Lecture - 22.4

Generative Adversarial Networks

Some Cool Stuff and Applications

So, before looking at the map, we look at some cool stuff about GANs and I'll ask you a question at the end of it we related to your latest assignment and so just listen carefully Okay?

Refer Slide Time: (0:27)

- In each row the first image was generated by the network by taking a vector z_1 as the input and the last images was generated by a vector z_2 as the input

So, these are some what I've shown here is actually a four or five cross 10 grid so there are 5 rows and 10 columns. Okay? Now look at one row at a time so in each row the first image was generated by sampling sounds z_1. Okay? So it tooks some z_1 fed it to the train generator and it generated this image the last image was generated by some other z_2. Okay? You took a z_1 you pass it to the generator that's the first image that it give or the first image that you see is the one generated by z_1 similarly the last image that you see is something generated by a different z_2 both z_1 and z_2 a randomly sampled from the normal distribution Okay?

Refer Slide Time: (1:16)

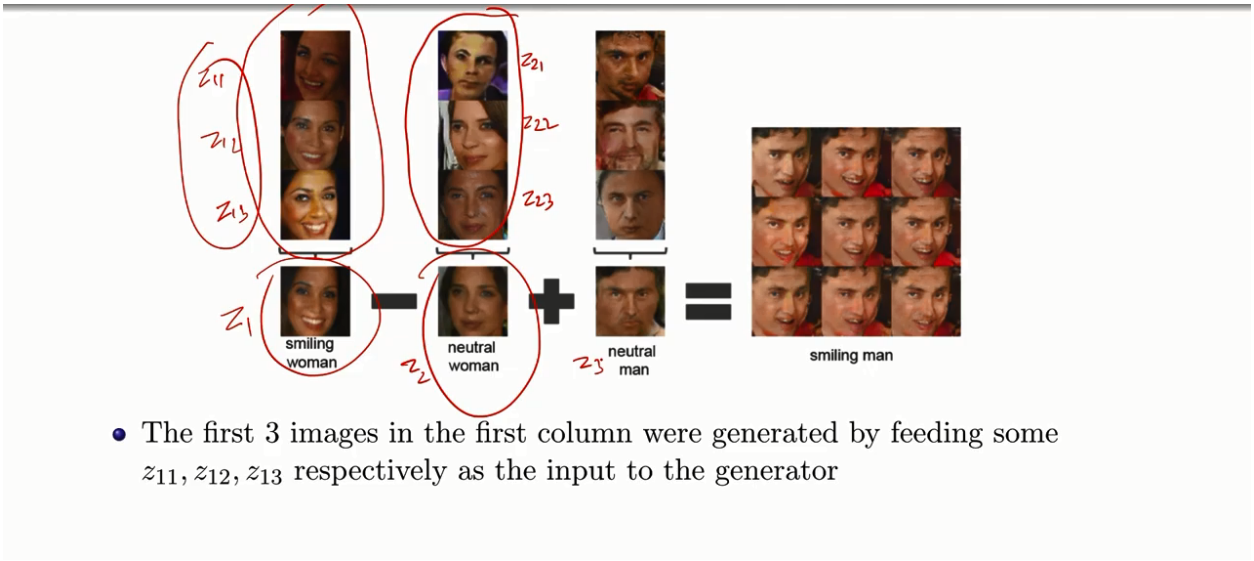
- In each row the first image was generated by the network by taking a vector z_1 as the input and the last images was generated by a vector z_2 as the input
- All intermediate images were generated by feeding z's which were obtained by interpolating z_1 and z_2 ($z = \lambda z_1 + (1 - \lambda) z_2$)

Now an interesting thing that these guys did is they took all Z's by interpolating z_1 and z_2 Okay? what does interpolation mean take this kind of a combination Right? So lambda times z_1 plus 1 minus lambda times Z so these are two points z_1 and z_2 so an interpolation will give me all the points between them and of course this is happening in a higher dimension and not just in a one-dimensional or two-dimensional case does that make sense Okay? So now here's the idea right you take a z_1 z_2 these are the two images that it generated now you take all vectors which come between them and try to generate images from them Right? and remember that there was a smooth transition from z_1 to z_2 in the latent space because you are doing this interpolation. Now you would expect a similar smooth transformation in the image space also and that's exactly what is happening here Right? So you had this bedroom and you had this another bedroom and now we are feeding Z's which lie between this first z1 and z2 and you see a smooth transition from the first bedroom to the second bedroom do you see that how many if you get this can you relate this to an RBM assignment this question was not asked but this to your album assignment how? could you plot a similar plot for your RBM assignment the answer is given on the slides just do these three things Right? So, you'll get a z_1 one if it were m-miss digits right so take a z_1 which results in a one suppose it draws a digit one.

Take another z_2 with suppose results in a nine suppose now if you interpolate between these two you should see a series of images which allow you to transition from one to nine does that make sense does that make sense so if you want you can try this for your fashion MLS data. So this is not a part of the assignment but just if you want you can try rate so this some interesting stuff that you can do and see how

the output comes and a lot of these transformations are actually very interesting so it may not be clear in the images here but you can go back and look at the slides

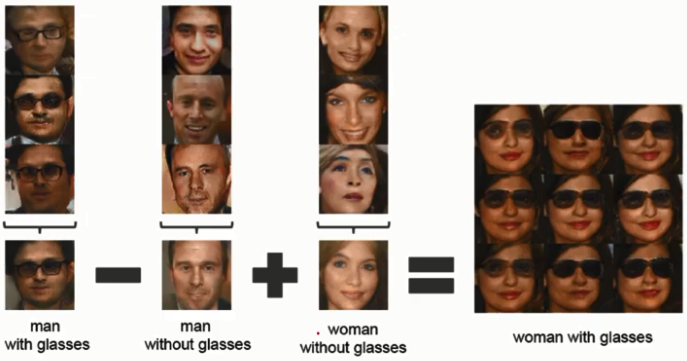
Refer Slide Time: (3:22)



The other stuff that you can do is something similar to what we had in the case of word to wake where you had this King minus man plus woman is equal to King minus man plus woman is equal to Okay? if you say so Okay? Yeah. So something similar Right? So what is happening here is if you look at these first three images they were generated by some vectors z_{11} z_{12} z_{13} Okay? and we just observe the images we as in the authors of the paper which does not include me so this is observe the images and saw that all of these are smiling women faces Okay? So what they did is they took the average of these vectors and came up with this average z_1 and they fed to that to the generator and it gave some average smiling woman Okay? and no I mean don't I mean the average is being used in a very different way Okay? and the same thing for the second row right so you have this z_{21} z_{22} Z_{23} and you get an average neutral woman Okay? and the same for the third row now you have this Z_1 Z_2 and Z_3 which represent the averages of smiling neutral man hence by smiling woman neutral woman and neutral man.

And now you do some vector arithmetic on top of that so you do z_1 minus z_2 so you remove the woman part of it so you just get smiling Okay? and then you add a man to it and then you get these creepy looking smiling men Right? So that's the vector arithmetic that you can do on the latent space Okay? So, these are interesting things that you can try once you have trained the model.

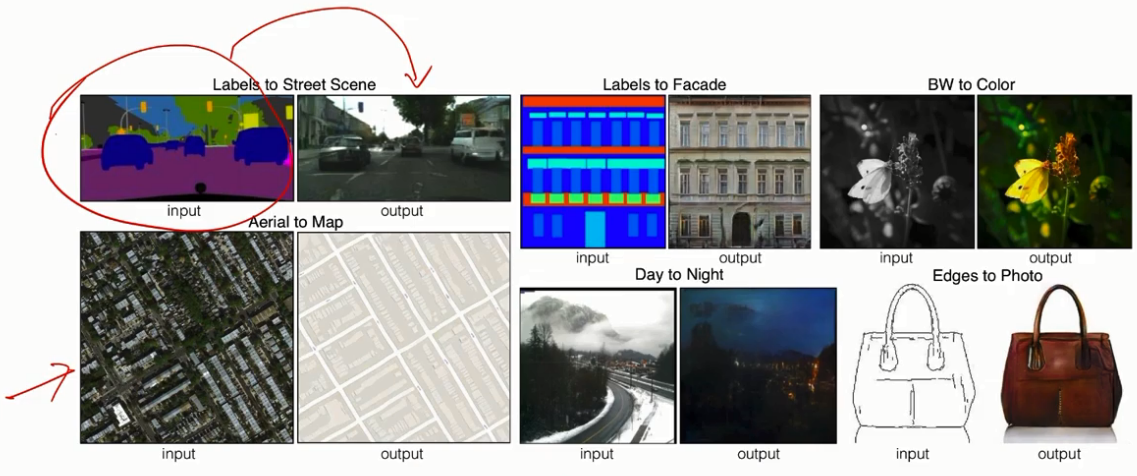
Refer Slide Time: (5:07)



- The first 3 images in the first column were generated by feeding some z_{11}, z_{12}, z_{13} respectively as the input to the generator
- The fourth image was generated by taking an average of $z_1 = z_{11}, z_{12}, z_{13}$ and feeding it to the generator
- Similarly we obtain the average vectors z_2 and z_3 for the 2nd and 3rd columns
- If we do a simple vector arithmetic on these averaged vectors then we see the corresponding effect in the generated images

And here's another example Right? you take a man with glasses now and subtract the man without glasses for might add a bombing and then you get some stylish looking women with glasses Right? Okay? So this is the quality of the generated images that people hype about Okay? Fine.

Refer Slide Time: (5:27)



Phillip Isola, Jun-Yan Zhu, Tinghui Zhou, Alexei A. Efros, Image-to-Image Translation with Conditional Adversarial Networks, CVPR, 2017.

So that's some cool stuff and there are like tons and tons of applications that people have come up with to use GANs for this is just from one single paper you can go back and google for gang zu and you'll find like some million papers about million actually hundreds or thousands of papers written on different types

of architectures for GANs different applications for GANs and so on. It's just enormous the amount of literature that has come upon GANs in the past four years since it was introduced is just mind-blowing Right? and there are several applications so one of this is that we are thinking about gender taking a random vector and generating an image from it but how about these other applications that you take one image from one domain so this is the an image from the segmented domain, and actually translate it to a real real image Right? which has the road and everything properly coming up same here Right? So you have this the architecture just the blocks given for it and from that you actually come up with the building which was there of course you'll have this parallel data for training but now from a latent variable or from a random variable sorry, a random vector going to an image vector now you're going from one image to another me so it and there could be various things here that you could take black-and-white images and convert them to color images this is again interesting you take the satellite image and you give back the Google map for that area and from day to night from sketch actually mages and so on they let tons and tons of applications which have come up in this space so I encourage you to go back and look at those.