' LLI XVLRQ P RGHOV

- LDQ / L

,,,6 7VLQJKXD

$7&6

5 HYLHZ VFRUH EDVHG JHQHUDWLYH GLIIXVLRQ PRGHOV

5HYHUVH 6'(

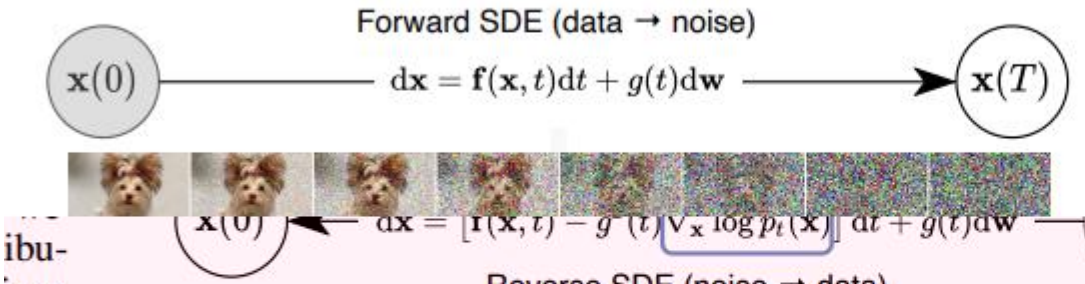

Figure 1: **Solving a reverse-time SDE yields a score-based generative model.** Transforming data to a simple noise distribution know the score of the dist tion at each intermediate step, $\nabla_{\mathbf{x}} \log p_t(\mathbf{x})$.

' (1 2 ,6 ,1 * ' ,)) 8 6 ,2 1 3 5 2 %&$%/ ,6 7 ,& 0 2 ' (/ 6
' ' 3 0

$$p(\mathbf{x}_i \mid \mathbf{x}_{i-1}) = \mathcal{N}(\mathbf{x}_i; \sqrt{1-\beta_i}\mathbf{x}_{i-1}, \beta_i \mathbf{I})$$

$$\mathbf{x}_i = \sqrt{1-\beta_i}\mathbf{x}_{i-1} + \sqrt{\beta_i}\mathbf{z}_{i-1}$$

Z KLFK LV D GLVFUHWL]DWLRQ RI 2 8 SURFHVV $\mathrm{d}\mathbf{x} = -\frac{1}{2}\beta(t)\mathbf{x}\,\mathrm{d}t + \sqrt{\beta(t)}\,\mathrm{d}\mathbf{w}.$

$$p_{\alpha_i}(\mathbf{x}_i \mid \mathbf{x}_0) = \mathcal{N}(\mathbf{x}_i; \sqrt{\alpha_i}\mathbf{x}_0, (1-\alpha_i)\mathbf{I}), \text{ where } \alpha_i := \prod_{j=1}^{i}(1-\beta_j)$$

6 FRUH P DWFKLQJ ORVV

$$\boldsymbol{\theta}^* = \arg\min_{\boldsymbol{\theta}} \sum_{i=1}^{N} (1-\alpha_i)\mathbb{E}_{p_{\text{data}}(\mathbf{x})}\mathbb{E}_{p_{\alpha_i}(\tilde{\mathbf{x}}|\mathbf{x})}[\|\mathbf{s}_{\boldsymbol{\theta}}(\tilde{\mathbf{x}}, i) - \nabla_{\tilde{\mathbf{x}}} \log p_{\alpha_i}(\tilde{\mathbf{x}} \mid \mathbf{x})\|_2^2].$$

7 KH RULJLQDO ' 3 0 SDSHU XVHV WKH YDULDWLRQDO ORZHU ERXQG WR GHULYH WKH ORVV IXQFWLRQ VHH ODWHU

6 WDEOH ' LIIXVLRQ LQSDLQWLQJ

&RQWURO HWV

&RQWURO HWV D QHXUDO QHWZRUN DUFKLWHFWXUH WKDW FDQ HQKDQFH SUHGLQHG LP DJH GLIIXVLRQ P RGHOV Z LWK VDVN VSHFLLF FRQGLWRQV

Source ima