$$\mathbf{W}_i^{(j)}(x) = diag([{}_i^{(j)}\sigma_x^2,\ {}_i^{(j)}\sigma_y^2,\ {}_i^{(j)}\sigma_\theta^2,\ {}_i^{(j)}\sigma_v^2)],\ \ j = 1, 2, 3,\ \ i = 1, 2, 3, 4. \tag{1}$$

0.1 Two-Component Gaussian Mixtures $p^{(a)}$

$$p^{(a)}(\mathbf{x}) = 0.5\mathcal{N}(\mathbf{0}, \mathbf{W}_\mathbf{1}^{(\mathbf{1})}(\mathbf{x})) + 0.5\mathcal{N}(\mathbf{0}, \mathbf{W}_\mathbf{2}^{(\mathbf{1})}(\mathbf{x})) \tag{2}$$

$${}_1^{(1)}\sigma_x^2 = \begin{cases} 0.002 \times (\sin x + 1.0) & 2.0 \le x \le 3.0 \\ 0.002 & \text{otherwise} \end{cases} \tag{3}$$

$${}_1^{(1)}\sigma_y^2 = \begin{cases} 0.002 \times (\sin y + 0.5) & 2.0 \le y \le 3.0 \\ 0.002 & \text{otherwise} \end{cases} \tag{4}$$

$${}_2^{(1)}\sigma_x^2 = \begin{cases} 0.003 \times (\sin x + 1.0) & 2.0 \le x \le 3.0 \\ 0.003 & \text{otherwise} \end{cases} \tag{5}$$

$${}_2^{(1)}\sigma_y^2 = \begin{cases} 0.003 \times (\sin y + 0.5) & 2.0 \le y \le 3.0 \\ 0.003 & \text{otherwise} \end{cases} \tag{6}$$

$$\begin{aligned} {}_1^{(1)}\sigma_\theta^2 = 1.0e^{-4},\ \ {}_1^{(1)}\sigma_v^2 = 1.0e^{-3} \\ {}_2^{(1)}\sigma_\theta^2 = 1.0e^{-4},\ \ {}_2^{(1)}\sigma_v^2 = 4.0e^{-3} \end{aligned} \tag{7}$$

0.2 Three-Component Gaussian Mixtures $p^{(b)}$

$$\begin{aligned} p^{(b)}(\mathbf{x}) = 0.6\mathcal{N}(\mathbf{0}, \mathbf{W}_\mathbf{1}^{(\mathbf{2})}(\mathbf{x})) + 0.3\mathcal{N}(\mathbf{0}, \mathbf{W}_\mathbf{2}^{(\mathbf{2})}(\mathbf{x})) + \\ 0.1\mathcal{N}(\mathbf{0}, \mathbf{W}_\mathbf{3}^{(\mathbf{2})}(\mathbf{x})) \end{aligned} \tag{8}$$

$${}_1^{(2)}\sigma_x^2 = \begin{cases} 0.001 \times (2.0x + 1.0) & 2.0 \le x \le 3.0 \\ 0.001 & \text{otherwise} \end{cases} \tag{9}$$

$${}_1^{(2)}\sigma_y^2 = \begin{cases} 0.001 \times (2.0y + 1.0) & 2.0 \le y \le 3.0 \\ 0.001 & \text{otherwise} \end{cases} \tag{10}$$

$${}_2^{(2)}\sigma_x^2 = \begin{cases} 0.003 \times (2.0x + 1.0) & 2.0 \le x \le 3.0 \\ 0.002 & \text{otherwise} \end{cases} \tag{11}$$

$${}_2^{(2)}\sigma_y^2 = \begin{cases} 0.003 \times (2.0y + 1.0) & 2.0 \le y \le 3.0 \\ 0.002 & \text{otherwise} \end{cases} \tag{12}$$

$${}_3^{(2)}\sigma_x^2 = \begin{cases} 0.005 \times (2.0x + 1.0) & 2.0 \le x \le 3.0 \\ 0.003 & \text{otherwise} \end{cases} \tag{13}$$

$$ {}^{(2)}_{3}\sigma_y^2 = \begin{cases} 0.005 \times (2.0y + 1.0) & 2.0 \leq y \leq 3.0 \\ 0.003 & \text{otherwise} \end{cases} \tag{14} $$

$$ \begin{aligned} {}^{(2)}_{1}\sigma_\theta^2 &= 1.0e^{-4}, \;\; {}^{(2)}_{1}\sigma_v^2 = 1.0e^{-3} \\ {}^{(2)}_{2}\sigma_\theta^2 &= 1.0e^{-4}, \;\; {}^{(2)}_{2}\sigma_v^2 = 4.0e^{-3} \\ {}^{(2)}_{3}\sigma_\theta^2 &= 4.0e^{-4}, \;\; {}^{(2)}_{3}\sigma_v^2 = 4.0e^{-3} \end{aligned} \tag{15} $$

0.3 Four-Component Gaussian Mixtures $p^{(c)}$

$$ \begin{aligned} p^{(c)}(\mathbf{x}) = 0.3\mathcal{N}(\mathbf{0}, \mathbf{W}_{\mathbf{1}}^{(\mathbf{3})}(\mathbf{x})) + 0.3\mathcal{N}(\mathbf{0}, \mathbf{W}_{\mathbf{2}}^{(\mathbf{3})}(\mathbf{x})) + \\ 0.2\mathcal{N}(\mathbf{0}, \mathbf{W}_{\mathbf{3}}^{(\mathbf{3})}(\mathbf{x})) + 0.2\mathcal{N}(\mathbf{0}, \mathbf{W}_{\mathbf{4}}^{(\mathbf{3})}(\mathbf{x})) \end{aligned} \tag{16} $$

$$ {}^{(3)}_{1}\sigma_x^2 = 0.001 \times (5 - \sqrt{|x|}) \tag{17} $$

$$ {}^{(3)}_{1}\sigma_y^2 = 0.001 \times (5 - \sqrt{|y|}) \tag{18} $$

$$ {}^{(3)}_{2}\sigma_x^2 = 0.002 \times \frac{6}{x + 1.0} \tag{19} $$

$$ {}^{(3)}_{2}\sigma_y^2 = 0.002 \times \frac{6}{y + 1.0} \tag{20} $$

$$ {}^{(3)}_{3}\sigma_x^2 = \begin{cases} 0.003 \times (x + 1.0) & 2.0 \leq x \leq 3.0 \\ 0.003 & \text{otherwise} \end{cases} \tag{21} $$

$$ {}^{(3)}_{3}\sigma_y^2 = \begin{cases} 0.003 \times (y + 1.0) & 2.0 \leq y \leq 3.0 \\ 0.003 & \text{otherwise} \end{cases} \tag{22} $$

$$ {}^{(3)}_{4}\sigma_x^2 = 0.004 \tag{23} $$

$$ {}^{(3)}_{4}\sigma_y^2 = 0.004 \tag{24} $$

$$ \begin{aligned} {}^{(3)}_{1}\sigma_\theta^2 &= 1.0e^{-4}, \;\; {}^{(3)}_{1}\sigma_v^2 = 1.0e^{-3} \\ {}^{(3)}_{2}\sigma_\theta^2 &= 1.0e^{-4}, \;\; {}^{(3)}_{2}\sigma_v^2 = 4.0e^{-3} \\ {}^{(3)}_{3}\sigma_\theta^2 &= 1.0e^{-4}, \;\; {}^{(3)}_{3}\sigma_v^2 = 4.0e^{-3} \\ {}^{(3)}_{4}\sigma_\theta^2 &= 4.0e^{-4}, \;\; {}^{(3)}_{4}\sigma_v^2 = 4.0e^{-3} \end{aligned} \tag{25} $$