

Supplementary Information

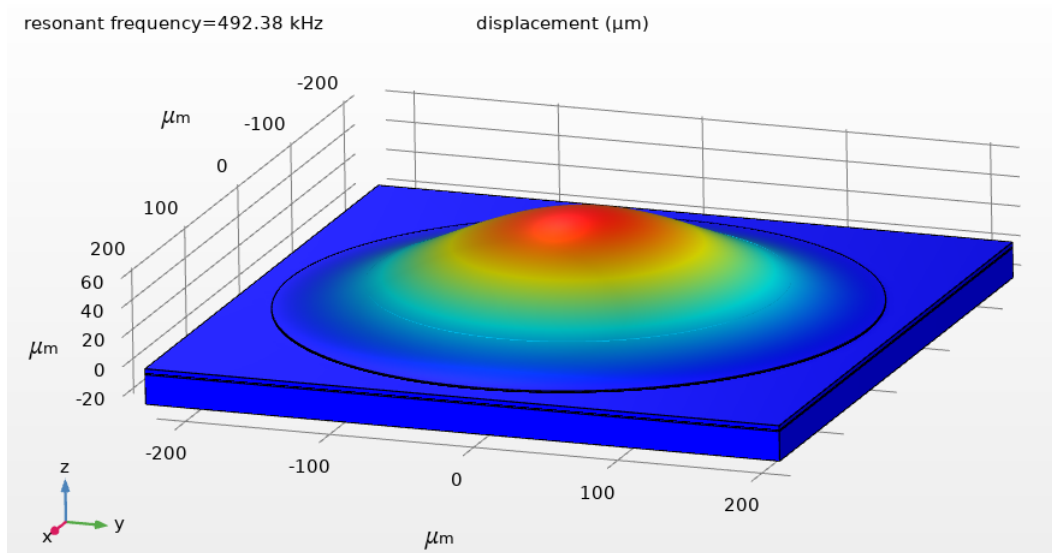
Noncontact human-machine interaction for air-writing with ultrasound technology

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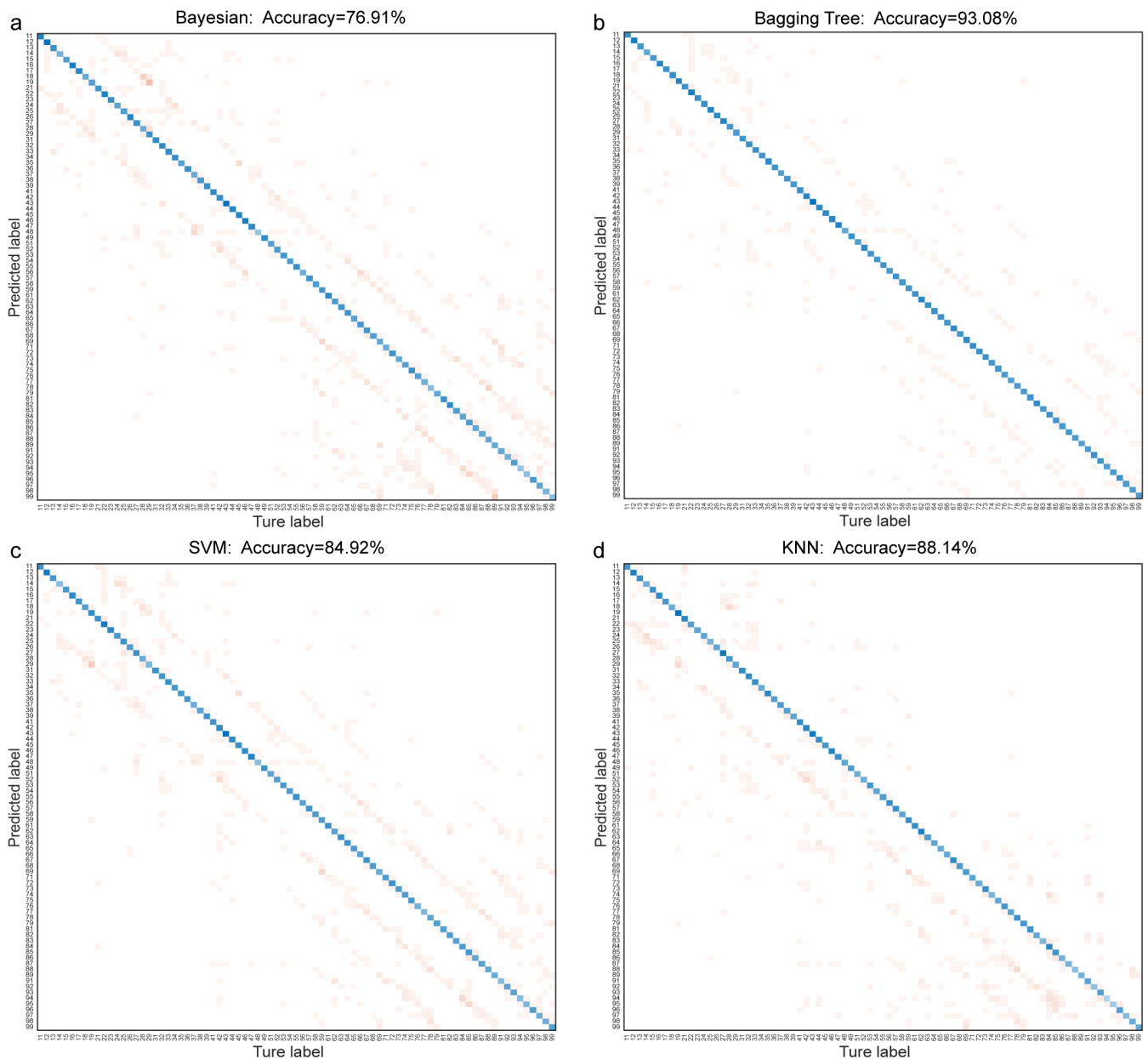
Supplementary Figures 1 to 4

Other Supplementary Information for this manuscript includes the following:

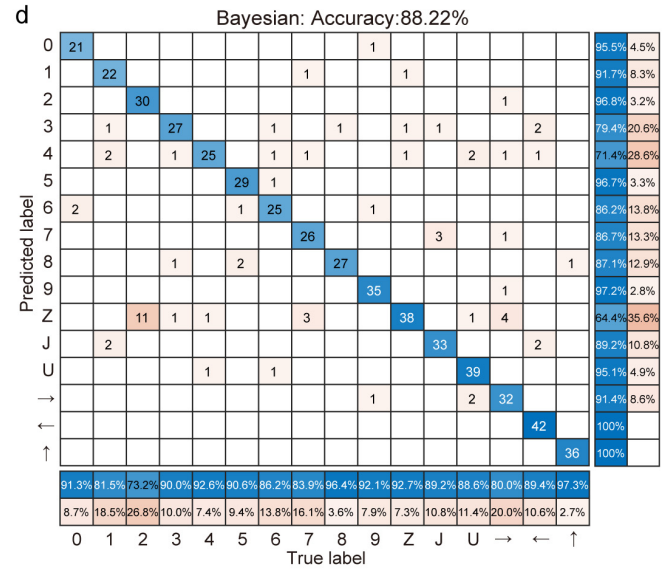
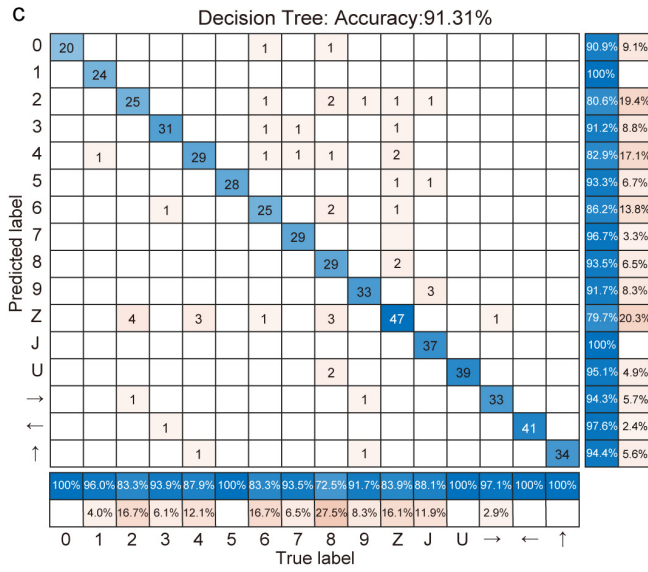
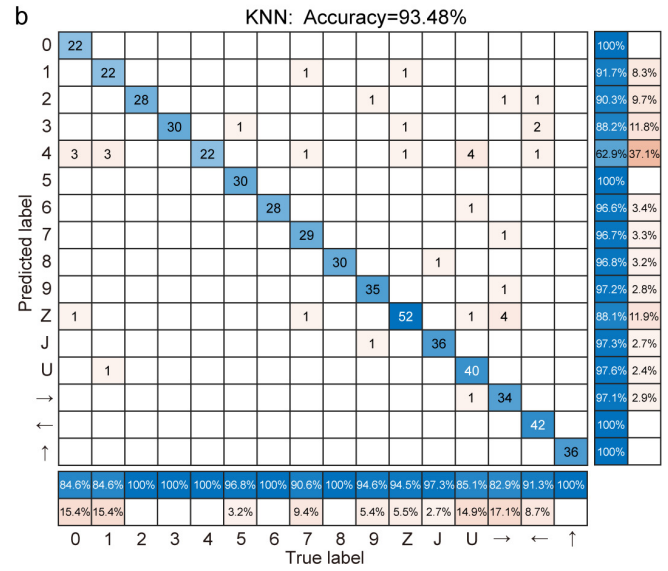
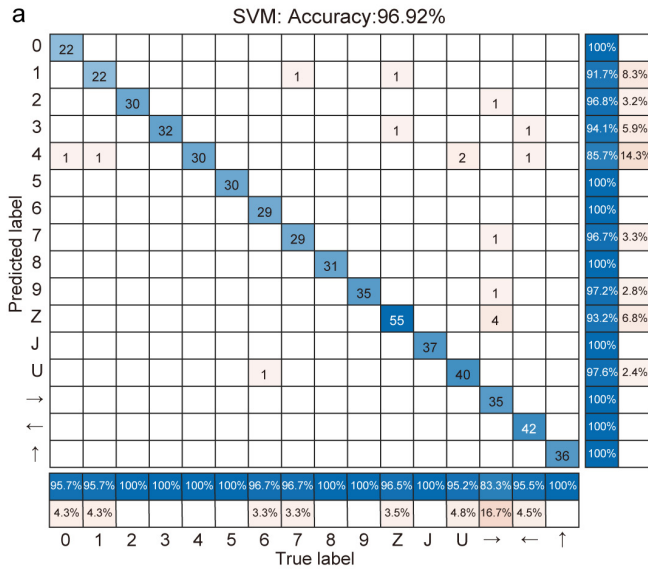
Supplementary Movies 1 to 2



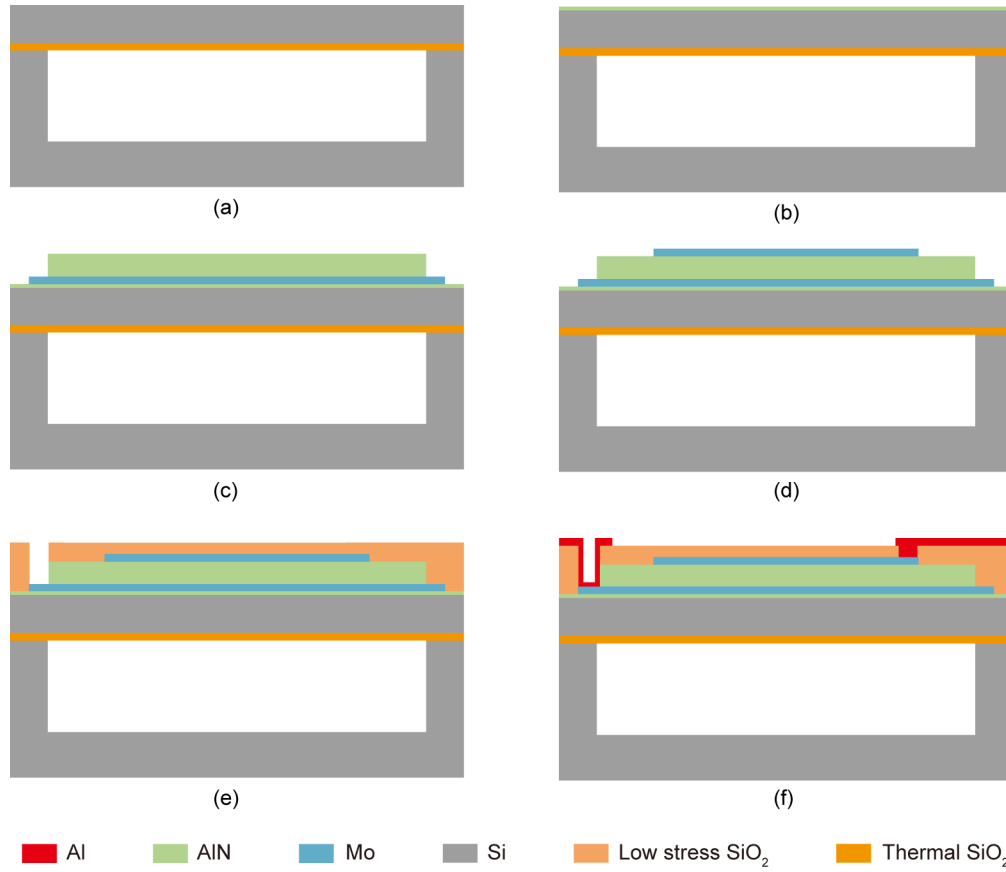
Supplementary Figure 1. Resonant frequency of a 400 μm diameter pMUT simulated by COMSOL. The geometry of the pMUT is shown in Supplementary Fig. 4, and the resonant frequency is about 492.38kHz when the diameter is 400 μm .



Supplementary Figure 2 Confusion matrixes of recognizing finger position based on four ML models. A total of 8,312 data sets are collected and trained using various models, such as **a** Bayesian, **b** bagging tree, **c** SVM, and **d** KNN models. And the bagging tree classifier with the highest accuracy achieve a cross-validation accuracy of 93.08%.



Supplementary Figure 3 Confusion matrixes of recognizing 16 gestures based on four ML models.
a SVM model (accuracy 96.92%). **b** KNN model (accuracy 93.48%). **c** Decision Tree (accuracy 91.31%). **d** Bayesian model (accuracy 88.22%).



Supplementary Figure 4 The fabrication process of the pMUT array. **a** The bare silicon wafer with a predefined cavity directly bonded to another SOI wafer. **b** Bottom Mo deposited and patterned. **c** AlN deposited and patterned. **d** Top Mo deposited and patterned. **e** Dielectric layer SiO₂ deposited and patterned. **f** Top Al inter connections and pads deposited and patterned.