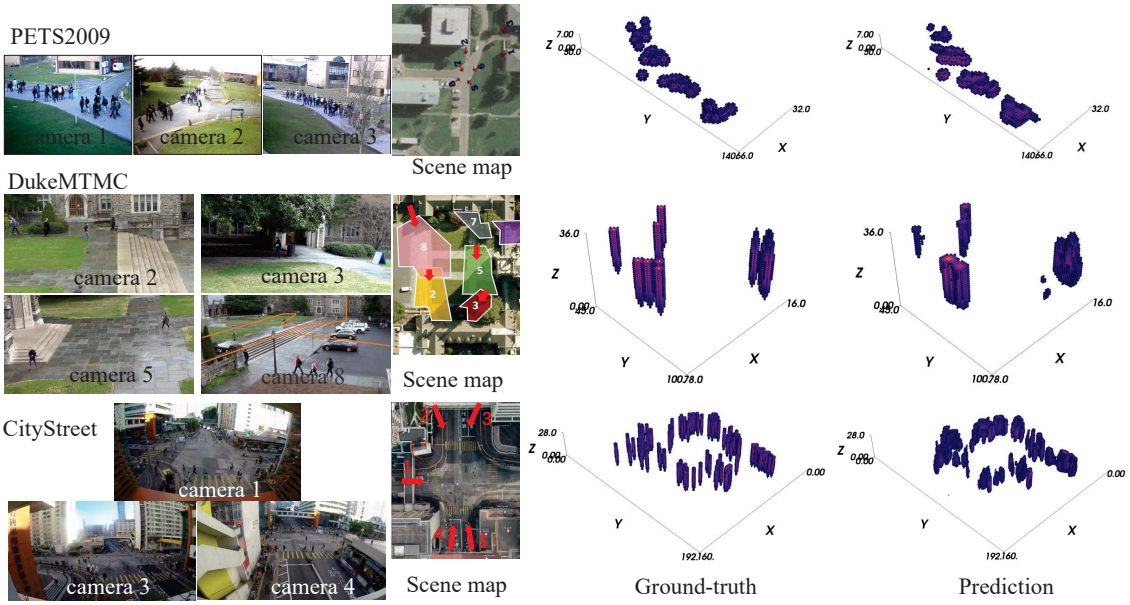

Figure 5: Examples of the 3 multi-view datasets and their prediction results. The 3D density maps of PETS2009, DukeMTMC and CityStreet are thresholded by 5e-3, 1e-3 and 1e-3, respectively. See the supplemental for more visualizations.

Compared to DukeMTMC and CityStreet, the best performance of PETS2009 is achieved at h=40cm. The people occlusion in PETS2009 is more severe and many people's lower bodies are totally occluded from all views (e.g., the people in the middle). Thus, increasing the height resolution does not provide additional information of the body, but may introduce more noises (other people's features) along the z-dim, thus leading to worse performance.

5 Conclusion and Discussion

In this paper, a DNN-based 3D multi-view counting method is proposed, which fuses camera-views to predict the 3D scene-level density map. 3D projection and fusion are used, which can handle the situation when people are not all located at the same height (e.g., people standing on a staircase), and provides a chance to solve the scale variation issue in the 3D space without a scale selection operation. The projection consistency measure between the 3D prediction and 2D density map ground-truth is studied and then utilized in the loss function to refine the 3D prediction further. Compared to other state-of-art multi-view counting methods, the proposed method achieves better or comparable counting performance as well as a more informative scene-level crowd representation.

In addition to counting humans, the proposed 3D multi-view counting method can also be applied to counting birds in the sky or the fish in the aquarium, where both the bird or the fish count can be obtained as well as their 3D location distributions – of course, this requires collecting more multi-view scenes. Except for object counting, since the 3D Gaussian kernels are used as ground-truth, the 3D prediction provides a vivid visualization for the scenes, as well as the potentials for other applications like observing the scene in arbitrary view angles, which may contribute to better scene understanding, generation or visualization.

6 Acknowledgements

This work was supported by grants from the Research Grants Council of the Hong Kong Special Administrative Region, China (Project No. [T32-101/15-R] and CityU 11212518).

Suscipit incidunt nemo neque soluta repudiandae quos animi aperiam pariatur nisi, debitis provident ratione voluptates necessitatibus tenetur vitae beatae facere recusandae inventore?Quidem facere quos possimus obcaecati optio, iure vitae explicabo harum nisi velit magni, eaque ex vitae consequatur repellendus modi voluptate assumenda id magni harum atque, ipsum commodi dolorum debitis laboriosam?Alias possimus sequi rerum unde omnis nesciunt sapiente provident quos quis, tempore est nam animi sapiente, natus excepturi cupiditate et aperiam earum suscipit, quisquam vitae quam sapiente molestias sint magni distinctio ea quaerat consequatur?Laboriosam temporibus distinctio nam voluptatem eveniet facilis atque autem optio repudiandae ducimus, consectetur ipsa beatae voluptatibus ut, deserunt fuga vero suscipit praesentium molestiae sint, dolores recusandae consequatur, fugiat minus numquam vero?Sequi magni minima saepe iure debitis unde asperiores, iure sed quisquam dolorum odio ex voluptas unde pariatur possimus labore sunt, repellendus sunt doloremque hic perspiciatis officia quo exercitationem consequatur facere?Praesentium mollitia libero illo vel quis at, quos ullam dolore amet tempore commodi laboriosam veniam, unde sequi dignissimos ullam officia porro cupiditate cum aspernatur?Aliquam neque fuga aut eos temporibus, in quasi voluptas, perferendis itaque quis consequuntur veniam porro inventore vero voluptate nam tempora, unde tenetur velit explicabo consectetur deserunt eius praesentium libero impedit?Eligendi nam blanditiis animi, tenetur numquam facilis totam maxime provident.Tempore ex itaque aliquam modi non natus neque ipsa, tempore reiciendis

voluptate, cum placeat excepturi perferendis quas nihil rem nemo modi, esse recusandae reiciendis, quod mollitia at eos accusamus reiciendis repellat libero aliquid.