Replace with your title

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Abstract

Put here a brief summary of the project: what is it about and what are the main results. You also need to submit your code for reproducibility (a github link suffices). Be concise and to the point. Please limit the report to less than ($\leq$) **4 pages** (references excluded).

1 Introduction

In this section you are going to present a brief background and motivation of your project. Consider summarizing the entire report in one overarching figure, such as Figure 1.

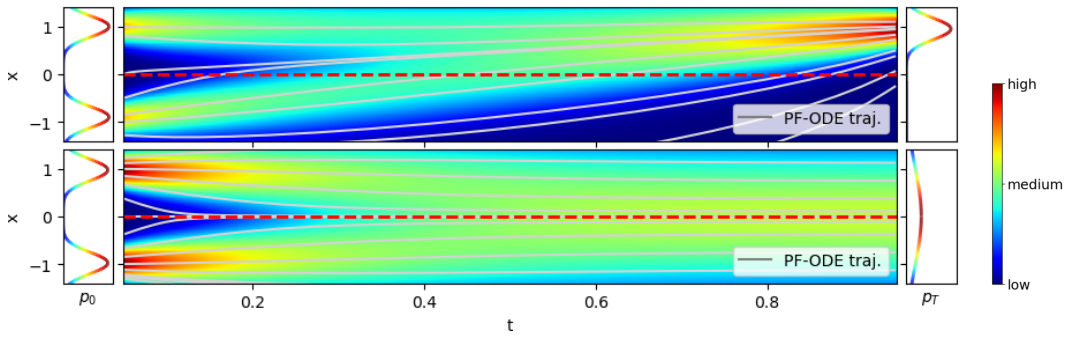

Figure 1: The evolution of p_t driven by diffusion processes where the data distribution p_0 is invariant under flipping with respect to the origin. We also plot the PF-ODE trajectories to visualize the transition direction of $p_t(x)$. The upper plot has $f(x,t) = \frac{1-x}{1-t}$ and $g(t) = 1$. The lower is VP-SDE with $\alpha_t = 1 - t$. For both processes, $T = 0.95$.

2 Related Works

Perform a reasonably thorough review of relevant literature. Has your approach, or one of similar nature, been considered before? By whom? What are the differences or limitations (if any)?

3 Main Results

Formulate your problem precisely (mathematically) and present the main methodology. Explain and justify each of your design choices, with some ablation studies to back them up.

Submitted to CS480/680, 2024 Spring. Do not distribute.

Table 1: Model Comparison on 28x28x1 Rotated MNIST (Group C4). * indicates author-reported values.

Model	FID↓				Inv-FID↓	$\Delta\hat{x}_0 \downarrow$
	1%	5%	10%	100%	100%	100%
SPDiff	5.97	**3.05**	3.47	2.81	2.21	0.2997
SPDiff+WT	5.80	3.34	3.57	3.50	2.20	0.0004
SPDiff+OC	6.10	3.09	3.45	2.82	2.12	0.0002
SPDiff+Reg	**5.42**	3.69	**2.83**	2.75	2.09	0.1806
SPDiff+Reg+OC	5.64	3.67	2.86	**2.64**	**2.07**	0.0002
SP-GAN	149*	99*	88*	81*	–	–
SP-GAN (Reprod.)	16.59	11.28	9.02	10.95	19.92	–

Please always give proper citations to prior work or results. Be precise and concise. Pay some attention to the organization and layout of the entire paper. Add variety (table, curves, bar graph, scatter plot, violin plot, pseudocode, etc.) and report statistical deviation (over at least 3∼5 runs).

Algorithm 1: Stochastic variance reduced proximal gradient

Input: $\mathbf{w}_0 \in \operatorname{dom} f$

for $k = 0, 1, 2, \ldots$ **do**

  $\mathbf{g}_k \leftarrow \frac{1}{n}\sum_{i=1}^{n} \nabla \ell_i(\mathbf{w}_k)$ `// compute full gradient at epoch` k

  $\mathbf{w}_{k,0} \leftarrow \mathbf{w}_k$

  for $t = 0, \ldots, m-1$ **do**

    randomly draw $i_t = i$ with probability p_i

    $\mathbf{g}_{k,t} \leftarrow \mathbf{g}_k - \frac{1}{np_{i_t}}\nabla \ell_{i_t}(\mathbf{w}_k) + \frac{1}{np_{i_t}}\nabla \ell_{i_t}(\mathbf{w}_{k,t})$ `// amortized gradient`

    $\mathbf{w}_{k,t+1} \leftarrow \mathrm{P}_r^{\eta_k}(\mathbf{w}_{k,t} - \eta_k \mathbf{g}_{k,t})$ `// stochastic proximal gradient`

  $\mathbf{w}_{k+1} \leftarrow \frac{1}{m}\sum_{t=1}^{m} \mathbf{w}_{k,t}$ `// in practice, can also do` $\mathbf{w}_{k+1} \leftarrow \mathbf{w}_{k,m}$

4 Conclusion

What have we learned? What limitations or directions do you think are worth exploring in the future?

Acknowledgement

Thank people who have helped or influenced you in this project. Figure 1 and Table 1 are from Lu et al. (2024).

References

Karras, T., M. Aittala, T. Aila, and S. Laine (2022). "Elucidating the Design Space of Diffusion-Based Generative Models". In: *Advances in Neural Information Processing Systems 35 (NeurIPS)*.

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