**Neural Artistic Style Transfer**

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1. **Introduction**  
     
    Deep neural networks have shown astonishing results in object recognition and detection, some of the models are achieved near human level performance. However, when the task is to generate artistic artifacts, deep neural network is far behind. This project takes advantage of pre-trained convolutional neural networks and combine famous artistic style references to generate arts. The rest of the proposal will discuss the motivation, the project summary, the project details and the conclusion.
2. **Motivation**  
     
    Art is an expression of the authors imaginative or technical skills. In 40,800 BP some art drawing was discovered in a cave in Spain called El Castillo[]. Humans already mastered the skills to create expressions to represent things. However, how machine can replicate this process through algorithms with similar capabilities is unknown.  
     
   There are existing solutions to the neural style transfer problem. The paper by Gatys, Ecker and Bethge use the representation of an image in a pertained VGG-Network to obtain the representation of an input image and a style image. The representations are used to generate a combination image which contains the content of the input image and the style of the style image through an optimization technique. The problem of generating stayed image through an optimization process is the computation time, because optimization is iterative.Another approach to solve this problem it to use an untrained image transformation network to generate the best guess at an appealing pastiche image. Then pass the pastiche image, the content image and the style image to a pre-trained image classification network. The possible improvements to neural style transfer is to find a way to control how much you want the style or preserve the content in your output image. Also, it is important to preserve the local pixel information from the previous image frames when applying style transfer to video.
3. **Project Summary**  
     
   This project will explore the optimization method generate styled image using a pertained VGG-network. The means only the content image data and the style image data is needed. Training an image classification network using imagine dataset is not necessary at this point. And make improvements on how to control the amount of style and content when generating styled image.
4. Project Details Architecture and Environment(More to be added in this section)  
     
    Since the project does not require to train a new image classification network the computation seems reasonable and feasible for the project(More detailed analysis needed).  
     
    Things I know so far: General Architecture of Convolution Neural Networks, like different layers, for example convolution layer, pooling layer and ect.

Things that I don’t know: architectures of CNN for image classification.(More to be added)  
  
  
 Papers that I would like to present:  
  
 [1] A Neural Algorithm of Artistic Style: <https://arxiv.org/pdf/1508.06576.pdf> [2] Perceptual Losses for Real-Time Style Transfer and Super-Resolution  
<https://arxiv.org/pdf/1603.08155.pdf> [3] Real-Time Neural Style Transfer for Videos  
<http://openaccess.thecvf.com/content_cvpr_2017/papers/Huang_Real-Time_Neural_Style_CVPR_2017_paper.pdf>

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| Timeline | Task | Start and end date |
| Week 1 | Background Reading | June,2 |
| Week 2 | Explore VGG-network(VGG-16 or VGG-19) |  |
| Week 3 | Explore and Implement the methods in the papers(optimization method and feed-foward method) |  |
| Week 4 | Continuing implementation if not done |  |
| Week 5 | Improve existing methods |  |
| Week 6 | Tuning the algorithm |  |
| Week 7 | TBA |  |

1. Conclusion(TBA)
2. References:

Gatys, L.A., Ecker, A.S., Bethge, M.: Texture synthesis using convolutional neural networks. In: Advances in Neural Information Processing Systems 28. (May 2015)

Gatys, L.A., Ecker, A.S., Bethge, M.: A neural algorithm of artistic style. arXiv preprint arXiv:1508.06576 (2015)  
  
J. Johnson, A. Alahi, and L. Fei-Fei. Perceptual losses for real-time style transfer and super-resolution. In Proc. ECCV, 2016.  
  
H.Huang, H. Wang, W.Luo, L.Ma, W. Jiang, X. Zhu, Z. Li, W. Liu,. Real-Time Neural Style Transfer for Videos. http://openaccess.thecvf.com/content\_cvpr\_2017/papers/Huang\_Real-Time\_Neural\_Style\_CVPR\_2017\_paper.pdf