Retrieval of gas concentrations in optical spectroscopy with deep learning

(Supplementary material)

1 Detailed results of the statistical tests

In this section, we gather the detailed results of our statistical test (Table 1).

Table 1: Wilcoxon signed rank test results.

		CH_4		C_2H_2	
		PT+TF			
TED		1D-CNN	DMLP	1D-CNN	DMLP
	1D-CNN	<0.001	-	<0.001	-
	DMLP	-	<0.001	-	<0.001
	DT	<0.001	<0.001	<0.001	<0.001
	ABDT	>0.05	<0.005	>0.05	<0.005
	KNN	>0.1	<0.005	>0.05	<0.005

2 Intuitive demonstration of concentration retrieval

In this section, we represent the example visualization of the concentration retrieval results obtained using our DNNs based DAS gas sensor. We illustrate the results of 100 experimental test data to intuitively demonstrate the performance of our gas sensor for methane and for acetylene. Fig. 1 shows the distributions of ground truth and predicted concentrations. The highly overlapped red and blue scatter points verify that all the proposed DNNs models present high precision and concentration fitting ability.

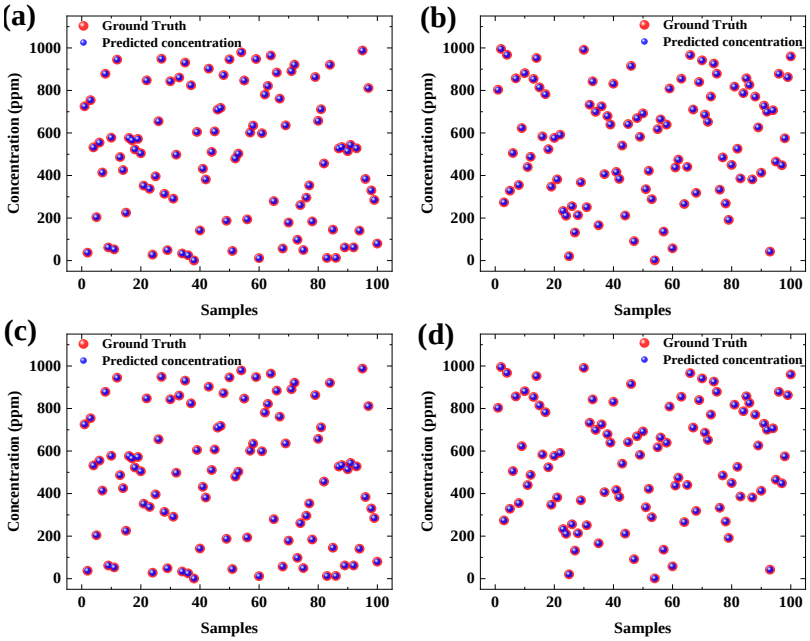

Fig. 1. Performance analysis of the 100 sets experimental test data of two gases. (a), (b): Distribution of 100 ground truth and predicted concentrations of methane and acetylene for 1D-CNNs. (c), (d): Distribution of 100 ground truth and predicted concentrations of methane and acetylene for DMLPs.