What would Avengers be like with Mr Bean as Thor?

How can 'deepfakes' disrupt the film industry?

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ABSTRACT

Discoveries in machine learning research has allowed exponential growth in the capabilities of AI technology. With the development of generative adversarial networks (GANs), it is now possible for machine learning models to generate superficially authentic content resembling its training data. This poster will show current research on the capabilities of GANs, share potential industrial applications, and provide a view on the possible disruption that application of GANs may have on existing techniques employed in film production.

KEYWORDS

Generative Adversarial Network, Neural Network, Machine Learning

1   Introduction

Generative adversarial networks are machine learning models that can take samples from a distribution and learn to represent an estimate of said distribution in some way. The models typically consist of two neural networks - a generator and a discriminator. The generator creates samples similar to the training input while the discriminator, trained using traditional supervised learning, identifies whether its input is authentic or fake. Pitting the generator and the discriminator against each other, it is possible to reach an equilibrium where the generator can generate superficially authentic output [1][2]. Extensive research in the application of GANs has shown great potential in their capability for content generation and modification. For example, the StackGAN++ can generate images which closely match the textual descriptions [2]. This prompts the questions: What are some potential applications? How might they affect current technologies? Can deepfakes be used to easily replace Thor with Mr Bean? (Fig. 1)

2   Survey of existing GAN applications

Current research into the applications of GANs show the potential in their capabilities. Examples of applications of GANs include deepfakes [3], CycleGAN [4], and StackGAN++ [2]. Deepfakes are created using models which combine GANs with auto-encoders. The models can map the faces of one person onto another [2]. CycleGAN allows unpaired image-to-image translation using cycle-consistent adversarial networks. For example, transforming a horse in a picture to a zebra [4]. Finally, StackGAN++ is capable of generating photo-realistic images from text descriptions [2]. Examples include the creation of images of robins from detailed descriptions of birds.

3   Analysis of existing techniques and potential disruption

Existing film production techniques which involve computer technology include performance capture, CGI composition, morphing… [5].

Performance capture records an actor's movement and maps it onto digital models. It typically requires actors, cameras and tracking technology. Using video and image input to train a model created with auto-encoders and GANs, it is possible to achieve similar effects without requiring physical labour. With further development in increasing the quality of the output, there is potential for it to replace existing performance capture technology.

Figure 1: Can Mr Bean replace Thor?

CGI composition and morphing techniques that typically require a combination of images, such as changing image subjects from horses to zebras, can be mimicked with a single input using GANs such as CycleGAN. These neural networks have been trained for image-to-image translation between domains and are capable of transforming subjects and content styles.

Film production techniques not traditionally requiring computer technology could also be enhanced with the integration of GANs. For example, in scripts and storyboards, descriptions of scenes could be visualised using StackGAN++.

4   Conclusion

Based on the initial research, the researcher suggests possible disruption that GANs may have on existing film production techniques: replace performance capture; visualise textual scene descriptions; and enable a wider variety of content transformation. For now, Chris Hemsworth is safe as Thor in Avengers, but how long before Mr Bean is wielding Mjolnir?

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