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## Analyzing the Latent Space of GAN through Local Dimension Estimation

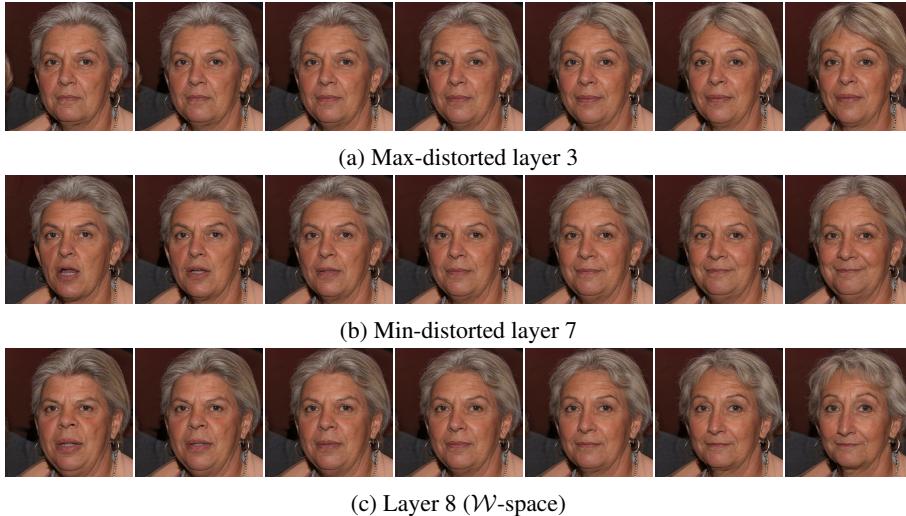
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Anonymous Authors<sup>1</sup>

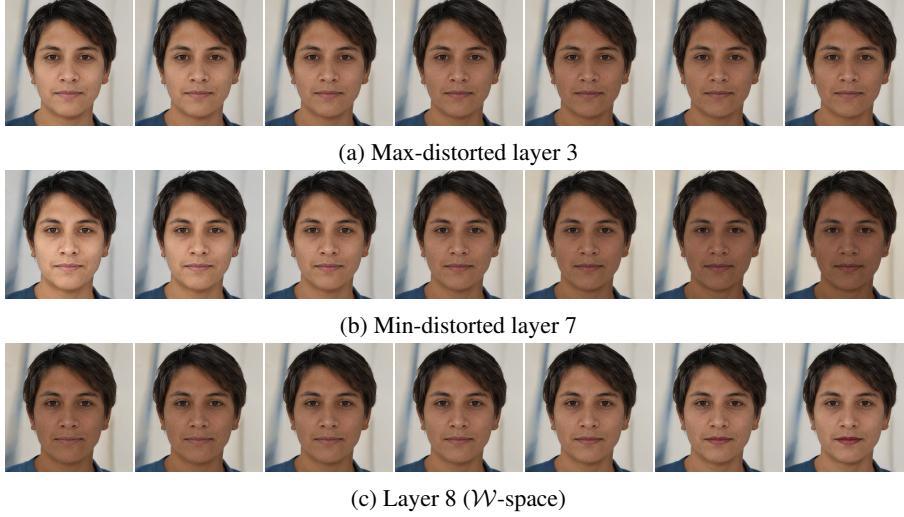
### 1. Comparison of Semantic Disentanglement

Using our Distortion metric, we chose the Max-distorted layer 3 and Min-distorted layer 7 from the mapping network of StyleGAN2-FFHQ (Karras et al., 2020). These two layers are compared with the renowned  $\mathcal{W}$ -space (layer 8). Each image traversal is obtained by perturbing a latent variable along the global basis from GANSpace (Härkönen et al., 2020).

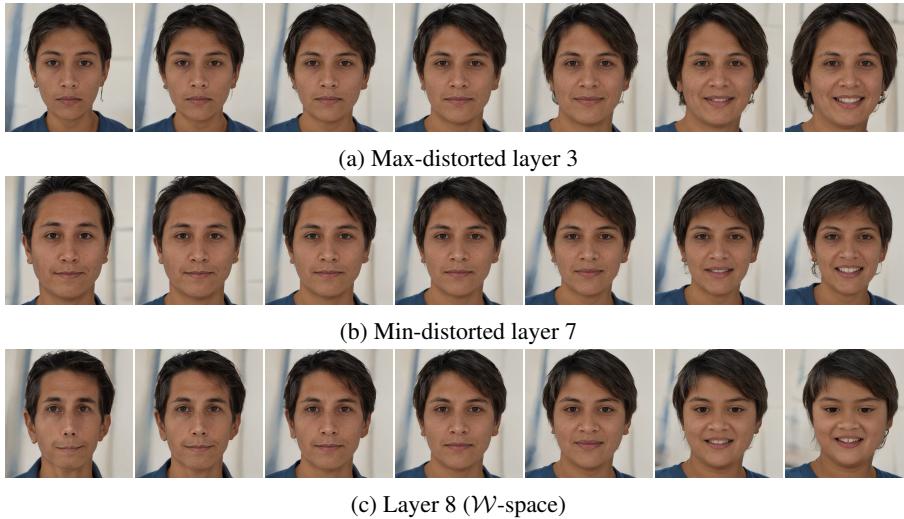


039 Figure 1: **Comparison of Semantic Disentanglement between Layers 3, 7, 8** for the semantic "Open Mouth". Layer 7  
040 exhibits a disentangled semantic variation of "Open mouth" without changing the face, such as a longer nose in Layer 8.  
041 Layer 3 shows only minor facial expression changes.

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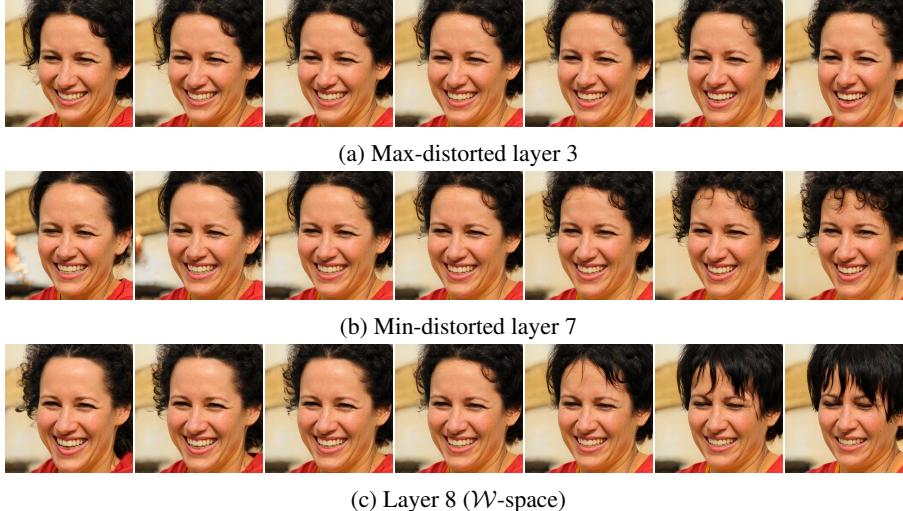
075 **Figure 2: Comparison of Semantic Disentanglement between Layers 3, 7, 8** for the semantic "Face Bright". Layer 8  
076 shows an entangled semantic variation of "Lipstick" and "Face Bright" on the right end. On Layer 3, the traversal toward  
077 the right end does not show "Face Dark" semantics.  
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103 **Figure 3: Comparison of Semantic Disentanglement between Layers 3, 7, 8** for the semantic "Gender". On Layer 3, the  
104 image traversal shows an entangled semantic variation of "Gender" and "Big face" on the right end. Also, Layer 8 exhibits  
105 an entangled semantic variation of "Gender" and "Age".  
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130 **Figure 4: Comparison of Semantic Disentanglement between Layers 3, 7, 8** for the semantic "Light Up". Layer 8  
131 exhibits an entangled semantic variation of "Light Down" and "Brown hair" on the right end. On the left end of Layer 3,  
132 the traversal shows the "Bright right" transformation. However, the traversal at the right end of Layer 3 does not present the  
133 "Bright left" transformation, while showing no shadow on the face. But, the traversal on Layer 7 shows a natural brightness  
134 change on the entire face.



158 **Figure 5: Comparison of Semantic Disentanglement between Layers 3, 7, 8** for the semantic "Curly hair". Layer 8  
159 presents the "Bang hair" transformation on the right, which is not the negative of "Curly hair". However, Layer 7 achieves  
160 the "Straight hair" transformation on the left. Layer 3 presents a minor variation of "Curly hair" compared to Layer 7.

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**References**

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