

# Yoga Pose Classification and Fake Pose Generation

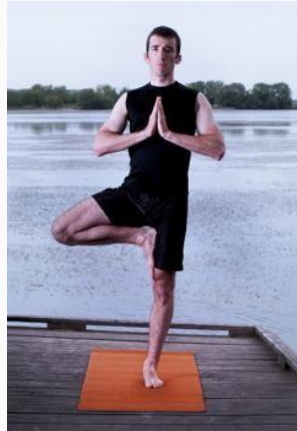


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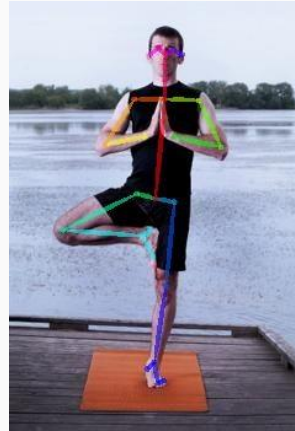
- **A dataset consisting of 2964 images of four different yoga poses is built**
  - Tree pose (Vrikshasana)
  - Mountain pose (Tadasana)
  - Warrior pose (Virabhadrasana)
  - Plank pose (Kumbhakasana)
  
- **[Link to dataset](#)**

# High level Block diagram - Pose classification and Generation



Raw Image

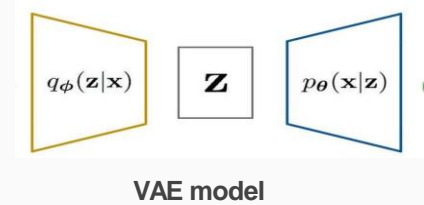
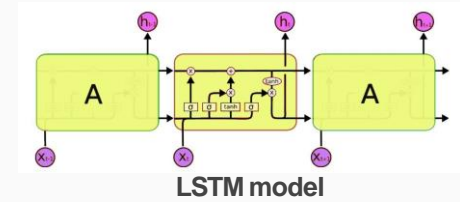
Body Points  
Identification



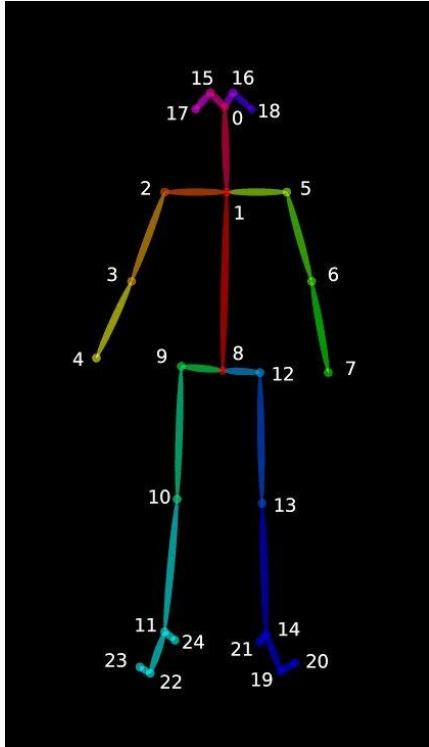
Processed Image

Pose  
Classification

Pose  
Generation



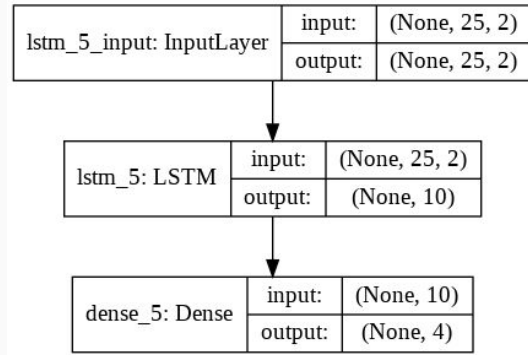
# Key point detection using OpenPose



- Trained on the COCO dataset and a foot dataset
- Capable of detecting 25 keypoints
  - 19 body key points
  - 6 foot key points

# Yoga Pose Classification

# LSTM model



[Link to cell with LSTM Code](#)

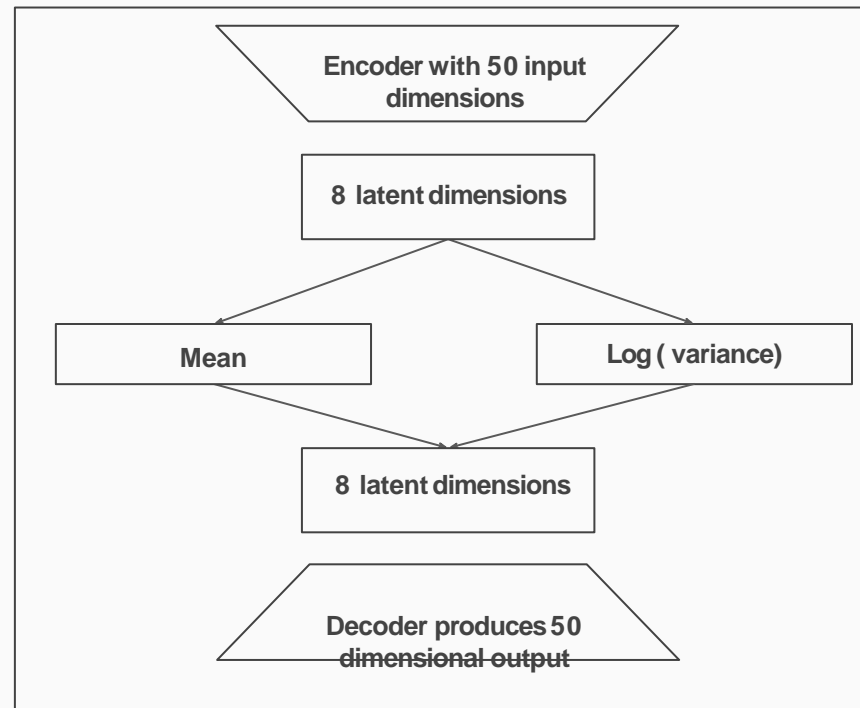
- **Loss function: Categorical Cross Entropy**
- **Optimizer: Adam**

Model	Accuracy	Validation Accuracy
LSTM model	92.24%	92.90%

# Fake Pose Generation

# Variational AutoEncoder

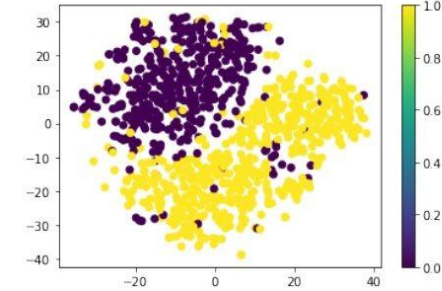
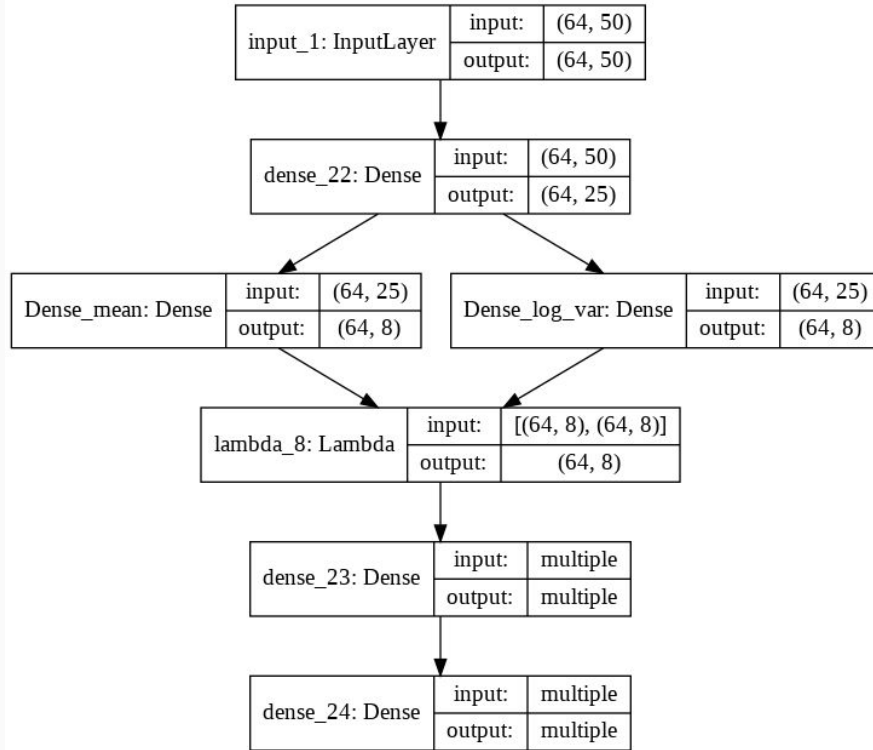
- **Latent dimensions: 8**
- **Input: Flattened array of X and Y coordinates**
- **Trained for 2 classes of input**



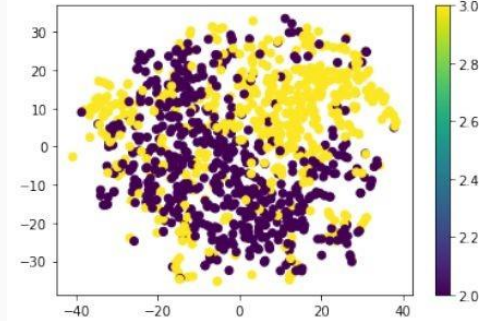
$$Loss = -30 * \sum_i^m (y_i \ln a_i + (1 - y_i) \ln(1 - a_i)) - 0.5 * ((\ln \sigma^2) + 1 - \nu^2 - \sigma^2)$$



# Variational AutoEncoder - Architecture

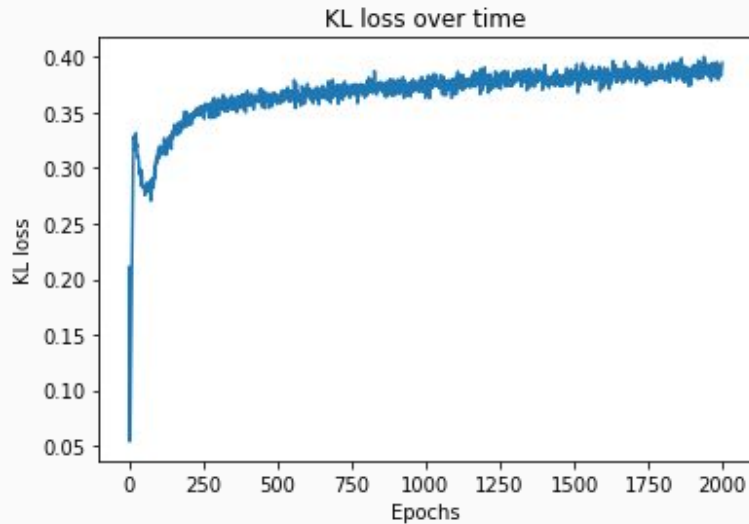


(b) TSNE plot for latent space of warrior + tree pose



(a) TSNE plot for latent space of Mountain + plank pose

# Variational AutoEncoder - Results



[Link to cell](#)

Data	Loss	Validation Loss	KL Loss
Mountain + Plank poses	18.50	18.58	0.395
Warrior + Tree poses	18.81	18.79	0.33

Table 1: Performance of 2 class flattened model

# Variational AutoEncoder - Latent Space interpolation

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## Algorithm 1: Latent space Interpolation

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Encoder(Input features);

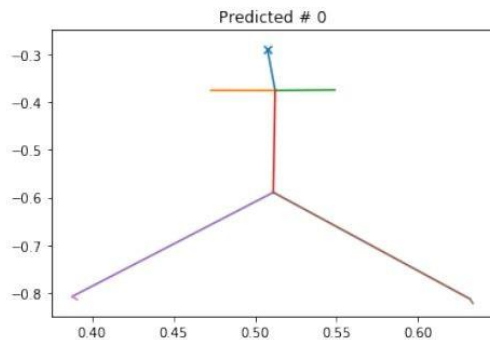
Obtain centroid for 2 different classes of input, say  $Z_a$  and  $Z_b$ . This will correspond to two different yoga poses;

Find the difference vector between the centroids, say  $Z_{diff}$ ;

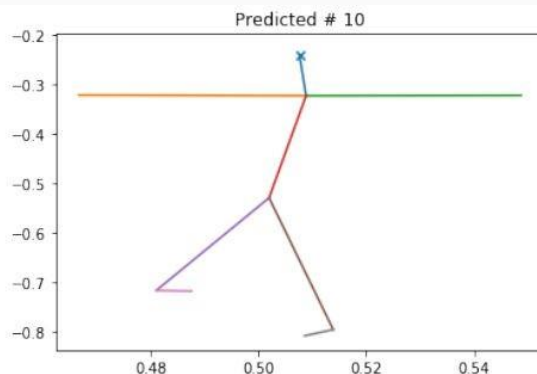
Generate new samples in latent space using  $Z_{new} = Z_b + \alpha * Z_{diff}$  ( $0 < \alpha < 1$ );

Decoder( $Z_{new}$ );

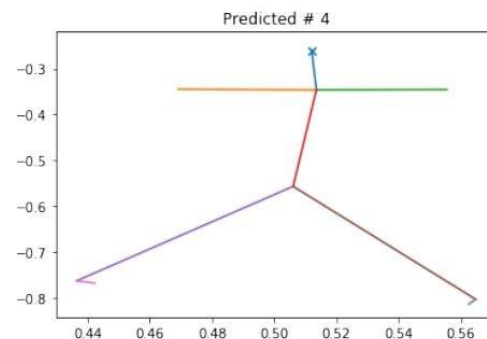
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Warrior Pose  
(Virabhadrasana)

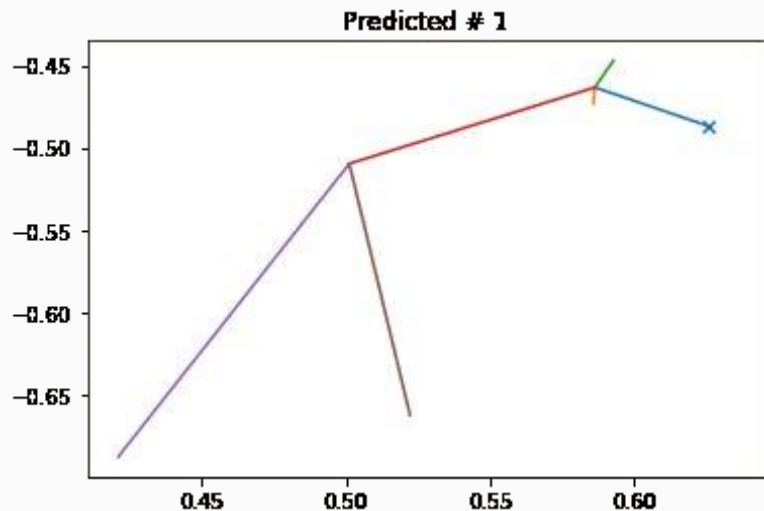


Tree Pose (Vrikshasana)

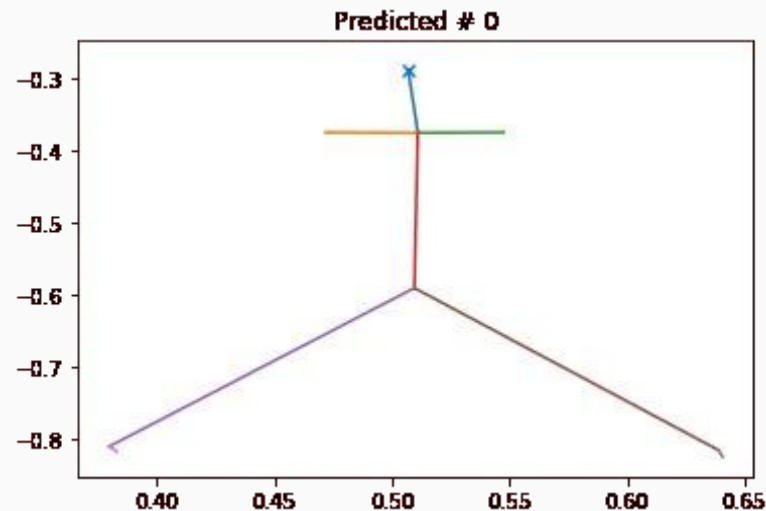


Intermediate/Fake Pose

# Variational AutoEncoder - Transition from Tadasana to Kumbhakasana



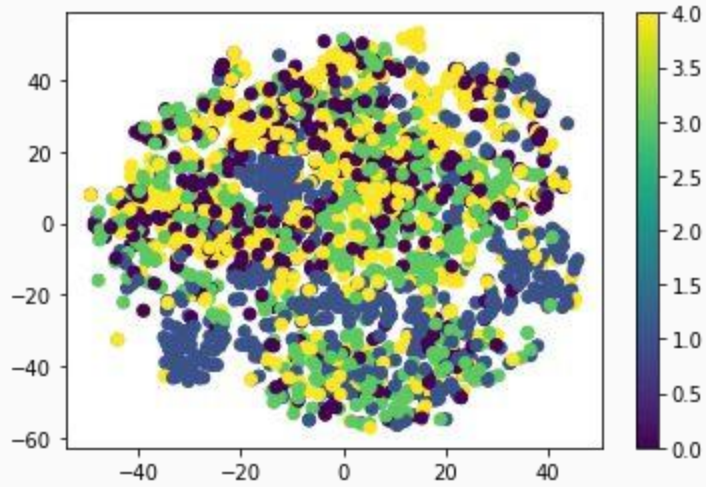
Transition GIF from Plank pose to Mountain pose



Transition GIF from Warrior pose to Tree pose

# Pose Generation for four classes of input

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Poor quality latent space

Codebase: <https://github.com/tej-prash/yoga-pose-classification-system>

Detailed Report: <https://drive.google.com/file/d/1G3OAHLMwPKEZZLB8-EPNqTczv8oK9IV/view?usp=sharing>