

# LLaDA: Large Language Diffusion Models

## Autoregressive LLM

Ken

▶ : LLM

- ▶ : LLM
- ▶ : LLaDA      masking diffusion 8B      LLaMA3 8B

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- ▶ :      in-context learning instruction-following





AR LLM

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- ▶ LLaDA Eq.3, Eq.4 remask

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- ▶ : 8B

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LM

GPT-2



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GPT-2

- ▶ LM                GPT-2
- ▶
- ▶ masked      : MaskGIT

# LLaDA

- ▶ Forward:  $t \sim U[0, 1]$

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- ▶ Forward:  $t$        $t \sim U[0, 1]$
- ▶ Reverse:

# LLaDA

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masked token CE :

$$\mathcal{L}(\theta) = -\mathbb{E}_{t,x_0,x_t} \left[ \frac{1}{t} \sum_{i=1}^L \mathbf{1}[x_t^i = M] \log p_\theta(x_0^i \mid x_t) \right]$$

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$$-\mathbb{E}_{p_{\text{data}}(x_0)} [\log p_\theta(x_0)] \leq \mathcal{L}(\theta)$$



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- ▶ Sampling remask low-confidence remasking

► : ARM baseline LLaDA

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- ▶ : FLOPs 6

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8B

Base

- ▶ LLaDA 8B Base vs LLaMA2 7B Base

8B

Base

- ▶ LLaDA 8B Base vs LLaMA2 7B Base
- ▶ 15

8B

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- ▶ LLaDA 8B Base vs LLaMA2 7B Base
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- ▶ LLaDA 8B Base vs LLaMA3 8B Base

8B

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- ▶

8B

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- ▶ HumanEval: 35.4 vs 34.8

## SFT

- ▶ LLaDA SFT RL instruction-following

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- ▶ LLaMA3 Instruct

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- ▶ : AR

## Reversal Curse

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► 8B      LM      LLM

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- ▶

- ▶ 8B      LM      LLM
- ▶
- ▶ reversal reasoning   AR

- ▶  $< 10^{23}$  FLOPs

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- ▶ RL

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► : AR

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- ▶ : RLHF/RLAIF agent AR

► LLaDA AR LLM 8B

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- ▶ reversal

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- ▶ reversal
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- ▶ RL AR
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# Q&A

Q1. BERT

A. mask       $t \sim U[0, 1]$

Q2. reversal

A.

Q3.

A. 1 1step AR      step -      sampling /

- ▶ Paper: Large Language Diffusion Models (Nie et al.)

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../\_papers/LargeLanguageDiffusionModels.pdf