## The details of the neural network architectures

The ANN and CNN structures that we used in the present work are illustrated in Figs. 1 and 2, respectively. To build a metamodel for the 5×5 PCBs, we used a multilayer perceptron (MLP) feedforward neural network with four hidden layers. For the 10×10 ones, we used a CNN with ten convolutional (100 output filters of sizes 3×3 and 2×2) and one fully connected layer (100 nodes). We also considered one max pooling layer with kernel size of 1×1 and a flattening layer before the fully connected layer. We used multiple batch normalization and added two dropout layers with the rate of 0.2. For both networks, we applied ReLU activation function for all the layers except for the last hidden layer, which we used tanh activation function $(2/(1+e^{-2x})-1)$. We used Adam optimizer with learning rates of 0.0005 and 0.001 for the training of the ANN and CNN models, respectively. The constructed metamodels are available in GitHub at https://github.com/engML/CPS.

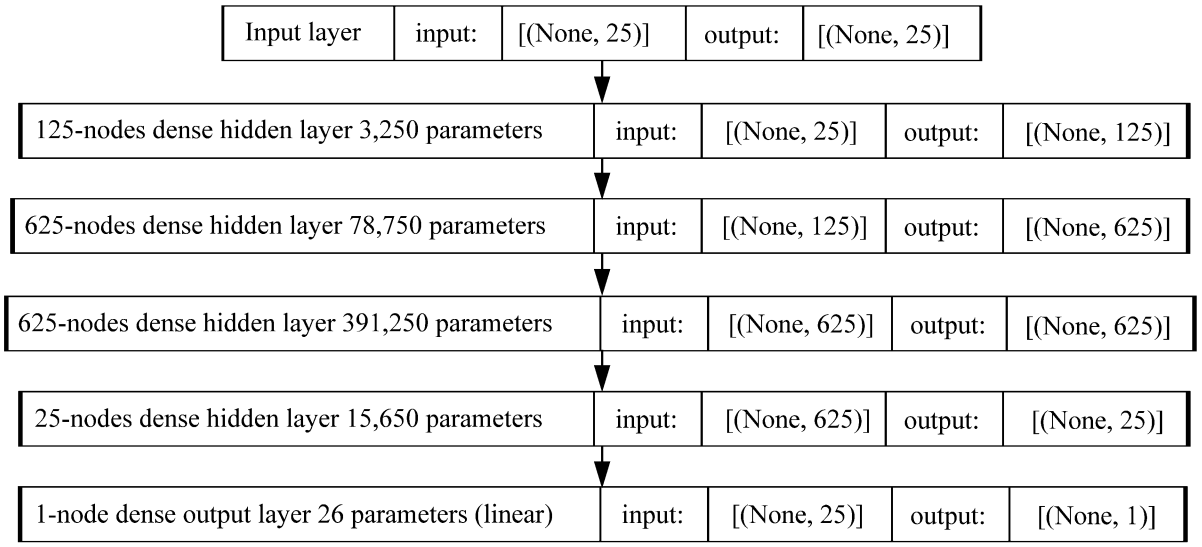


Fig. 1. The structures of the ANN with 488,926 trainable parameters for metamodeling the electrode configuration on the 5×5 PCB.

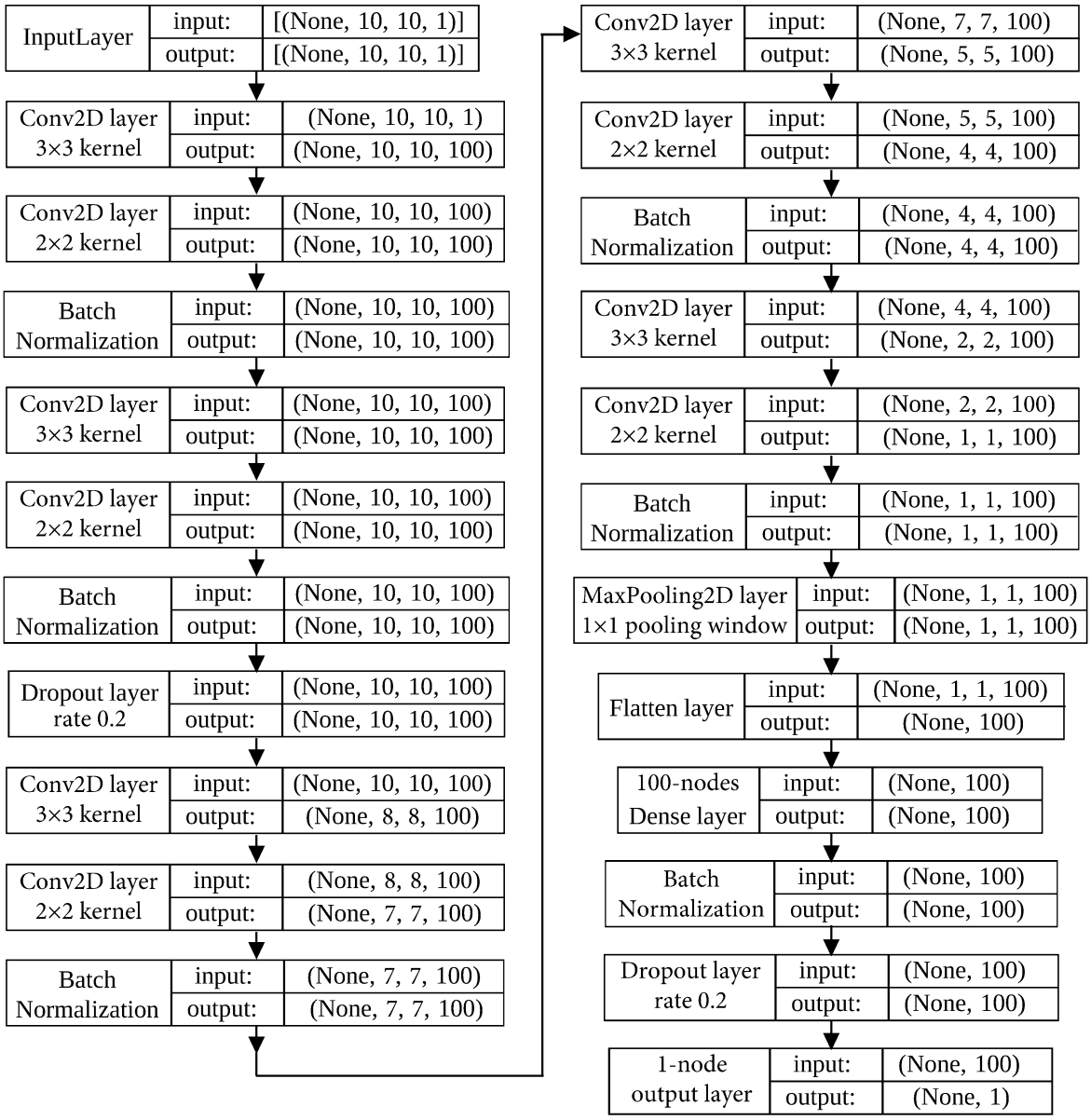


Fig. 2. The structures of the CNN used in the present study. The total trainable parameters of the network are 573,301.