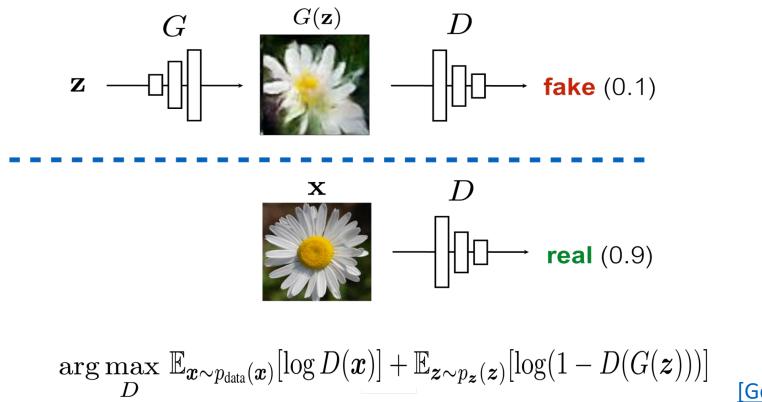
## Extra Slides for Generative Models

### by Margrit Betke, CS 585, April 4, 2024



### Hao on GANs last time:

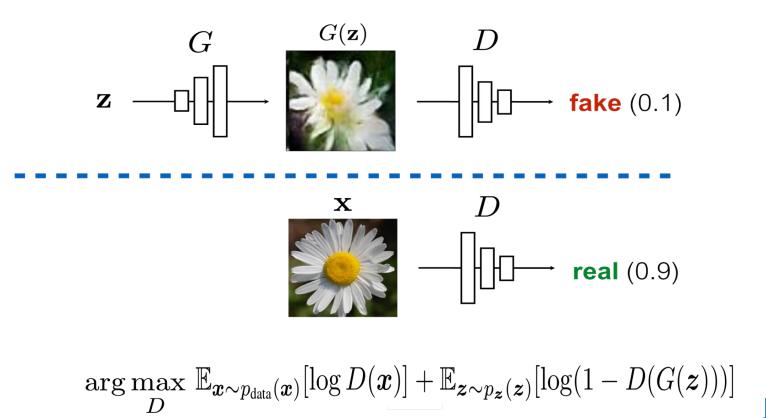


[Goodfellow et al., 2014]



### Hao on GANs last time:

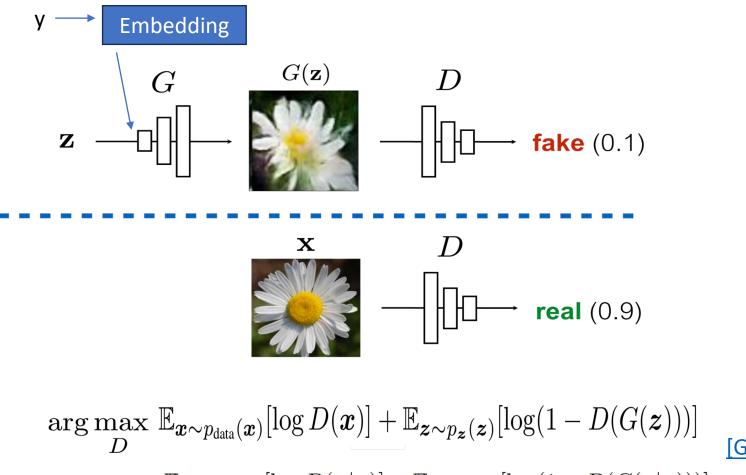
## How can you make the model create an image of a daisy flower?



[Goodfellow et al., 2014]



### Hao on GANs last time:



How can you make the model create an image of a daisy flower?

Use a conditional GAN: Mirza and Osindero, 2014

y="daisy flower"

[Goodfellow et al., 2014]  $\mathbb{E}_{\boldsymbol{x} \sim p_{\text{data}}(\boldsymbol{x})}[\log D(\boldsymbol{x}|\boldsymbol{y})] + \mathbb{E}_{\boldsymbol{z} \sim p_{z}(\boldsymbol{z})}[\log(1 - D(G(\boldsymbol{z}|\boldsymbol{y})))]$ 



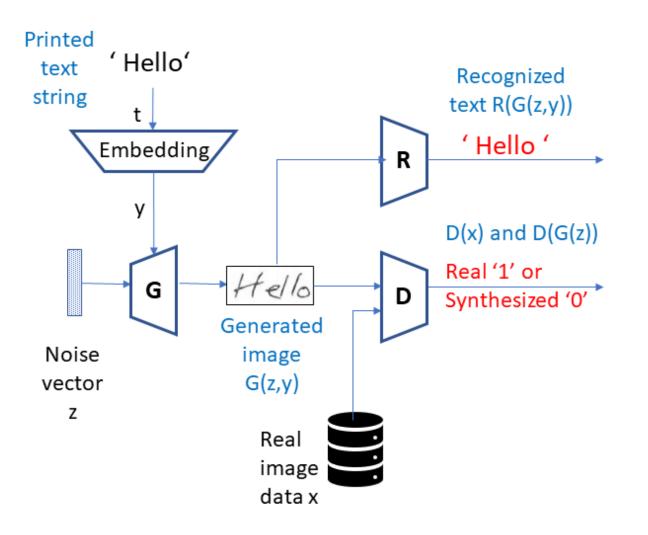
# Where are GANs still better than Diffusion Models (as of early 2024)?



# Handwriting Generation



### Alonso et al.'s Seminal GAN for Handwriting Synthesis, 2019



#### Add a text recognition network R

Here: gated convolutional recurrent network (CRNN), consisting of an encoder of five layers, with tanh activations and convolutional gates, followed by a max pooling layer, and a decoder made up of two stacked bidirectional LSTM layers

$$l_{D,G} = \mathbb{E}_x[\log(D(x|y))] + \mathbb{E}_z[\log(1 - D(G(z|y)))]$$

$$l_R = \mathbb{E}_{(z,t)} [CTC(t, R(G(z, y)))],$$

CTC: Connectionist Temporal Classification algorithm



# Works extending Alonso et al.'s 2019 model:

		Single word	Arbitrary text
<ul> <li>Text</li> <li>Writing style</li> <li>Variable length words</li> <li>Paragraphs</li> </ul>	SCRABBLEGAN	malade	My spelling is wobbly It's good spelling but it wobbles I saw that bad handwriting should be regarded
	HigAN	three	the processo fpenciland paperasopposed to machines ligancanalkays clinage; to land kritingas; thikes
	Davis et al.	bonjour	A single-decker," he elaborated. Daggers, the allies being more inferior than formerly to W.C.U. in
	JokerGAN	coventry	seven hundred meters you cannot go there
	Higan+	styles	handwritinginitationgenreative
	SLOGAN	content	generate words out of the training vocabulary CUIVE text generation



## Diffusion Model for Handwriting?



