We test the DS model for pose estimation on the "Buffy the Vampire Slayer" data set.

**Introduction**

Pictorial Structures (PS) models do not represent shape deformations induced by pose.

**Contribution:** Deformable Structures (DS) are a generative model of 2D human shape that can represent pose-dependent shape deformations.

**Training data**

Training contours are derived by SCAPE, a realistic, parametric 3D model of articulated human shape, projecting random poses with random cameras.

The model is gender and person specific.

**Model**

\[ p(L|θ) = \frac{1}{Z} \prod_{i=1}^{Ld} \phi_{li}(l_i) \prod_{i<j \in K} \psi_{ij}(l_i, l_j(θ_{ij})) \]

- \( l_i = (c_i, θ_i, z_i) \)
- \( c_i = \) location, \( θ_i = \) orientation, \( z_i = \) shape.

**Shape representation**

\[
\begin{align*}
\mathbf{s}_i &= \text{contour points}, \\
\mathbf{p}_i &= \text{joint points}, \\
\mathbf{z}_i &= \text{PCA coefficients}, \\
\mathbf{n}_i &= \text{mean shape}, \\
\mathbf{B}_i &= \text{basis components}.
\end{align*}
\]

**Probabilistic model**

\[
\psi_{ij}(l_i, l_j(θ_{ij})) = N(\mathbf{z}_j, \sin(θ_{ij}), \cos(θ_{ij}), \mathbf{q}_{ij}, t_j, t_i, μ_{ij}, Σ_{ij})
\]

- \( θ_{ij} = \) relative angle, \( t_i = \) part lengths, \( \mathbf{q}_{ij} = \) vector between joint points.

**Sampling**

- \( \theta_{ij} = \) output of a linear SVM classifier, \( a_i \) and \( b_i = \) calibration parameters, \( h_i = \) set of HOG descriptors computed at contour locations and steered along the contour direction.

\[
\phi_{\text{contour}}(l_i) = \frac{1}{1 + \exp(a_i f_i(l_i) + b_i)}
\]

**Likelihood**

\[
\phi_{\text{color}}(l_i) = \prod_{r \in h(l_i)} \text{hist}(r)
\]

- \( \text{hist} = \) histogram of skin colors or upper body colors.

**Inference**

Due to the high dimensional variables and continuous state space, inference is performed with a particle-based version of Max-Product BP.