**SlitNet**

SlitNet is a spectrometer slit empowered by a deep learning model. Using synthetic data resembling Raman spectra, we trained a neural network to reconstruct synthetic Raman spectra with enhanced resolution and signal-to-noise ratio from low-resolution inputs. Subsequently, we performed transfer learning from synthetic data to experimental Raman data of materials. Through fine-tuning the model with experimental data, we successfully recovered high resolution Raman spectra and discriminated between two materials that were previously indistinguishable using a wide slit.

**Installation**

Please refer to <https://github.com/conor-horgan/spectrai>

**Usage**

Please refer to <https://github.com/conor-horgan/spectrai>

python train.py -- config custom\_config.yml – verbose

python apply.py -- config custom\_config.yml

The commands above will operate on default configs , from which six steps of model optimization could be achieved.

1. Training on synthetic data ( Synthetic\_Data\_Generation.py)
2. Applying on synthetic data and experimental data (polystyrene)
3. Transfer learning on chemicals
4. Applying on experimental data (polystyrene & compounds of Urea and L-Arginine)

**Environment**

spectrai was implemented and tested in Python 3.8.10 using PyTorch 2.1.0 on a desktop computer with a Core i7-8700 CPU at 3.2 GHz (Intel), 64 GB of RAM, and a Titan V GPU (NVIDIA), running Windows 10 (Microsoft). spectrai has not yet been extensively tested in other environments (it's on our to do list).