

## 1. `nelly_main.m`

```
[freq, n_fit, freq_full, tf_full, tf_spec, tf_pred, func, spec_smp, spec_ref]  
= nelly_main (input, t_smp, A_smp, t_ref, A_ref)
```

### Input arguments

1. `input` Contains the input specification, which includes **data processing parameters** like windowing and zero-padding, and the **geometry specification**, which gives the thickness and refractive index for each layer. This variable can either be a structure string pointing to a JSON file,
2. `t_smp` and `A_smp` are vectors containing the time-domain trace for the sample geometry; `t_ref` and `A_ref` give the time-domain trace for the reference geometry

### Output arguments

1. `freq` is a vector containing the frequency points for the results
  2. `n_fit` is a vector containing the refractive indices extracted. The corresponding frequency points can be found in `freq`
  3. `freq_full` is the full range of frequency points created by the zero-padded Fourier transform
  4. `tf_full` is a vector containing the transfer function--i.e.  $E_{\text{sample}}/E_{\text{ref}}$ --at each frequency point in `freq_full`
  5. `tf_spec` is a vector containing the transfer function-at each frequency point in `freq`
  6. `tf_pred` is the transfer function predicted with the extracted refractive index (values correspond to `freq`)
  7. `func` is a handle to an anonymous function that takes two arguments--a frequency and a value for the unknown refractive index--and returns the value of the transfer function at that frequency.
  8. `spec_smp` is the complex spectrum for the sample geometry. The points correspond to `freq`
  9. `spec_ref` is the complex spectrum for the reference geometry. The points correspond to `freq`
- ## 2. `fft_func.m`

```
[freq, spec] = fft_func (time, amplitude, options)
```

### Input arguments

1. `time` and `amplitude` are vectors giving the time domain trace to be Fourier transformed
2. `options` is a structure which gives the padding used. The structure should match that found in the `fft` portion of the `settings` section of the example input files (i.e. it should have fields for `windowing_type` etc.)