Algorithm 1 Training (Conditional Inpainting)

repeat
$x_0 \sim q(x_0)$
let M be the observation mask (1=known, 0=unknown)
$t \sim \text{Uniform}(\{1, \dots, T\})$
$\epsilon \sim \mathcal{N}(0, I)$
Take gradient descent step on

$$\nabla_\theta \left\| \left(\epsilon - \epsilon_\theta(\underbrace{\text{concat}([(\sqrt{\bar{\alpha}_t} x_0 + \sqrt{1-\bar{\alpha}_t}\epsilon) \odot (1-M) + x_0 \odot M, M])}_{\text{MODIFIED INPUT}}, t) \right) \underbrace{\odot (1-M)}_{\text{MODIFIED LOSS}} \right\|_2^2$$

until converged

Algorithm 2 Sampling (Conditional Inpainting)

Input: x_0 (ground truth image), M (observation mask)
$x_T \sim \mathcal{N}(0, I)$
let $cond \leftarrow x_0 \odot M$
for $t = T, \dots, 1$ **do**
    if $t > 1$ **then**
        $z \sim \mathcal{N}(0, I)$
    else
        $z = 0$
    end if
    $\epsilon_{\text{pred}} \leftarrow \epsilon_\theta(\text{concat}([x_t \odot (1-M) + cond, M]), t)$
    $x_{t-1} \leftarrow \left(\frac{1}{\sqrt{\alpha_t}} \left(x_t - \frac{1-\alpha_t}{\sqrt{1-\bar{\alpha}_t}} \epsilon_{\text{pred}} \right) + \sigma_t z \right) \odot (1-M) + cond$
end for
return x_0