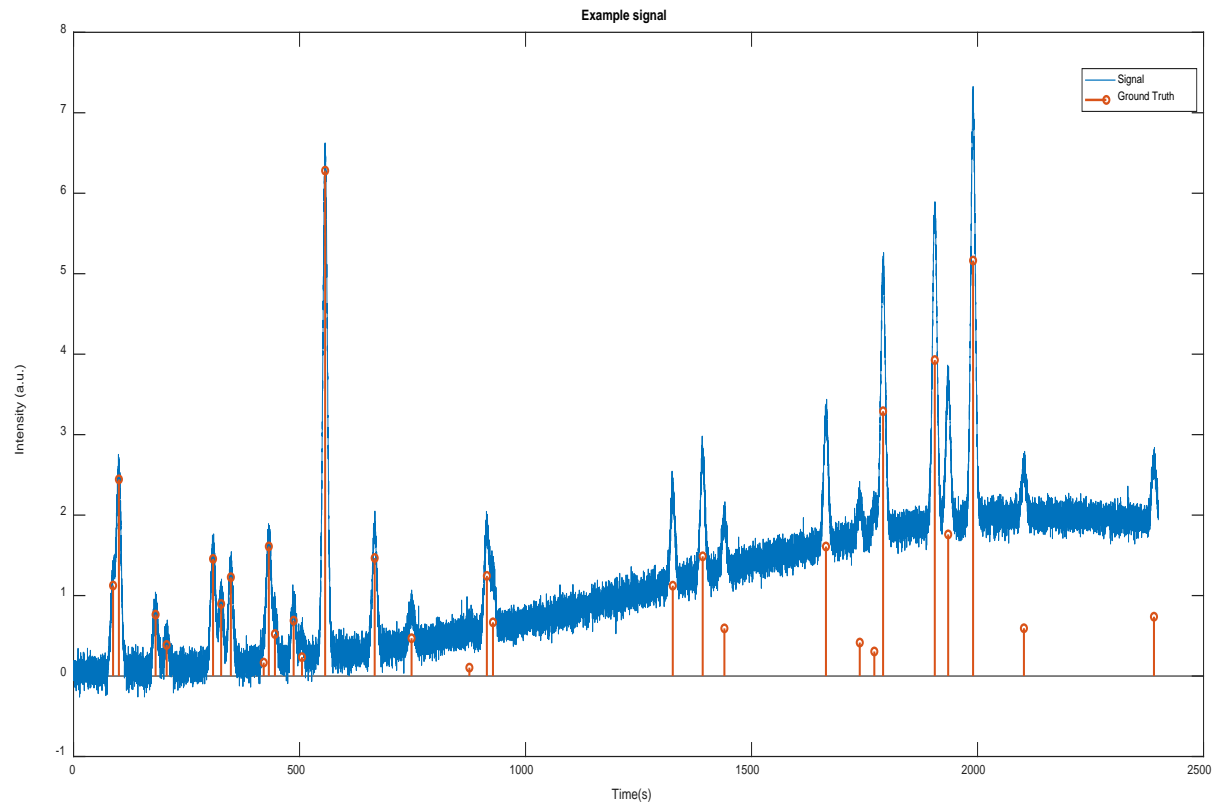

Small Project: Peak detection

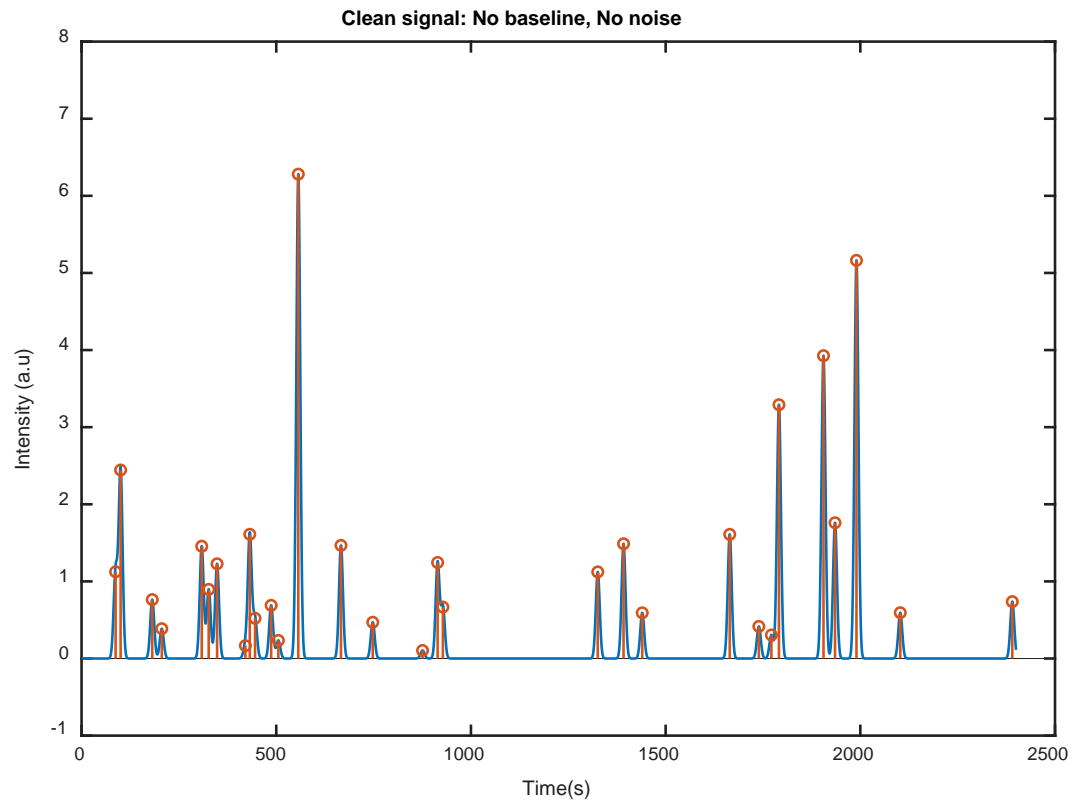
Peak detection

- **Peak detection is a common objective in biomedical signal processing.**
- **Examples:**
 - ECG
 - Analysis of biofluids by:
 - Chromatography
 - Mass Spectrometry
 - Ion Mobility Spectrometry
 - Nuclear Magnetic Resonance
- **In many cases the objective is to retrieve the peak location and the amplitude.**
- **Difficulties and solutions:**
 - Noise (digital filtering, smoothing, de-noising)
 - Baseline problems (detrend, baseline estimation)
 - Peak overlapping (deconvolution, signal separation)
 - Distortions in peak shape

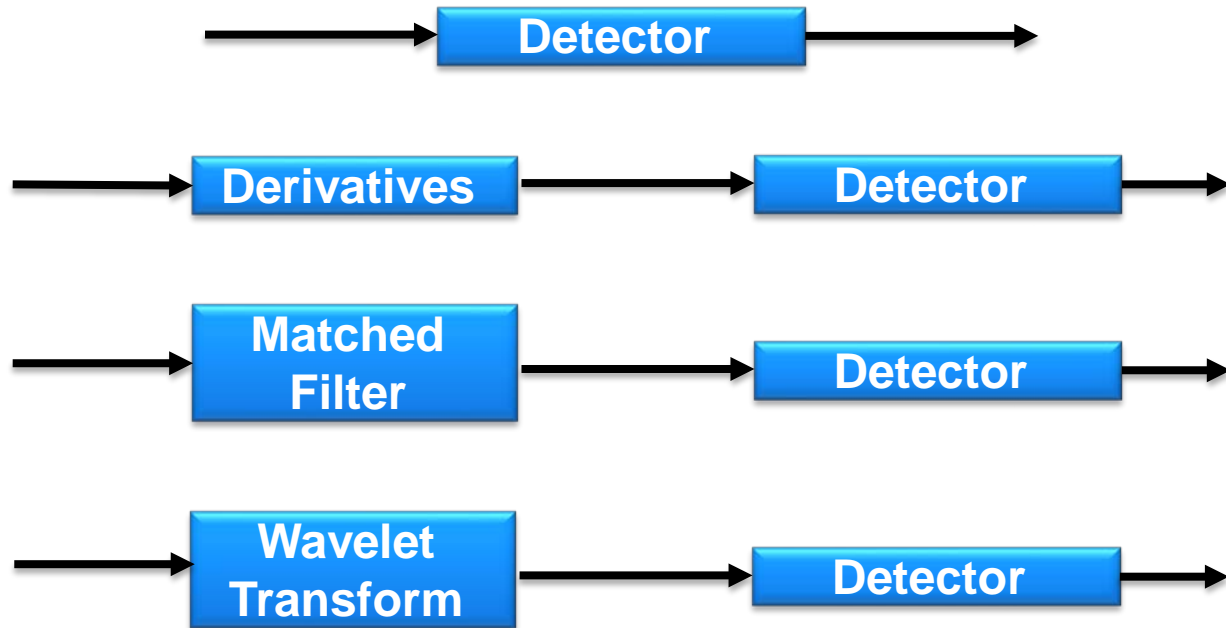
Example signal



Clean signal: Smoothing + Baseline correction



Techniques for peak detection



Design your own method

Materials supplied and Evaluation

■ Additional materials:

- Peak detection literature

■ Tools:

- 'findpeaks' function in R
- Explore 'gsignal::conv' in R to implement a cross-correlation filter (matched filter)
- Use package R.Matlab to read Matlab data files.

■ Ten signal examples:

- Signal + Ground truth
- One example of a clean peak intensity one

■ Objective

- Peak detection
- Intensity estimation

■ Figures of merit

- Sensitivity and Specificity of peak detection
- Time accuracy of peak location
- Mean absolute error of peak intensity

■ Evaluation of intermediate results and team ranking

- Weekly submission of your analysis file and return of the performance

■ Final score

- 50% Algorithm performance, 50% Oral presentation