Review of paper - Generative Modeling by Estimating Gradients of the Data Distribution

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Summary of the paper (3-4 sentences)

The paper introduces the score-based generative model, whose key idea is to model the gradient of the log PDF and get a quantity called (Stein) score function. The paper shows the procedures of calculation of score-based function, it used Langevin dynamics to approach data sampling iteratively. After that, the author illustrates the basic score-based model and uses multiple noise perturbation and stochastic differential equations to optimise the model.

Main contributions (2-3 bullet points)

1. Update on probability flow ODEs, improve comparison of different samplers.
2. The 'score' in 'score-based models' is defined as the gradient $\nabla_x logp(x)$ in $logp(x)$. The benefit of this definition is that because the function is differentiated by x, and Z is a constant, it can be 0 after differentiation and is able to be ignored naturally. It enables us to do research on more complicated models regardless of its Probability density function.
3. Use Stochastic differential equations, which can be reversed. We do not need to train a feature network like StyleGAN model, or is able to avoid huge computation like FLOW.

Positive and negative points (2-3 points each)

1. Positive: no need adversarial training, flexible structure of model, exact log-likelihood computation, uniquely identifiable representation learning.
2. Negative: expensive on computation.

Unclear (2-3 points)

1. How to transform the reverse SDE into the probability flow ODE?
2. Derivation of detailed technical functions.