DDPM 演讲大纲

开场白

Hello, everyone, today our team would like to share the paper ——"Denoising Diffusion Probabilistic Models", this paper is written by three scholars from UC Berkeley.

大家好，今天我们小组分享的是 DDPM 这篇文章，论文由来自UC Berkeley的三位学者完成。

These are our team members. After this presentation, you will understand why we use these strange avatars.

这是我们的小组成员，在这次展示过后，你将会理解为什么我们使用这组奇怪的头像。

We will divide our presentation into 6 parts.

我们将从六个方面介绍DDPM。

1.背景介绍 Background

DDPM is a generative model.

DDPM是一个“生成式模型”。

Maybe some of you don't know what generative model is.

也许你们中的一些人并不知道什么是生成模型

什么是生成模型?

In Wikipedia, there is a precise but complex definition, but ...

在维基百科，有精确但复杂的定义，不过……

【读ppt】

【图片例子】

For Example, this picture doesn't come from human beings. It is generated by NovelAI, which is now a popular project on Github.

这张图片并非出自人类之手，而是由NovelAI生成的。目前，这个项目在Github上非常受欢迎。

By just typing the description of the image you want, you can get many fancy pictures from NovelAI.

只需要输入对图片的描述，你就可以获得大量精致的图片。

直观理解 Intuitive understanding

【2张图片】

All these images are not real, they come from generative models.

这些图片都不是真实存在的，它们都来自于生成式模型。

深度生成模型

The research on generative models has a long time.

针对生成模型的研究已经有了相当的时间。

【读ppt中的文字】

These models we list here are very popular in recent years, like GANs, or VAEs.

2. DDPM模型介绍 Introduction

什么是DDPM

【读ppt】

forget about it, let us see some picture to understand it intuitively.

忘记这些定义，让我们看一些图片，以便于直观地理解它

微观视角Microscopic

Molecules do random Brownian motion as they diffuse, and their position at each moment follows a small Gaussian distribution;

分子在扩散时做无规则的布朗运动，它们的每一时刻的位置都遵循一个小的高斯分布；

Interestingly, if we put this process upside down, this reverse process also follows a Gaussian distribution

有意思的是，如果我们把这个过程倒放，这一反向过程同样也遵循高斯分布

3 扩散模型的原理 Theory

扩散过程

The left figure is the initial state, and in every step, we add some noise into the picture, then those points will diffuse in the whole space, and after thousands of steps, finally the results will close to the Gaussian Distribution

左图是初始状态，每一步，我们在画面中加入一些噪点，然后这些点会在整个空间中扩散，几千步后，最后结果会接近高斯分布

【图片】

前向扩散公式

This equation shows after we add noise, how those points changed in mathematical form.

这个方程显示了，在我们添加噪声之后，这些点是如何以数学形式变化的。

Here is the Derivation of the formula, if you are interested in it. we can discuss it after the speech.

这是公式的推导，如果你对它感兴趣。我们可以在演讲后讨论。

反向扩散公式

This is the backward equation, which shows how the Gaussian Distribution reverses to a real picture in mathematical form.

这是逆向方程，它显示了高斯分布如何以数学形式反演为真实图片。

Ignore that derivation, we put our attention on Except and Variance. This is the key to generating a picture.

忽略这个推导，我们把注意力放在 except 和 Variance 上。这是生成图片的关键。

Using those formulas, we could build a model with code to simulate this process.

使用这些公式，我们可以构建一个带有代码的模型来模拟此过程。

4 扩散模型的特点 Features

对比图

【表格，看懂表格，组织语言】

Compare to other generative models, each model has its own features, for example, VAEs run fast and is able to generate one picture at one time.

与其他生成式模型相比，每个模型都有自己的特点，例如，VAEs的速度很快，一次可以生成一张图片。

Although DDPM is slower than other kinds of models, DDPM has its unique advantage.

尽管速度上DDPM不如其他类型的模型，但是DDPM模型有着自己的独特优势。

DDPM比GANs更好的理由

【对照表格】

The table here shows DDPM outperforms GANs in the aspect of FID、sFID, precision rate and recall rate on many popular datasets.

表格显示，多个流行数据集上，DDPM在FID、sFID、准确率、召回率等指标上相比起GANs有着更好的表现。

5. 扩散模型的应用 Application

文本图像 Text2Image

【读ppt】

根据文本生成符合描述的图像，给出一些描述，可生成符合描述的图片。

Here we show an example of a description dog is reading, which can generate a picture of a puppy being read

这里我们展示了一个例子，给出描述dog is reading，可以生成一张正在阅读的小狗的图片

图像精细化 Image Refinement

Refine the blurry image to give the picture more detail.

对模糊的图像进行精细化，给图片更多的细节。

Here we give an example, give some blurry pictures, can produce a clearer, more detailed picture with more detailed features

这里我们给出一个例子，给出一些模糊的图片，可以生成更加清晰的，有更多细节特征的图片

像素填充 Inpainting

Padding the missing image can complement the details and content of the image.

对缺失内容的图像进行填充，可以补充图像的细节和内容。

Here is a picture of the defect, restore it, restore it to a complete photo.

这里给出一张缺损的图片，对其进行还原，将其还原成一张完整的照片。

填色 Colorization

Color fill images with missing colors,

对缺少色彩的图像进行色彩的填充，

To give an example, we input a grayscale map to which the model can assign appropriate colors.

给出一个例子，我们输入一张灰度图，模型可以对其赋予合适的色彩。

6 担忧与未来 Worries and the future

Unfortunately, there are numerous well-known malicious uses of generative models. Sample generation techniques can be employed to produce fake images and videos of high profile figures for political purposes

不幸的是，生成模型有许多众所周知的恶意使用。样本生成技术可用于生成高调人物的假图像和视频政治目的

but diffusion models might also become viable for creative uses in art, photography, and music.

扩散模型也可能在艺术、摄影和音乐中的创造性用途中变得可行

7 引用 References