GENERATE RNN

Stroke Data (5D, length ≈ 200) $[\Delta x, \Delta y, p1, p2, p3]_{t=0}$, $[\Delta x, \Delta y, p1, p2, p3]_{t=1}$ $[\Delta x, \Delta y, p1, p2, p3]_{t=2999}$ **Preprocessing** Normalize & Center Padding & Truncate Tensors [T,5] Bi directional LSTM $[\Delta x, \Delta y, p1, p2, p3]_{t=0}$ $[\Delta x, \Delta y, p1, p2, p3]_{t=1}$, $[\Delta x, \Delta y, p1, p2, p3]_{t=2}$ $[\Delta x, \Delta y, p1, p2, p3]_{t=199}$ Forward $h_{fwd} \in \mathbb{R}^{256}$ Backward $h_{bwd} \in \mathbb{R}^{256}$ $h_{encoder} = [h_{fwd}, h_{bwd}]$ Two Linear Heads Linear μ $\log \sigma^2 = w_{\log \sigma^2} h_{encoder} + b_{\log \sigma^2}$ $\mu = w_\mu h_{encoder} + b_\mu \in \mathbb{R}^{128}$ $\sigma = exp \ (0.5 \ * \log \sigma^2) \in \mathbb{R}^{128}$ Reparameterization 1. Object layout $Z = \mu + \sigma \cdot \epsilon \in \mathbb{R}^{128}$ 2. Aspect ratio 3. Overall style ... { $[\Delta x, \Delta y, p1, p2, p3]_{t=0}, Z$ } $[\Delta x, \Delta y, p1, p2, p3]_{t=0}, Z$ $[\Delta x, \Delta y, p1, p3, p3]_{t=1}, Z$ **LSTM** Mixture density Network $M * \{ \mu_x, \mu_y, \sigma_x, \sigma_y, \rho, \pi \} + 3 logits (p1, p2, p3)$ $\{\mu_x, \mu_y, \sigma_x, \sigma_y, \rho, \pi\} + 3 logits (p1, p2, p3)$ $\{\mu_x, \mu_y, \sigma_x, \sigma_y, \rho, \pi\} + 3 logits (p1, p2, p3)$ M = 20 possibilities $\{\,\mu_x\,,\mu_y\,,\sigma_x,\sigma_y,\rho\,,\pi\,\} + 3\,logits\,\,(\texttt{p1},\texttt{p2},\texttt{p3})$ $\{\mu_x, \mu_y, \sigma_x, \sigma_y, \rho, \pi\} + 3 logits (p1, p2, p3)$ Pick component with arg max (π_m) Feed this back Sample $(\Delta x, \Delta y) \sim \text{Normal } (\mu_m, \sigma_m)$ into the LSTM Sample pen state from softmax (p1, p2, p3) for the next time step, until p3 = 1Next stroke = $[\Delta x, \Delta y, p1, p2, p3]$