Supporting Information

Deciphering Tip-Enhanced Raman Imaging of Carbon Nanotubes with

Deep Learning Neural Networks

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Code for the architecture of our ANN Models can be found on GitHub at:

https://github.com/usant/Neural-Networks-TERS-CNT



Fig. S1. Setup diagram of the HORIBA Scientific Atomic Force Microscope (OmegaScope) combined to the XploRa Raman system.



Fig. S2. A) Accuracy of ANN Model 1 after training phase. B) Loss of ANN Model 1 after training. C) Accuracy of ANN Model 2 after training. 1, 2, and 3 are the three constituents of ANN Model 2. D) Loss of ANN Model 2 after training.



Fig. S3. A) All colour TERS map of CNT3-semi. B) ANN Model 1 map discriminating background versus CNT spectra. C) ANN Model 1+2 classifying the spectra by number of peaks present. D) ANN Model 1+2 map classifying the spectra into four different viable classes of peaks present.



Fig. S4. A) All colour TERS map of CNT4-semi. B) ANN Model 1 map discriminating background versus CNT spectra. C) ANN Model 1+2 classifying the spectra by number of peaks present. D) ANN Model 1+2 map classifying the spectra into four different viable classes of peaks present.



Fig. S5. A) AFM height profile scan with TERS image overlaid of CNT3-semi, to actual size scan. B) TERS map with respective cross sections 1-3 selected. C) Cross sections 1-3 of the AFM height profiles. D) Cross sections 1-3 of the TERS intensity profile.



Fig. S6. A) AFM height profile scan of CNT4-semi. B) TERS map with respective cross sections 1-3 selected. C) Cross sections 1-3 of the AFM height profiles. D) Cross sections 1-3 of the TERS intensity profile.



Fig. S7. A) AFM height profile scan showing 1-3 cross sections selected of CNT2-metal . B) TERS map with respective cross sections 1-3 selected. C) Cross sections 1-3 of the AFM height profiles.D) Cross sections 1-3 of the TERS intensity profile.



Fig. S8. TERS maps of CNT1-semi that integrate the all color map A) D band TERS map B) G band TERS map. C) G' band TERS map. D) All color TERS map integrating all three bands.



Fig. S9. TERS maps of CNT2-metal that integrates the all color map A) D band TERS map B) G band TERS map. C) G' band TERS map. D) All color TERS map integrating all three bands.



Fig. S10. ANN Model 1+2 maps with enhanced D+G peaks (green pixel) for A) CNT1-semi B) CNT2-metal C) CNT3-semi D) CNT4-semi.



Fig. S11. A) ANN Model 1+2 map of CNT1-semi with selected labeled areas. B) ANN Model 1+2 map of CNT2-metal with selected labeled areas. C) Corresponding spectra for selected areas of CNT1-semi. D) Corresponding areas for selected areas of CNT2-metal.