Statistics Seminar

Department of Mathematics and Statistics

DATE:	Thursday, October 31, 2024
TIME:	1:15pm – 2:15pm
LOCATION:	WH 100E
SPEAKER:	Geran Zhao, Binghamton University
TITLE:	DiffusionEdge: Diffusion Probabilistic Model for Crisp Edge Detection

Abstract

Limited by the encoder-decoder architecture, learning-based edge detectors usually have difficulty predicting edge maps that satisfy both correctness and crispness. With the recent success of the diffusion probabilistic model (DPM), we found it is especially suitable for accurate and crisp edge detection since the denoising process is directly applied to the original image size. Therefore, we propose the first diffusion model for the task of general edge detection, which we call DiffusionEdge. To avoid expensive computational resources while retaining the final performance, we apply DPM in the latent space and enable the classic cross-entropy loss which is uncertainty-aware in pixel level to directly optimize the parameters in latent space in a distillation manner. We also adopt a decoupled architecture to speed up the denoising process and propose a corresponding adaptive Fourier filter to adjust the latent features of specific frequencies. With all the technical designs, DiffusionEdge can be stably trained with limited resources, predicting crisp and accurate edge maps with much fewer augmentation strategies. Extensive experiments on four edge detection benchmarks demonstrate the superiority of DiffusionEdge both in correctness and crispness. On the NYUDv2 dataset, compared to the second best, we increase the ODS, OIS (without post-processing) and AC by 30.2%, 28.1% and 65.1%, respectively.

Reference:

Ye, Y., Xu, K., Huang, Y., Yi, R., & Cai, Z. (2024, March). DiffusionEdge: Diffusion Probabilistic Model for Crisp Edge Detection. In Proceedings of the AAAI Conference on Artificial Intelligence (Vol. 38, No. 7, pp. 6675-6683).