Supplementary Materials: Inversion of Nighttime PM2.5 Mass Concentration in Beijing Based on the VIIRS Day-Night Band. *Atmosphere* 2016, 7, 136.

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The link weight and threshold value of BP neural network are initialized as random number [−0.5, 0.5] by using MATLAB neural network toolbox. Neurons inside the hidden layer adopt S-type transfer function $\mathrm{tansig} = \dfrac{2}{1 + e^{-2x}} - 1$, and neurons inside the output layer adopt the linear transfer function $\mathrm{purelin} = x$. The number of neurons inside the hidden layer has a major impact on network performance. In the 3-layer network, the number of neurons inside the input layer is m, the number of neurons inside the hidden layer is l, and the number of neurons inside the output layer is n. When l meets $2m^{1/2} + n < l < 2m + 1$, the effect is desirable. In this paper, $m = 6$, $n = 1$, and hence, l is identified from 5 to 13 preliminary. Through the subsequent network training and performance evaluation, the optimum number of neutrons inside the hidden layer is selected as 13. Thus, the structure of BP neural network can be set as 6-13-1 (as shown in Figure S1).
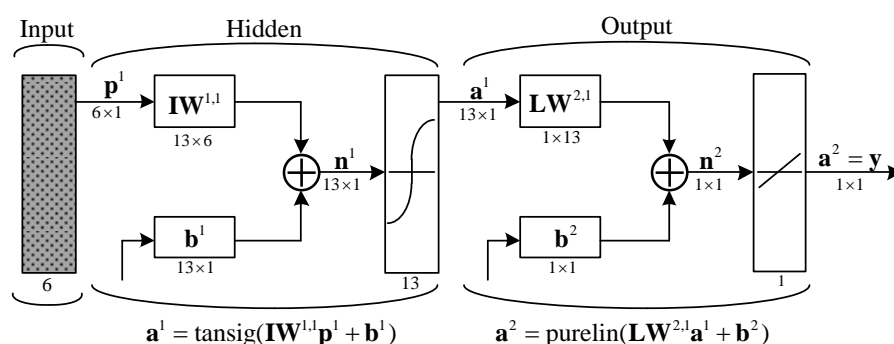

$$\mathbf{a}^1 = \mathrm{tansig}(\mathbf{IW}^{1,1}\mathbf{p}^1 + \mathbf{b}^1) \qquad \mathbf{a}^2 = \mathrm{purelin}(\mathbf{LW}^{2,1}\mathbf{a}^1 + \mathbf{b}^2)$$

Figure S1. Structure of BP Neural Network.

In the figure, $\mathbf{p}^1$ is the input variable of BP network, $\mathbf{IW}^{1,1}$ is the weight matrix between neurons in input layer and in hidden layer, $\mathbf{b}^1$ is the threshold matrix of neurons in hidden layer, $\mathbf{a}^1$ is S-type transfer function in hidden layer, $\mathbf{LW}^{2,1}$ is the weight matrix between neurons in hidden layer and in output layer, $\mathbf{b}^2$ is the threshold matrix of neurons in output layer, $\mathbf{a}^2$ is the linear transfer function in output layer and $\mathbf{y}$ is the output result of BP network.