**Age Progression/Regression by Conditional Adversarial Autoencoder**

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**Motivation:**

- Regression
- Given face
- Progression
- 10
- 20
- 35 years old
- 40
- 60

**Existing works:**

- Group-wised learning
- Query with label
- Query without label
- Step-to-step transition
- One-step transition
- Progression by adding texture

**Ours:**

- Main Idea --- Manifold Traversing:

**Approach:**

- Graphs and diagrams showing the architecture of the model.

**Main Idea --- Manifold Traversing:**

- Training --- mainly three losses:
  - Reconstruction loss $L_{\text{const}}(E, G) = \|x - G(E(x, l))\|_2$
  - Adversarial loss on latent variable $L_{\text{adv}_z}(E, D_z)$
    
    
    $L_{\text{adv}_z}(E, D_z) = E_{x \sim p_{\text{data}}} \log \left(1 - D_z(E(x))\right) - E_{z \sim \text{noise}} \log D_z(z)$
  - Adversarial loss on image $L_{\text{adv}_\text{img}}(G, D_{\text{img}})$
    
    
    $L_{\text{adv}_\text{img}}(G, D_{\text{img}}) = E_{x \sim p_{\text{data}}} \log \left(1 - D_{\text{img}}(G(E(x), l))\right) - \log D_{\text{img}}(x, l)$

**Results:**

- Qualitative Comparison:
  - Compare to prior --- the BEST result achieved by existing works

- Quantitative Comparison:
  - Totally, 124 subjects, and 4716 valid votes
  - Each survey has 45 questions randomly selected from over 1000 questions

<table>
<thead>
<tr>
<th>Better than prior?</th>
<th>Same to ground truth?</th>
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<tbody>
<tr>
<td>Yes</td>
<td>52.77%</td>
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<tr>
<td>No</td>
<td>28.99%</td>
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<tr>
<td>Not sure</td>
<td>18.24%</td>
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