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Wasserstein Distance in Crowd Counting

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Outline

Introduction to Crowd Counting

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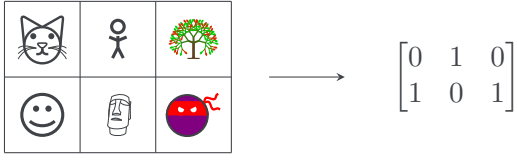
Crowd Counting

- Given a crowd image $\boldsymbol{X} \in \mathbb{R}^{H \times W \times C}$, **crowd counting** aims to automatically calculate the size c of the crowd.
- The ground truths in SOTA datasets [1] are density maps $\boldsymbol{Y} \in \mathbb{R}^{H \times W}$ instead, with

$$\boldsymbol{Y}_{i,j} = \begin{cases} 1 & \boldsymbol{X}_{i,j,:} \text{ denotes a person} \\ 0 & \text{otherwise} \end{cases}$$

Thus, $c = \sum_{i=1}^{H} \sum_{j=1}^{W} |\boldsymbol{Y}_{i,j}|$.



$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

[1] For example, ShanghaiTech A & B [1], UCF-QNRF [2] and NWPU-Crowd [3].

Crowd Counting

Fig. 1: a crowd image and its annotations.

References I

[1] Y. Zhang, D. Zhou, S. Chen, S. Gao, and Y. Ma, "Single-image crowd counting via multi-column convolutional neural network," in *Proceedings of the IEEE conference on computer vision and pattern recognition*, 2016, pp. 589–597.

[2] H. Idrees, M. Tayyab, K. Athrey, *et al.*, "Composition loss for counting, density map estimation and localization in dense crowds," in *Proceedings of the european conference on computer vision (ECCV)*, 2018, pp. 532–546.

[3] Q. Wang, J. Gao, W. Lin, and X. Li, "Nwpu-crowd: A large-scale benchmark for crowd counting and localization," *IEEE transactions on pattern analysis and machine intelligence*, vol. 43, no. 6, pp. 2141–2149, 2020.