Summary

- Recent deep image generation models, such as StyleGAN2, has confronted with the challenge of synthesizing 2D face images with multi-view consistency.
- By leveraging StyleGAN2 as 3D generator, we achieved:
  - View-Consistent face image generation
  - The 3D face model synthesized from our latent codes are compatible to the original StyleGAN2 latent space
  - Provide explicit face attribute control over generated face
  - Synthesize 3D-applicable face for downstream tasks

Method

- **Style to 3Dcoeffs**
  - Fit 3DMM coefficients from StyleGAN2 generated face image
  - Train a module \( \phi_{3D} \) to estimate 3DMM coefficients given stylecode

- **Gradient mask**
  - Differentially render parameterized face model brings gradient at visible region in texture

- **Multi-view consistency**

- **Smooth transition**

Experiment and results

- **Experiments and results**

Pipeline

Loss function

- Reconstruction loss w/ gradient mask
  \[
  L_{\text{rec}} = L_{\text{photo}} + \lambda_{\text{percept}} L_{\text{percept}}
  \]

- GAN loss
  \[
  L_{\text{GAN}} = L_{\text{GAN}} + \lambda_{\text{rec}} L_{\text{rec}}
  \]

- Multi-view consistency loss
  \[
  L_{\text{multi}} = L_{\text{GAN}} + \lambda_{\text{multi}} L_{\text{sym}}
  \]

3D Generator

- **3D Generator**

Explicit attribute control

- **Explicit attribute control**