## Supporting Information

## 2D-SnSe Film with Ferroelectricity and Its Bio-Realistic Synapse Application

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## I. Atomic structure diagram of the two-dimensional SnSe film

Figure S1. Top view, side view and front view of the 2D-SnSe film.

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Figure S2. XPS results of SnSe films for the full spectrum.

## **I**. Device electrical properties



Figure S3. Semi-logarithm I-V curves of the random nine device cells.



Figure S4. The statistical distribution of resistance.



Figure S5. HRS and LRS retention of the Au/SnSe/NSTO memristor.



Figure S6. (a, b) The potentiation and depression processes of the electronic 2D-SnSe synapse operated under



**Figure S7**. Resistive switching behavior for the Au/SnSe/NSTO memristor cell. (a) Semi-logarithm I-V curves under different scanning voltages. (b) Semi-logarithm I-V curves under different compliance current levels of 1.0 mA, 1.5 mA, and 3.0 mA. (c, d) Ten consecutive DC sweeps were applied from 0 to 1.5 V and 0 to -2.0 V, respectively.



Figure S8. Cross-sectional image for the Au/SnSe/NSTO device.