**Supplementary information**

**Controllable Digital Resistive Switching for Artificial Synapses and Pavlovian Learning Algorithm**

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Fig S1. XRD spectra of the ZnO thin film; the presence of the intense peak close to 34 degrees corresponds to the (002) plane of the ZnO crystal.
Fig. S2: The SEM image of (a) AgNWs and (b) Ag dots coated Si substrates. These two substrates were used to grow the ZnO and ITO films sequentially.
**Fig S3.** a) and b) depict the Zn 2p and O 1s XPS spectra, respectively, obtained from the ZnO thin film.
Fig. S4: Typical $I-V$ curves for (a-c) ITO/ZnO/AgNWs/Si and (d-f) ITO/ZnO/Ag-dots/Si devices in semilogarithmic scale. (g) ITO/ZnO/AgNWs/Si device response with applied pulse. (h) ITO/ZnO/Ag-dots/Si devices response with applied pulse.
Fig S5. Current profile versus area of the devices. Note that the current increases with increasing device area for the ZnO/Si and ZnO/Ag-dots/Si devices. However, the current remains the same for the ZnO/AgNWs/Si devices.
Fig S6. The change decay with time measured at +0.5V; this decaying behavior corresponds to the STM behavior of the device.
Fig S7. Reproducibility of the device for demonstration of potentiation.