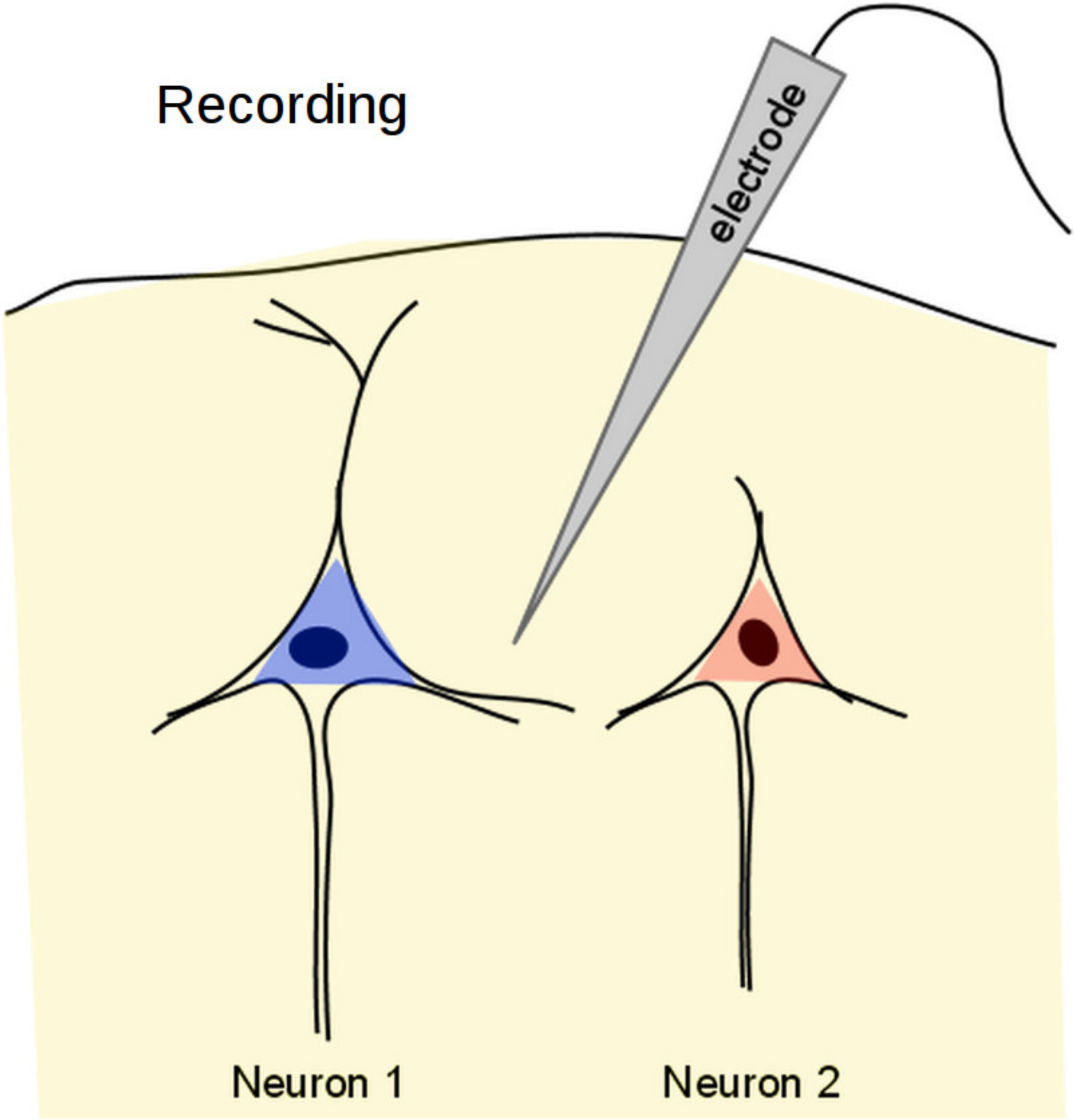
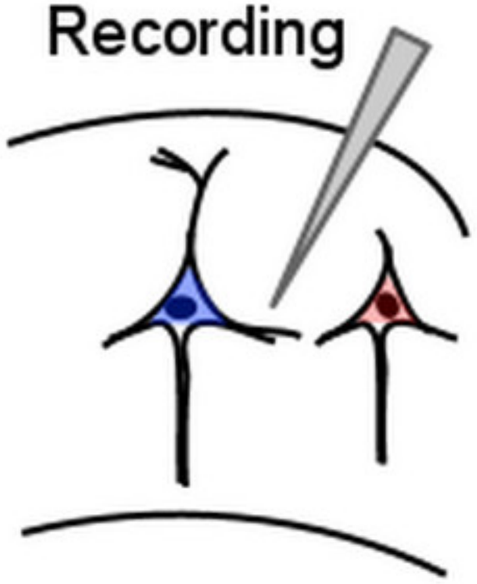
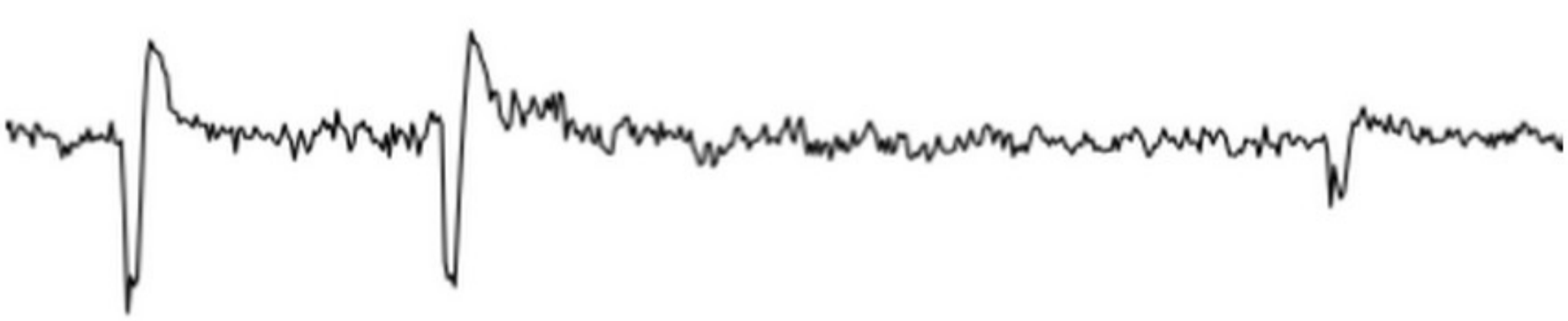
SpikeSort:
flexible spike sorting in Python

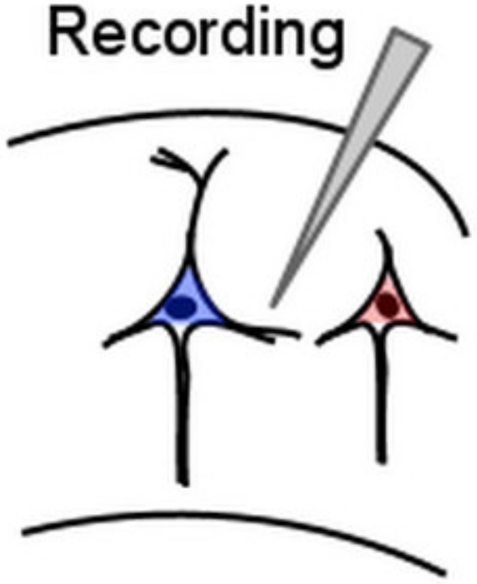
Dmytro Bielievtsov, Bartosz Telenczuk


Recording
electrode
Neuron 1
Neuron 2

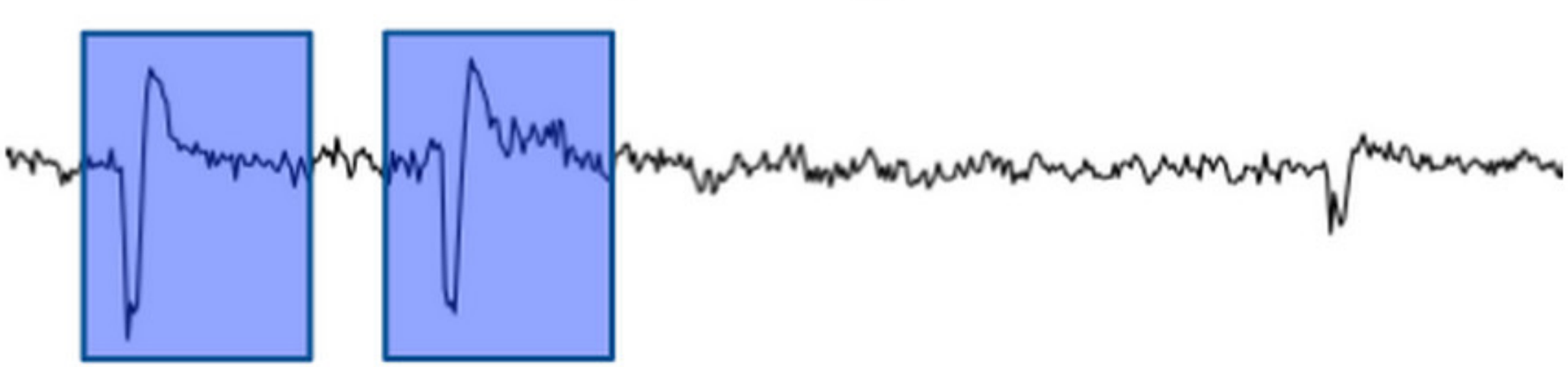


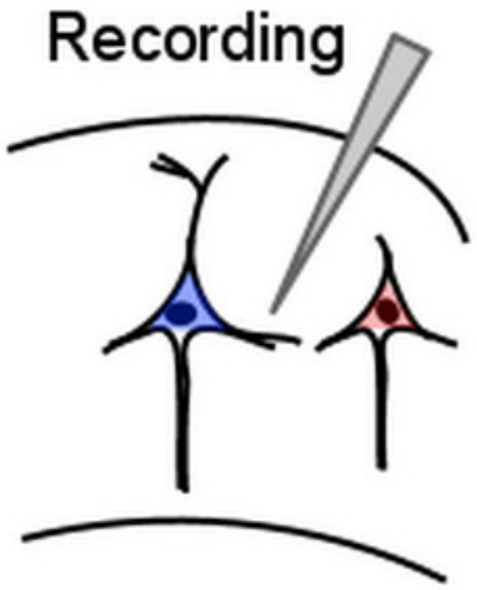
1) Filtering



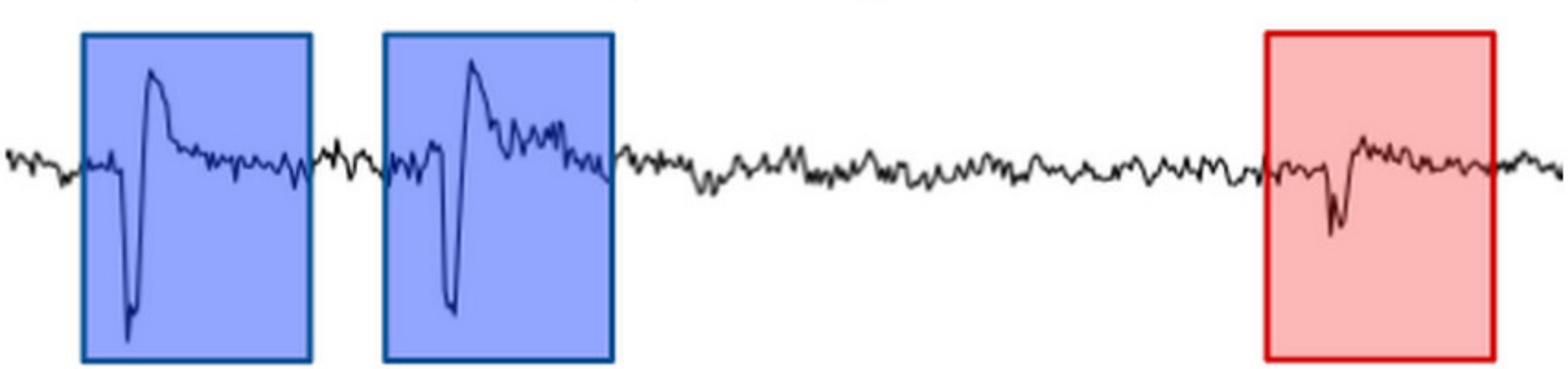


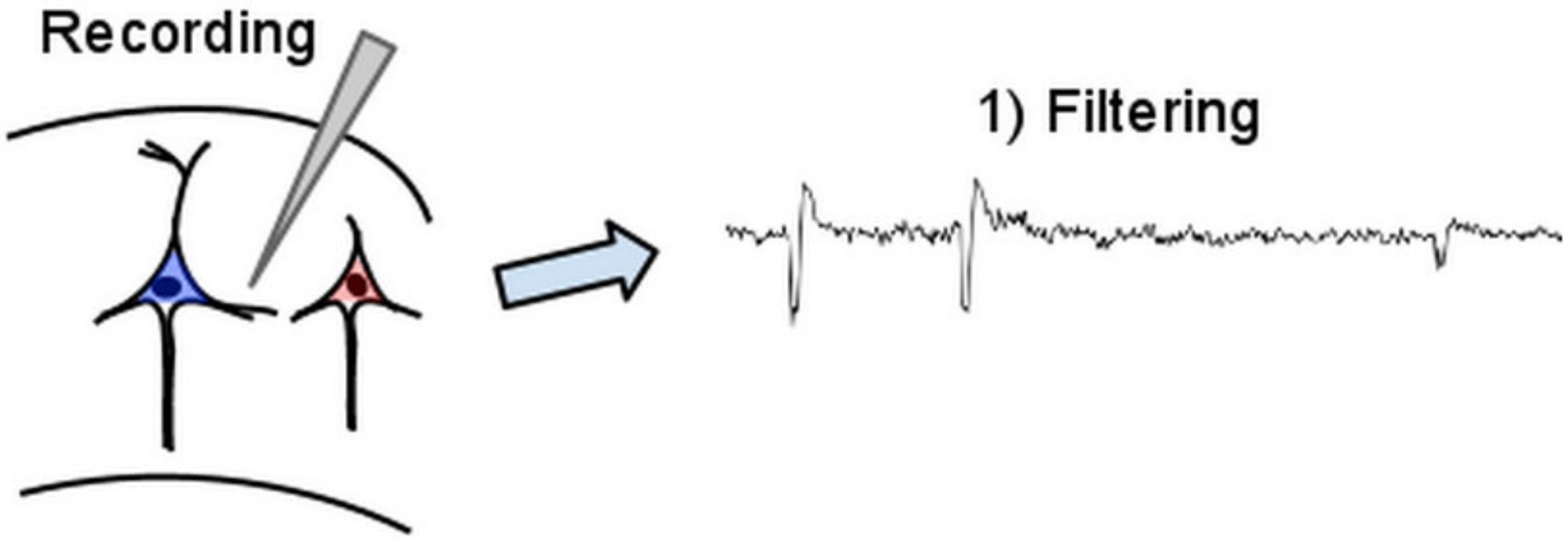
1) Filtering

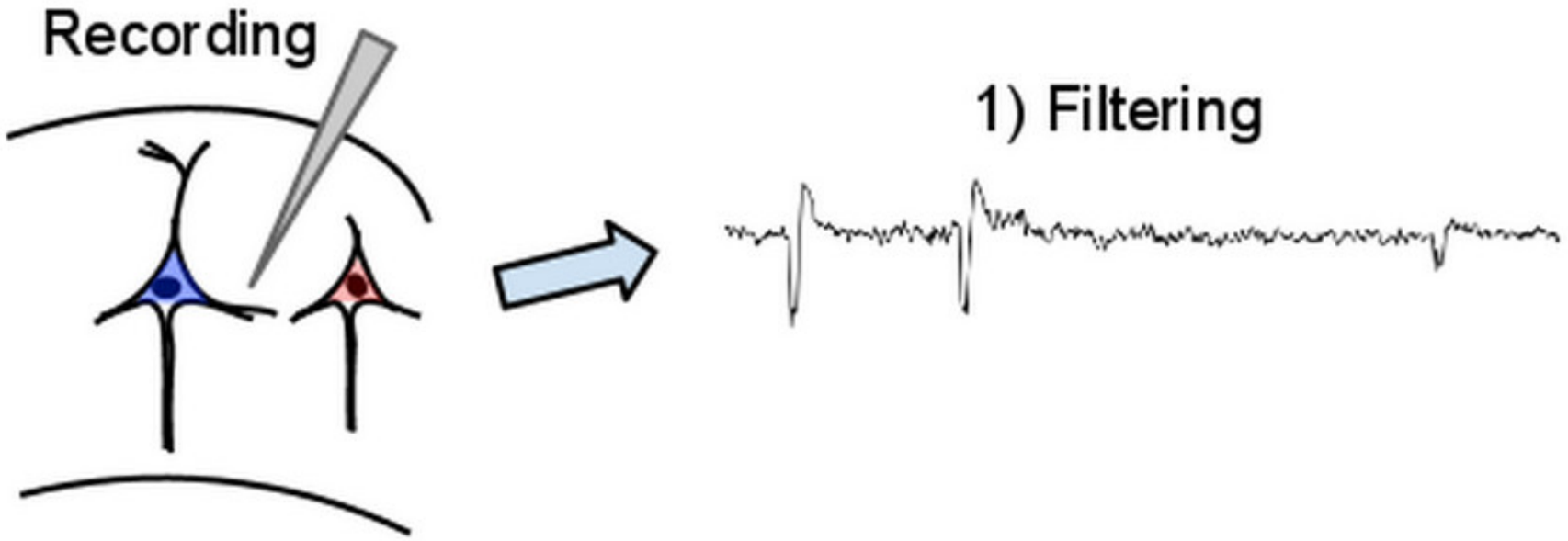




1) Filtering




Recording
1) Filtering



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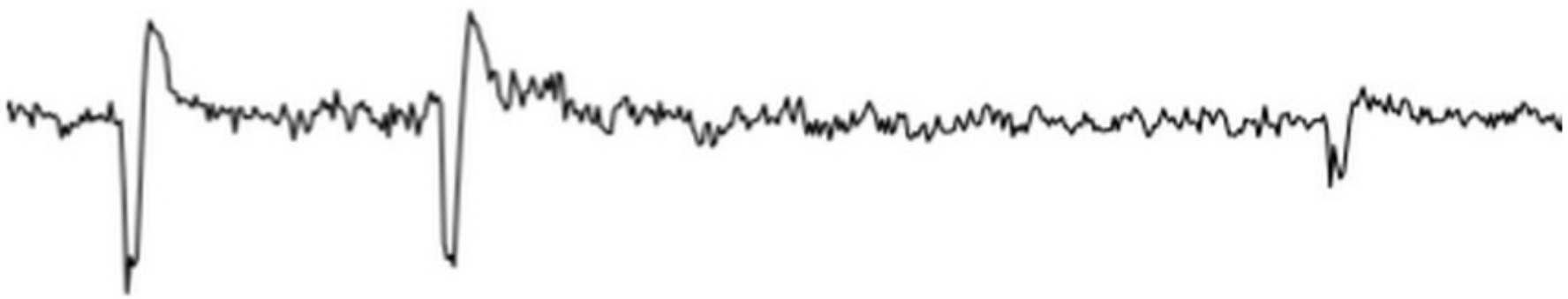

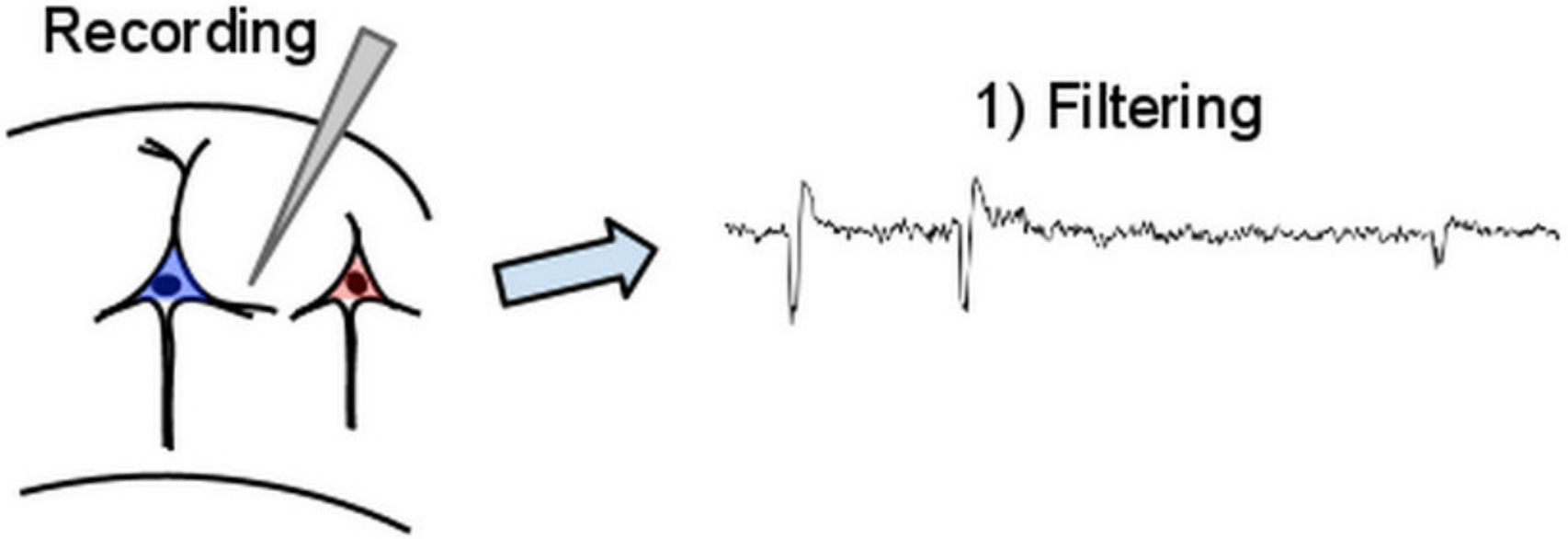

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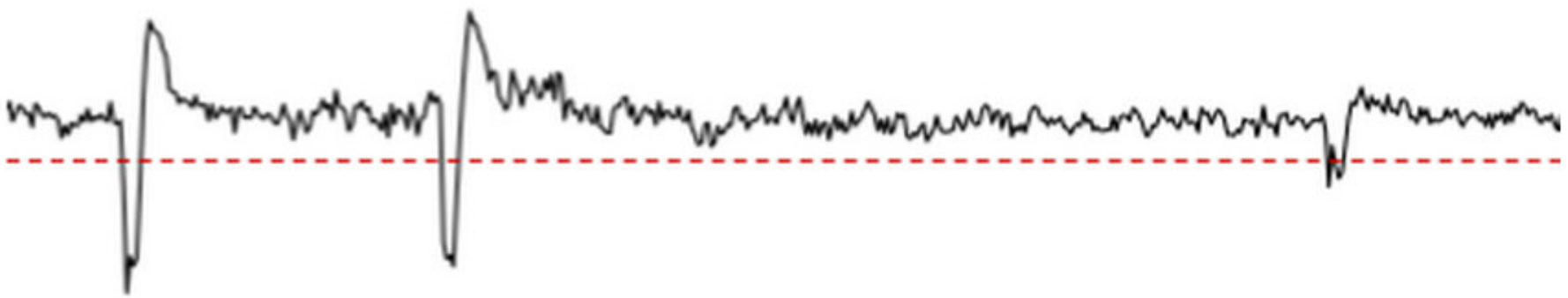
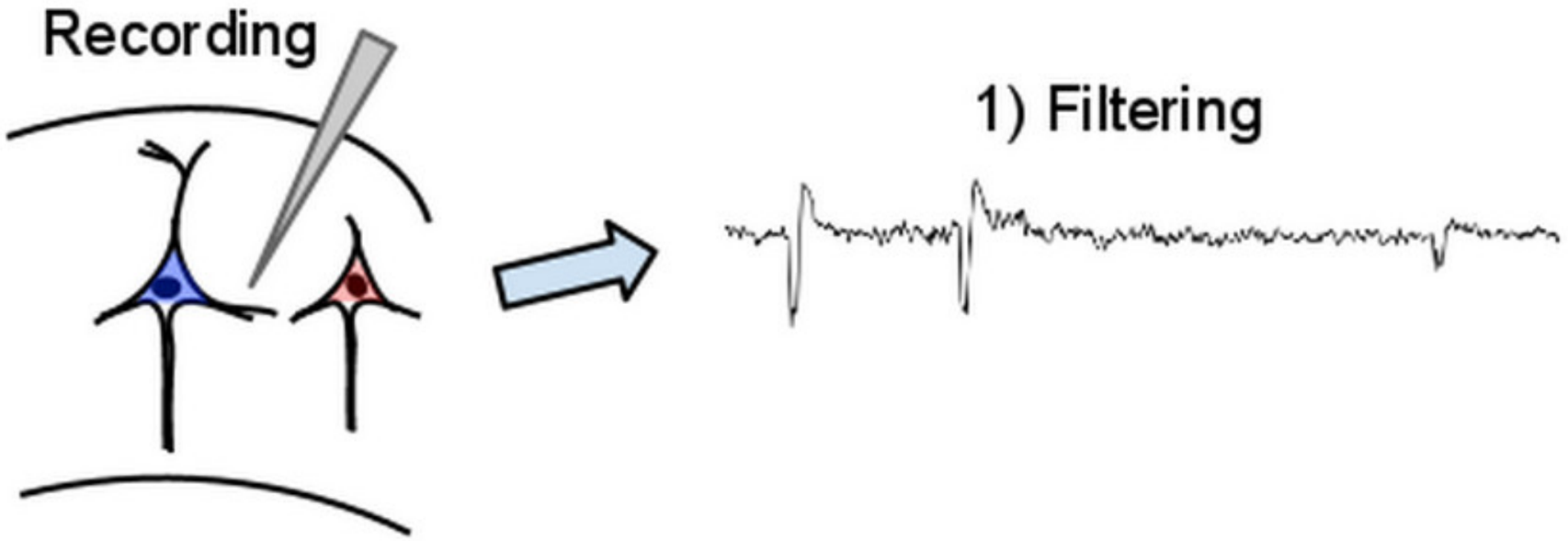
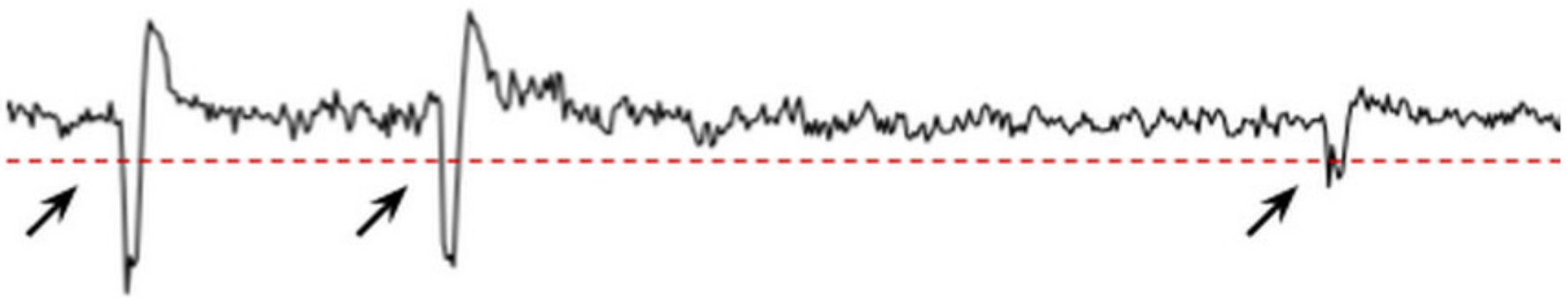
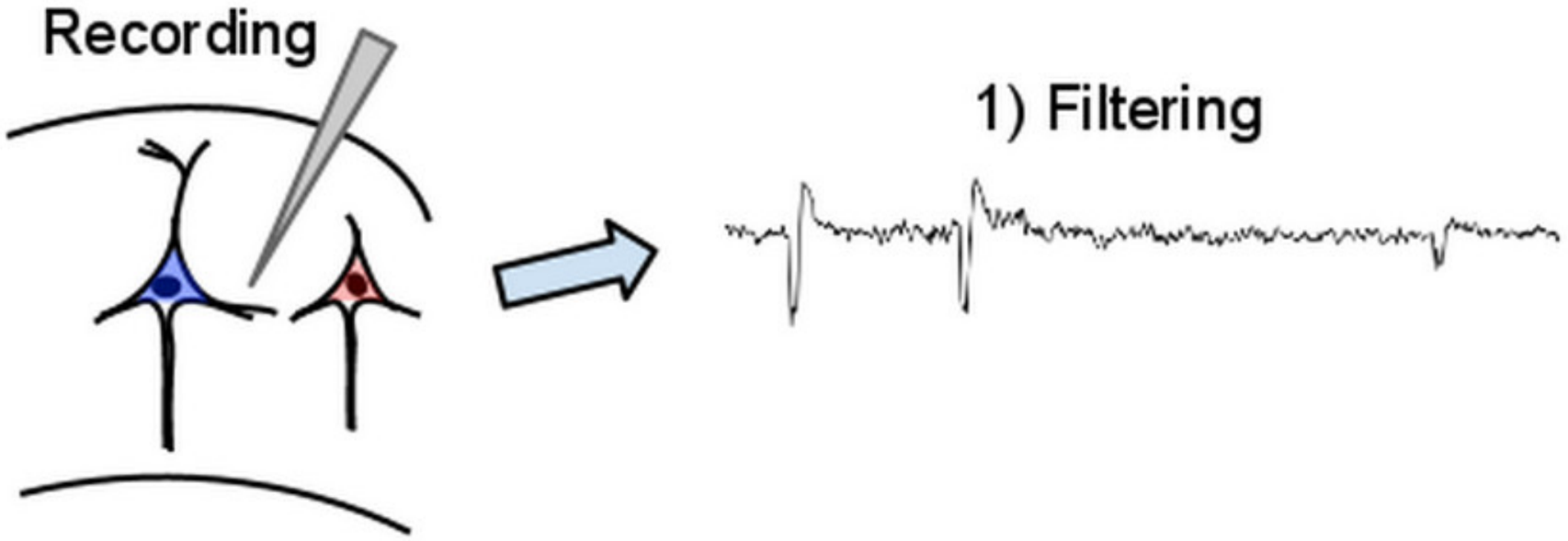


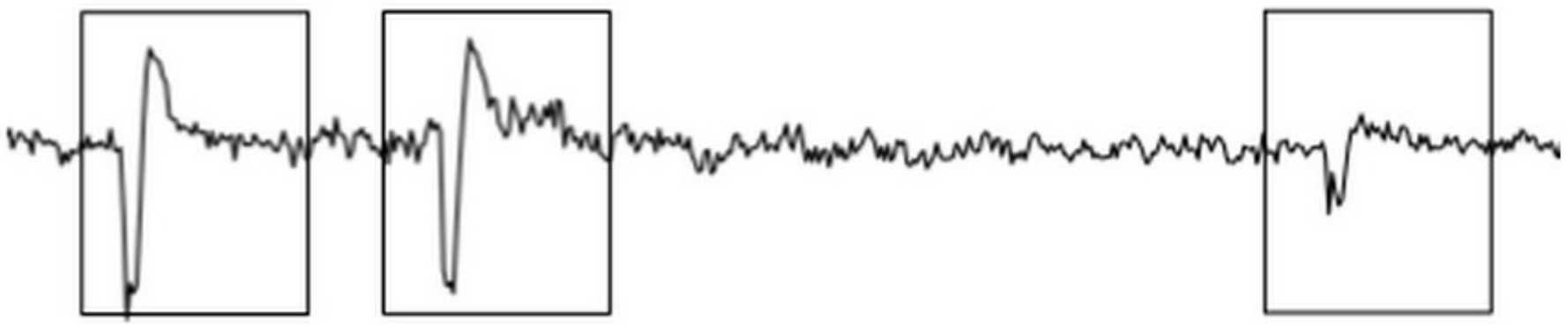


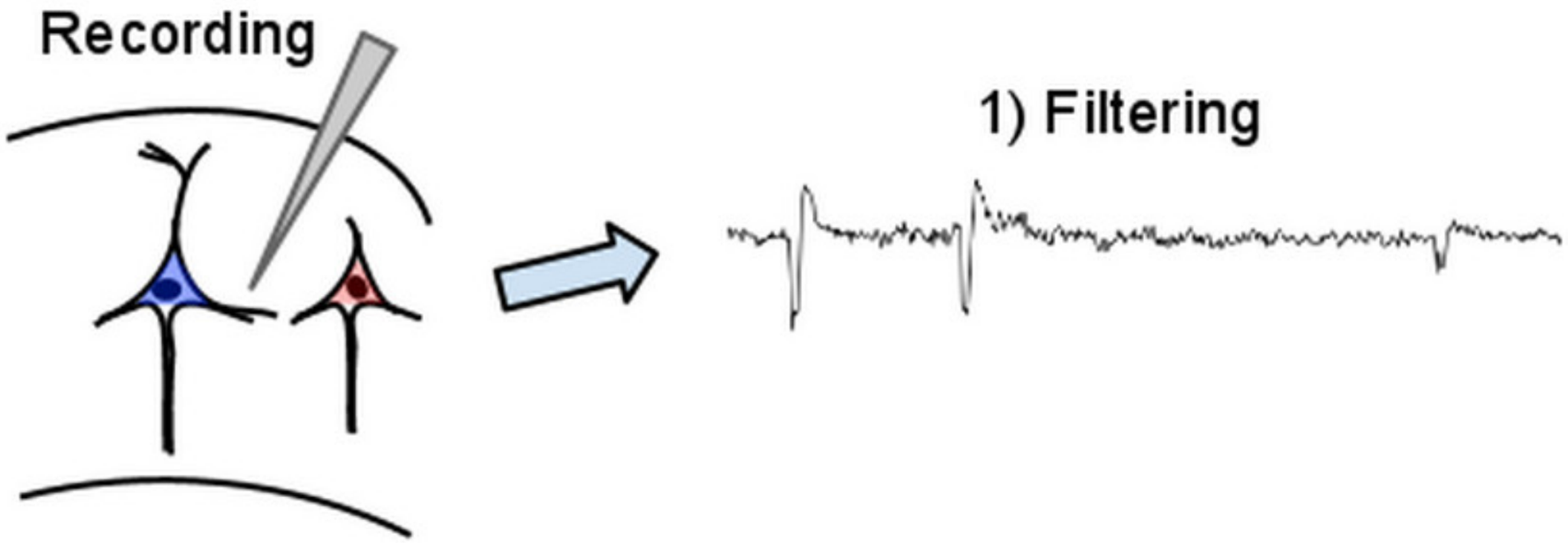
2) Detection

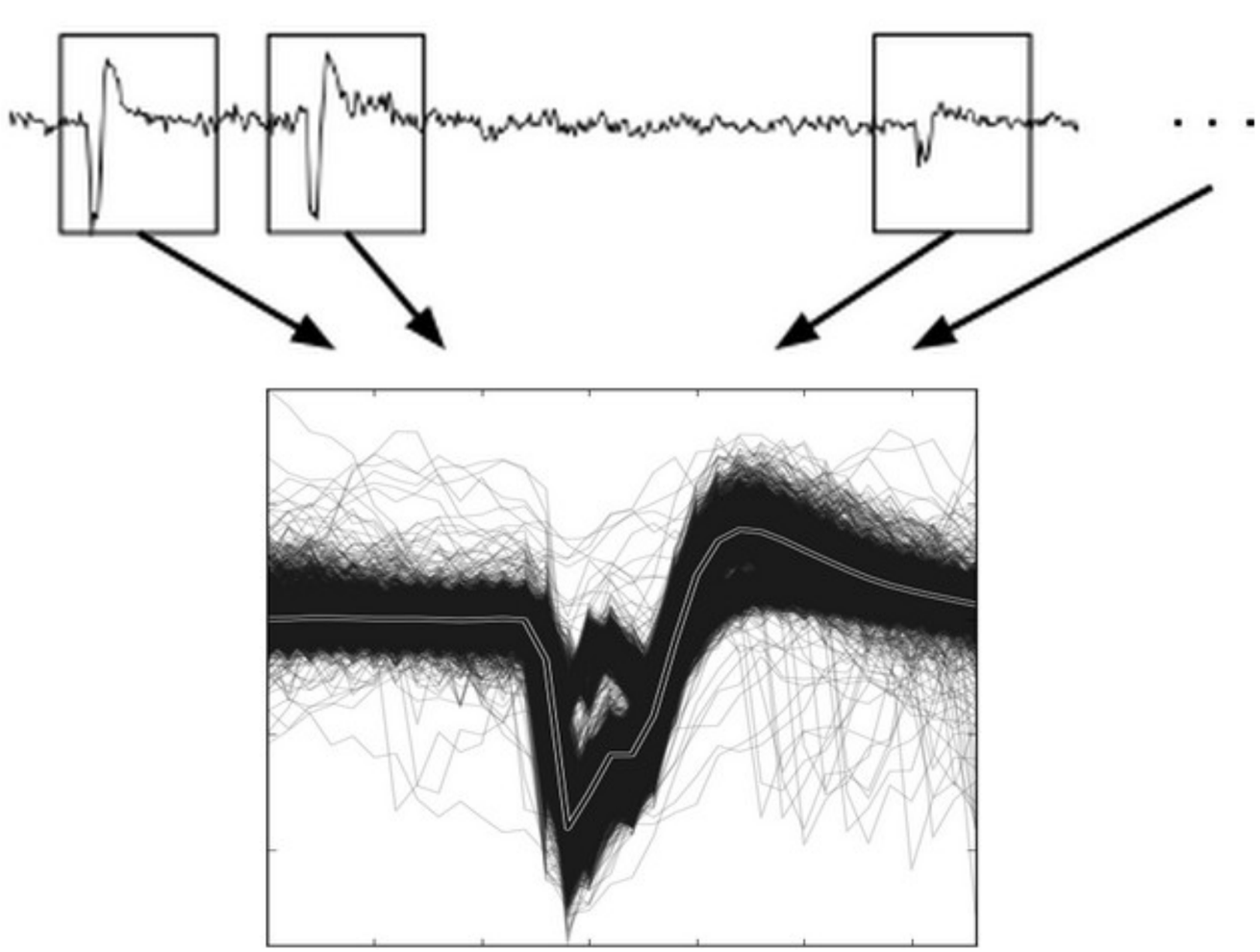




2) Detection




Recording
1) Filtering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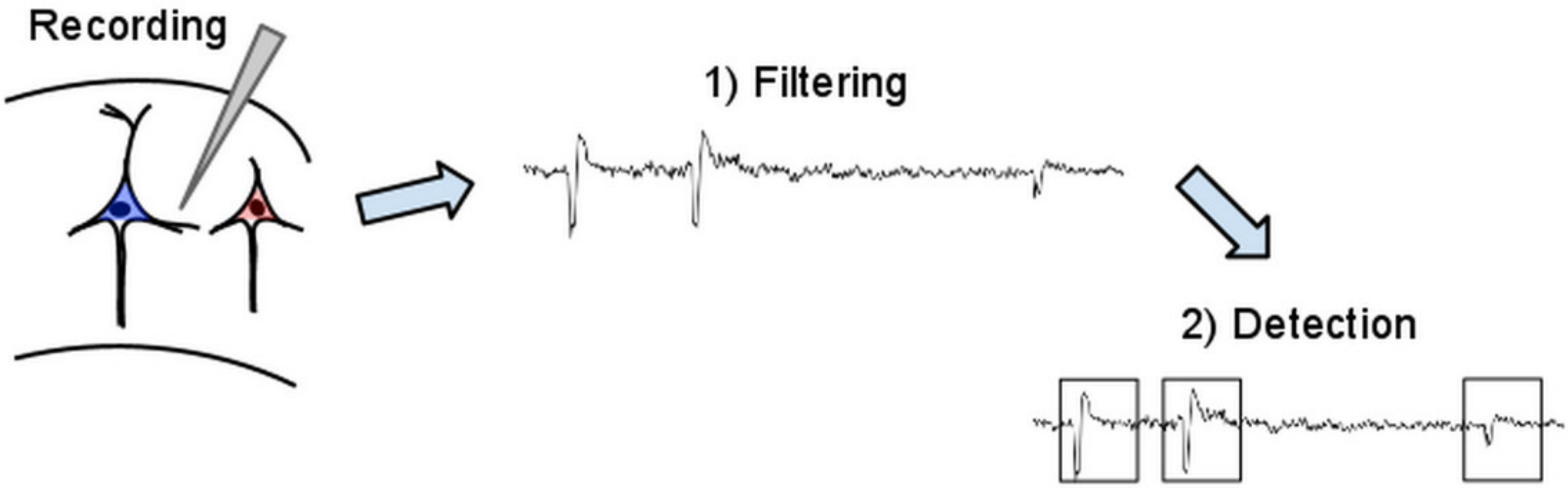
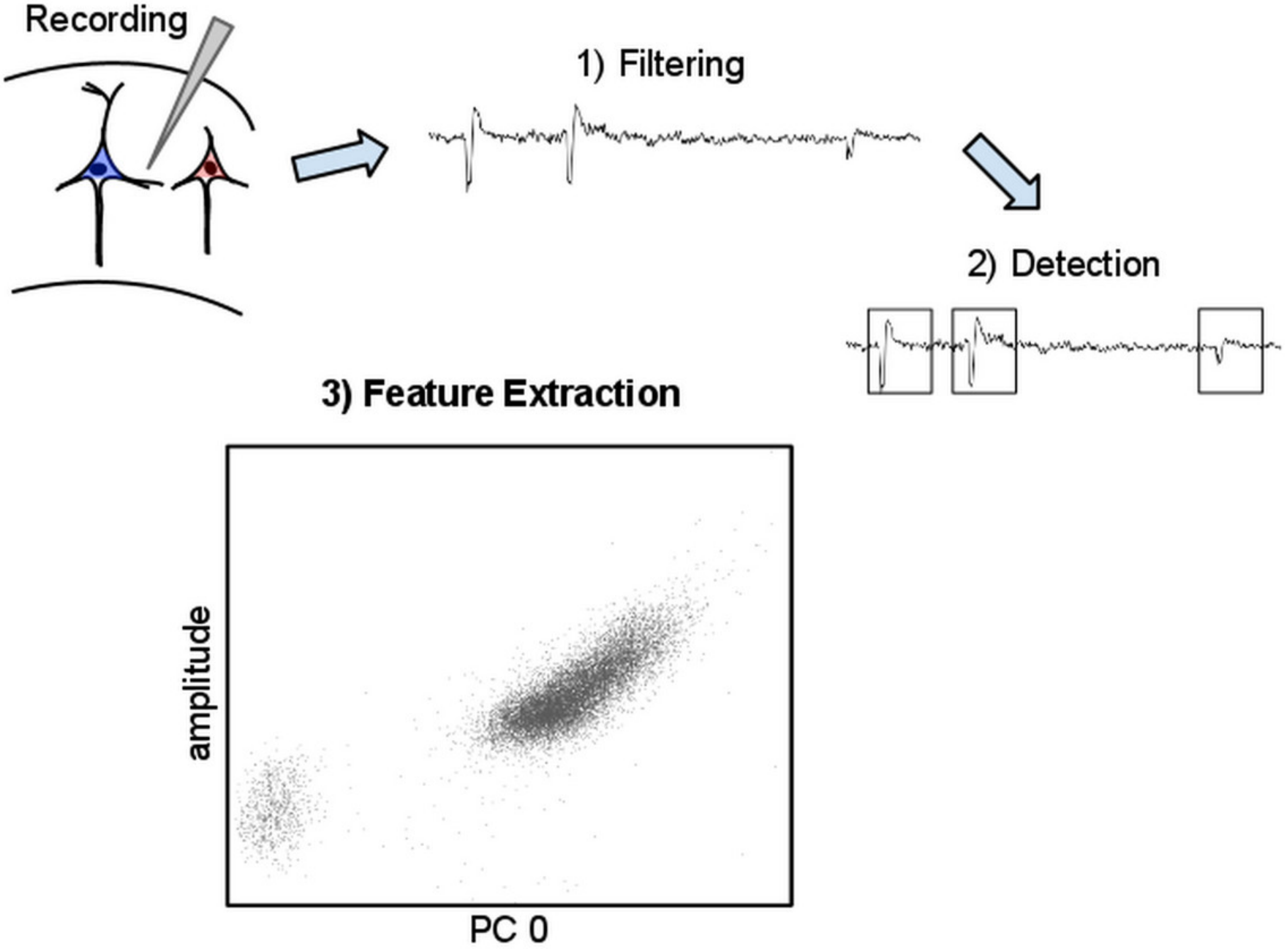
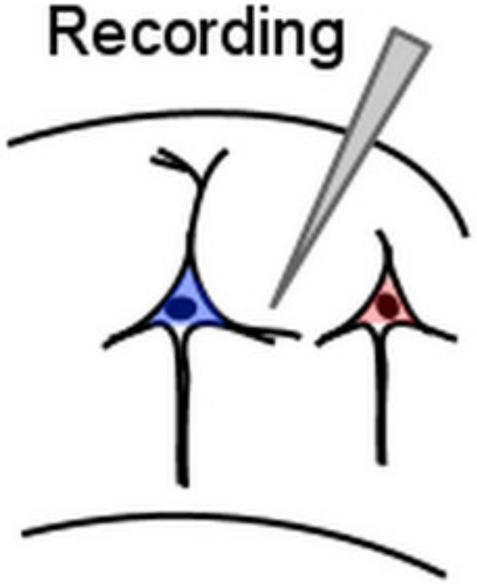
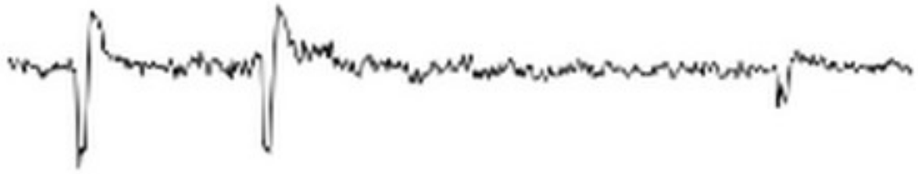

Recording
1) Filtering
2) Detection


Recording
1) Filtering
2) Detection
3) Feature Extraction
amplitude
PC 0

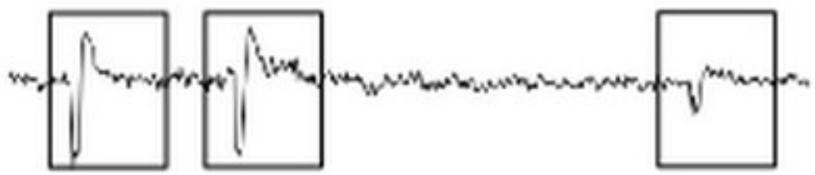
Recording





1) Filtering

2) Detection



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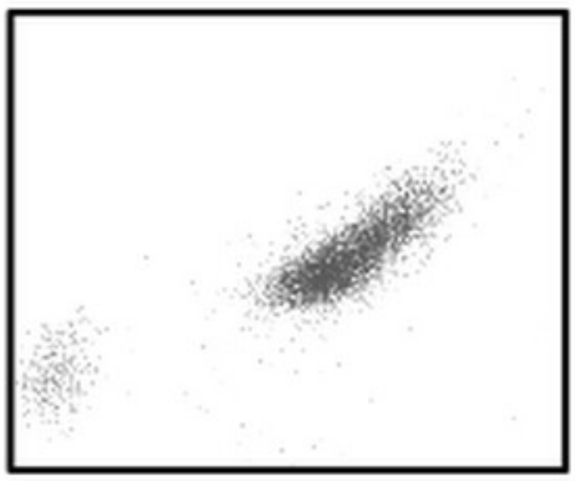
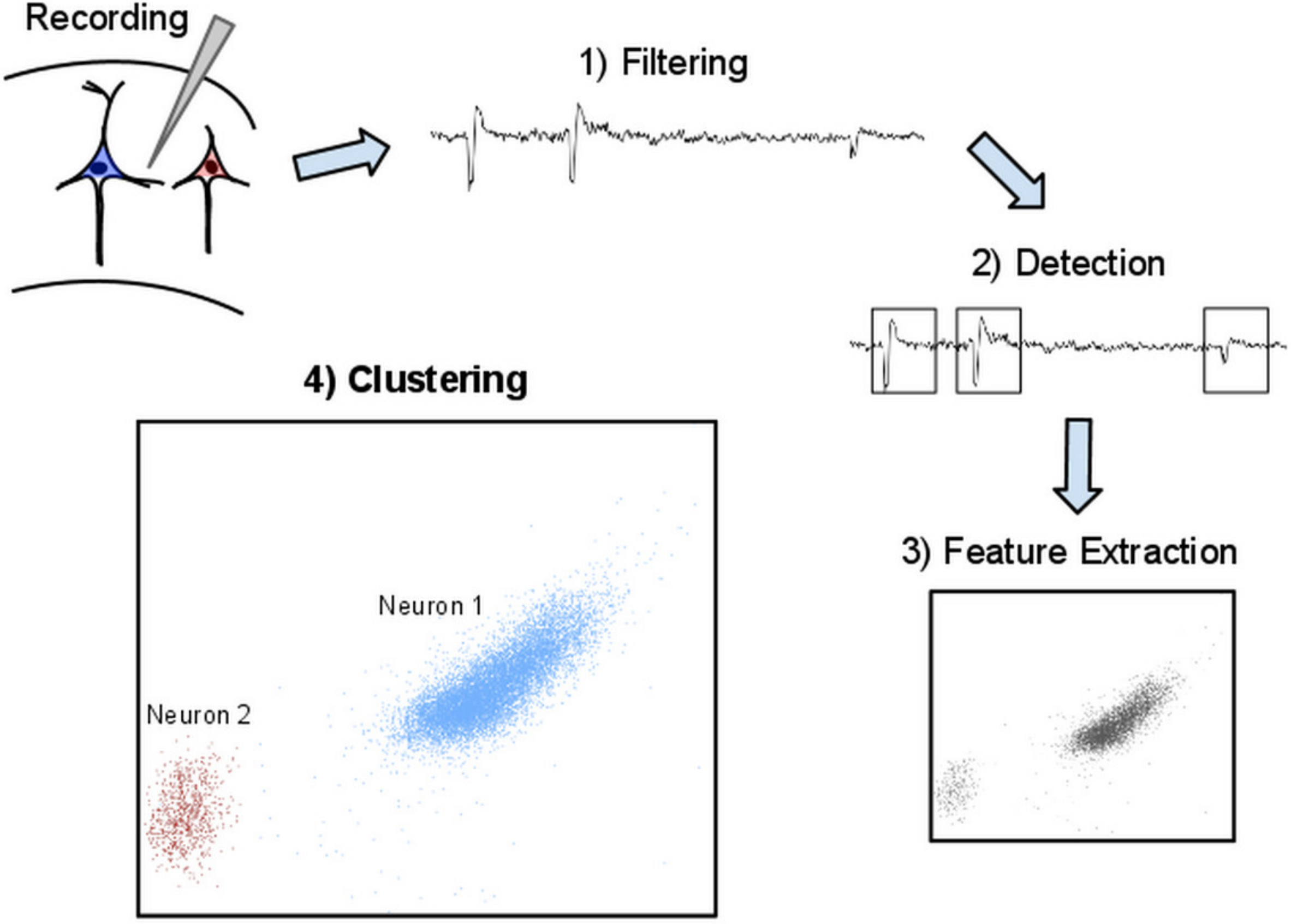
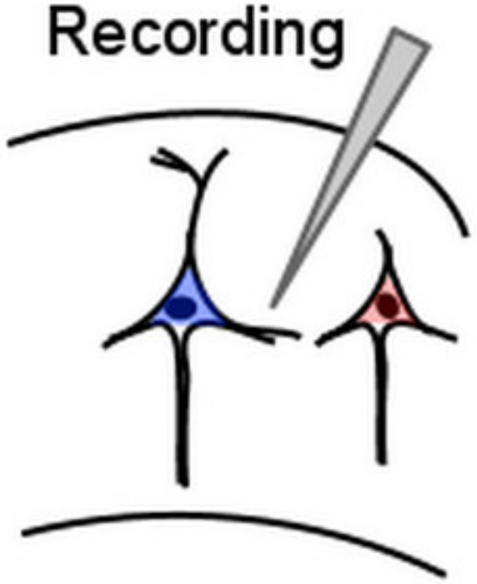
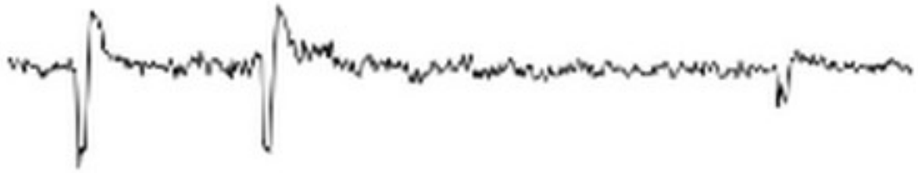



Recording
1) Filtering
2) Detection
3) Feature Extraction
4) Clustering
Neuron 1
Neuron 2

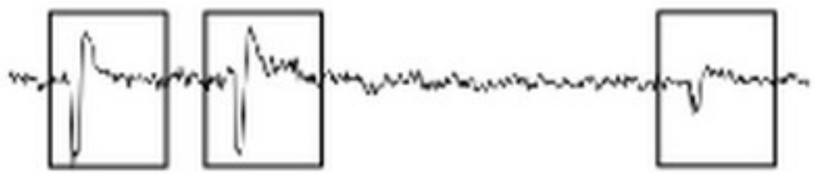
Recording



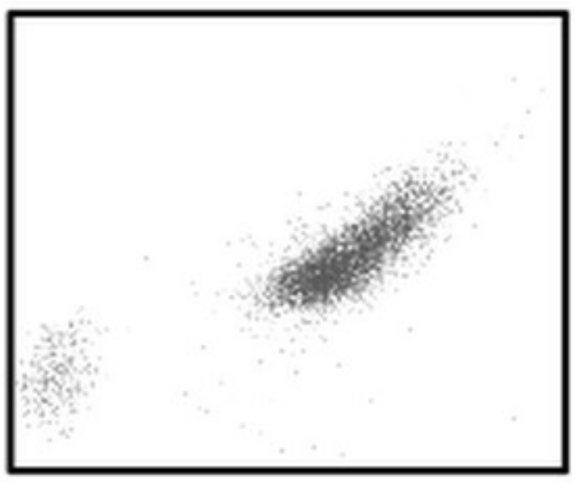


1) Filtering

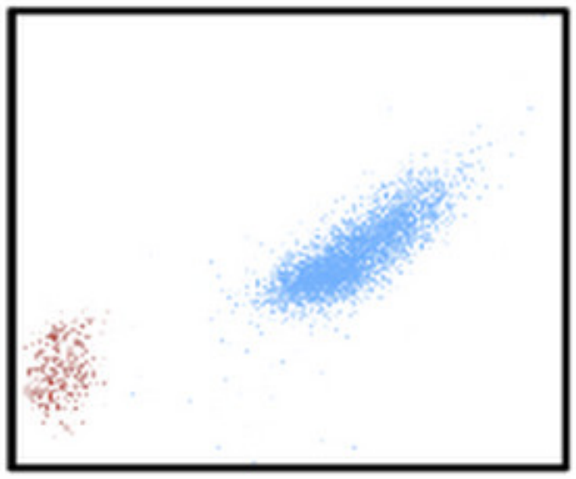
2) Detection



3) Feature Extraction



4) Clustering



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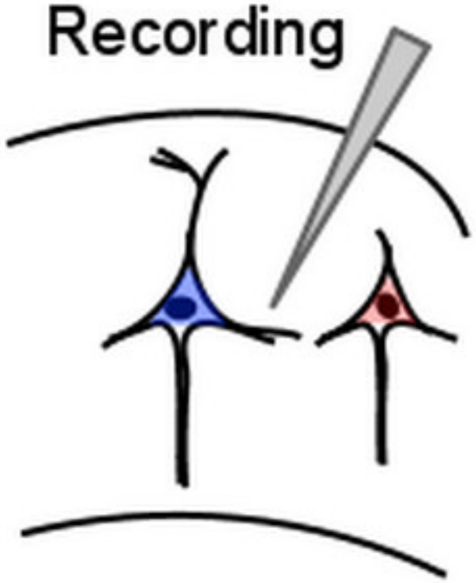

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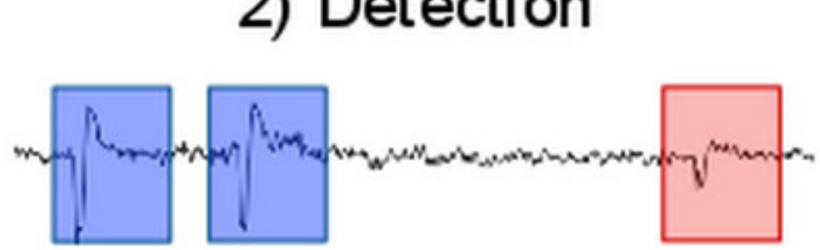
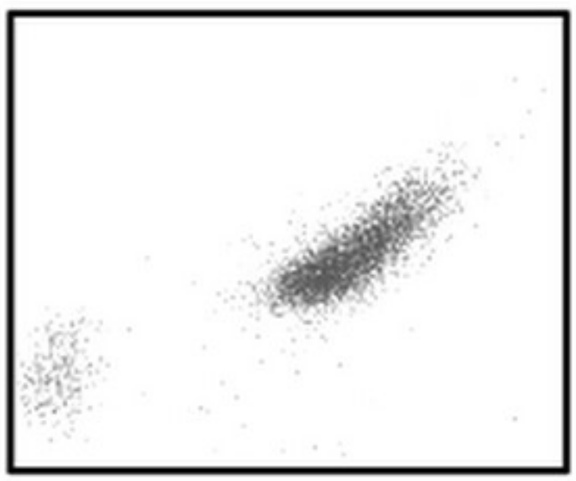
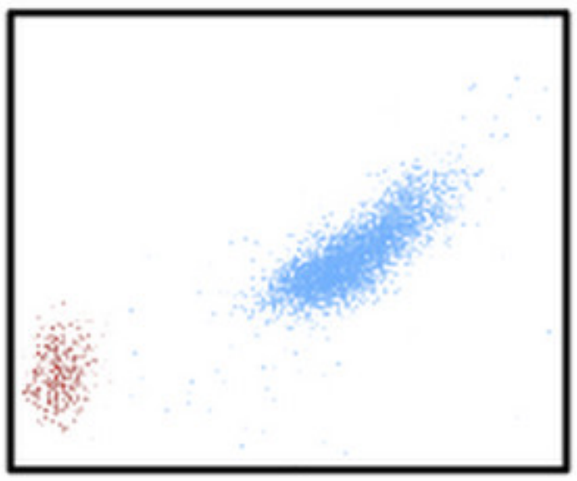


2) Detection

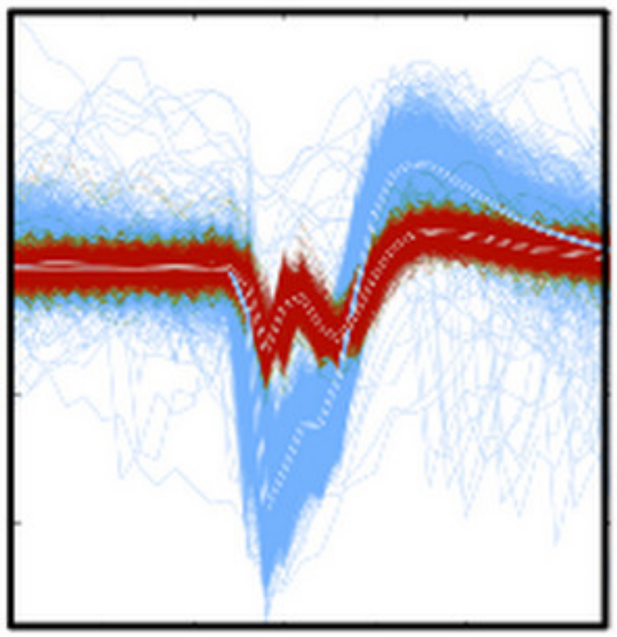
3) Feature Extraction



4) Clustering



Result



modular

modular

customizable

customizable

modular

shell-based

modular

customizable

shell-based

interactive

modular

customizable

shell-based

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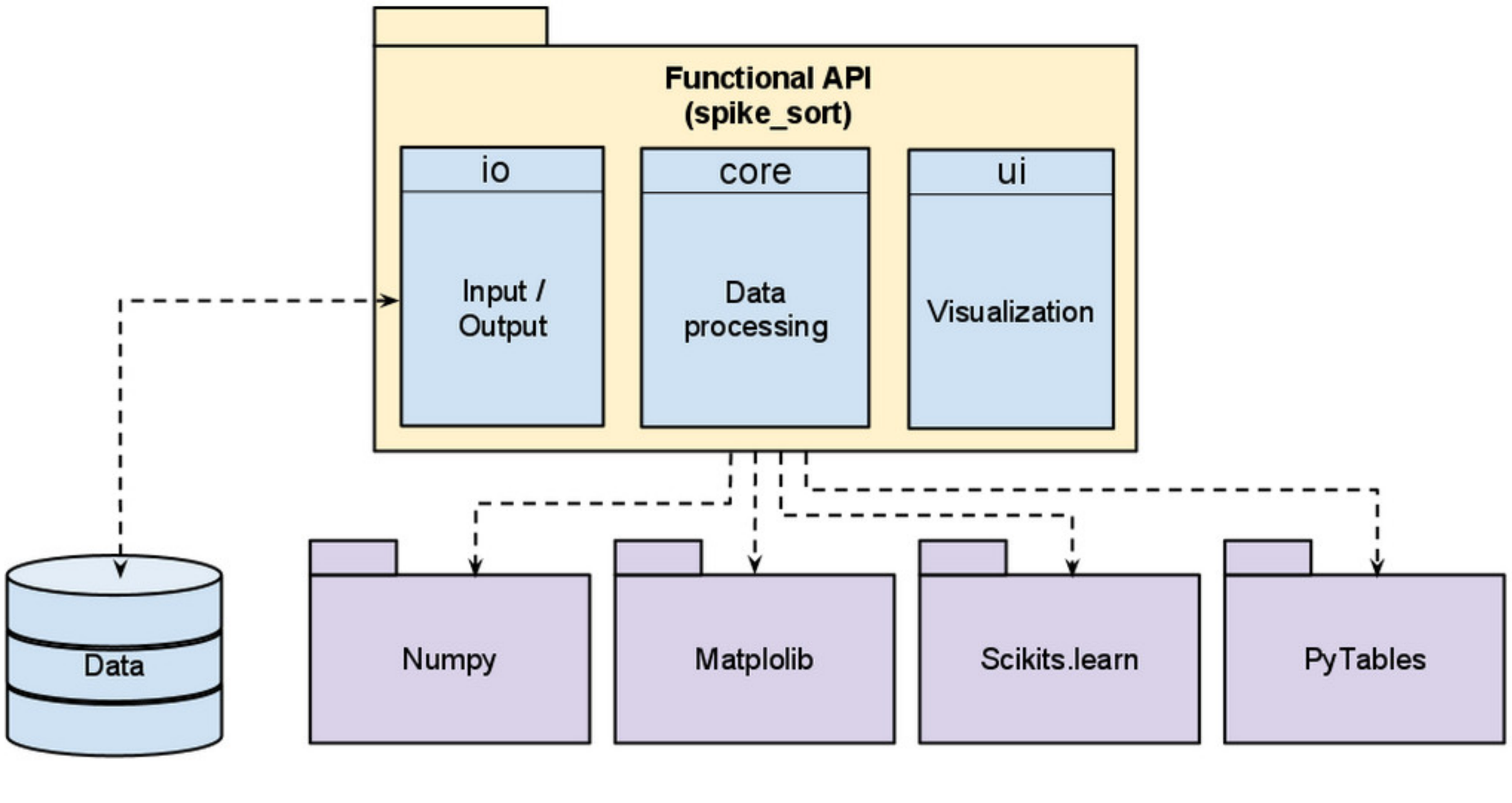
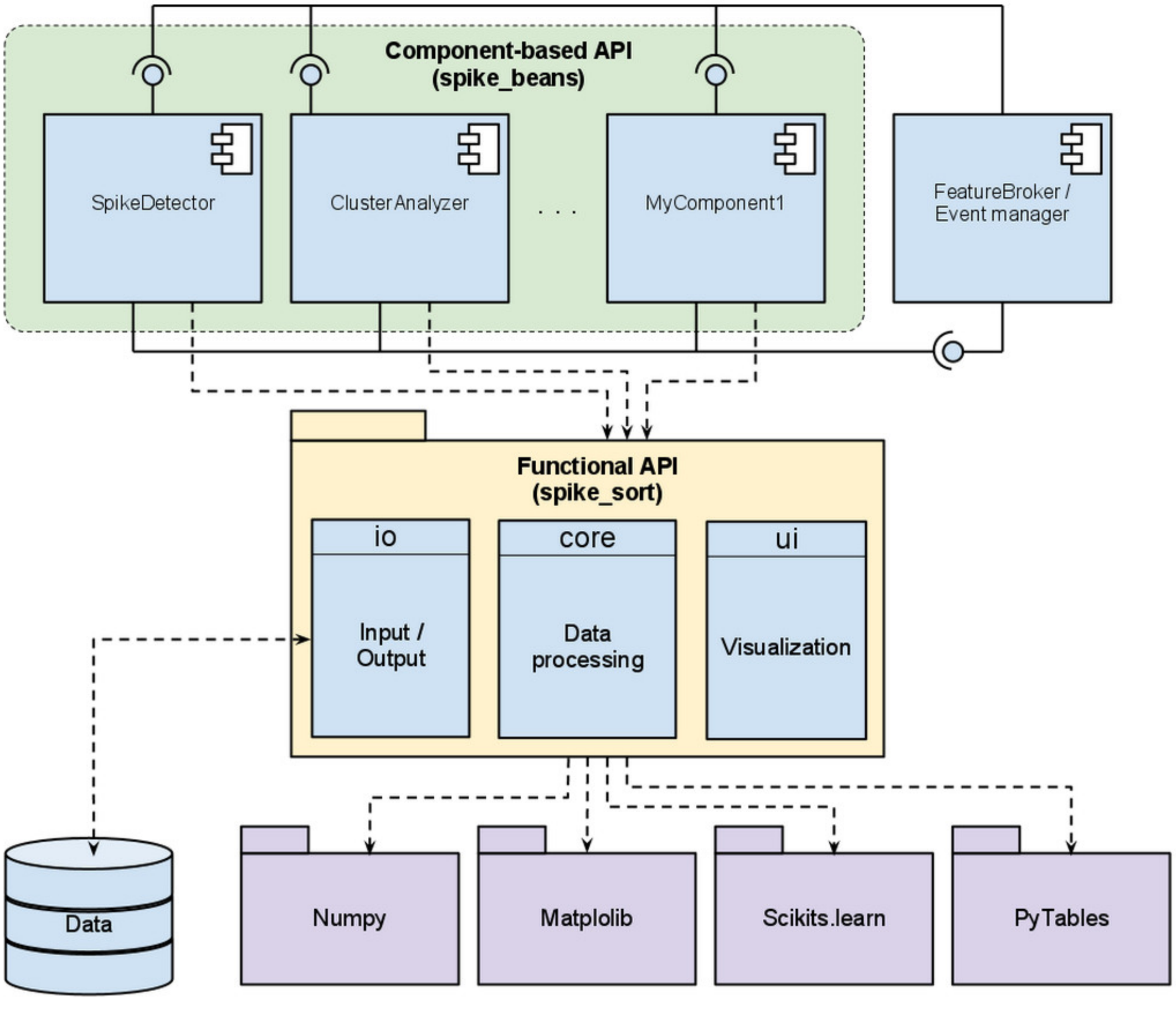
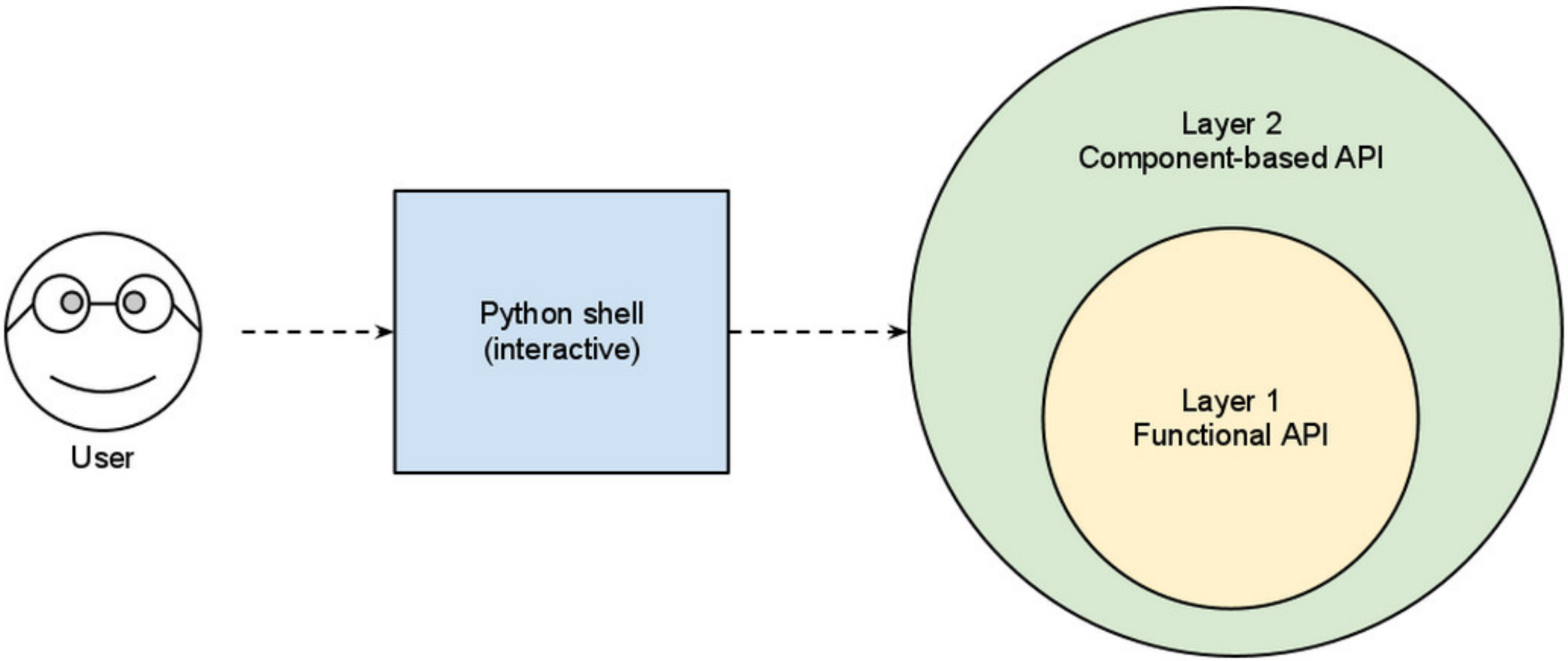
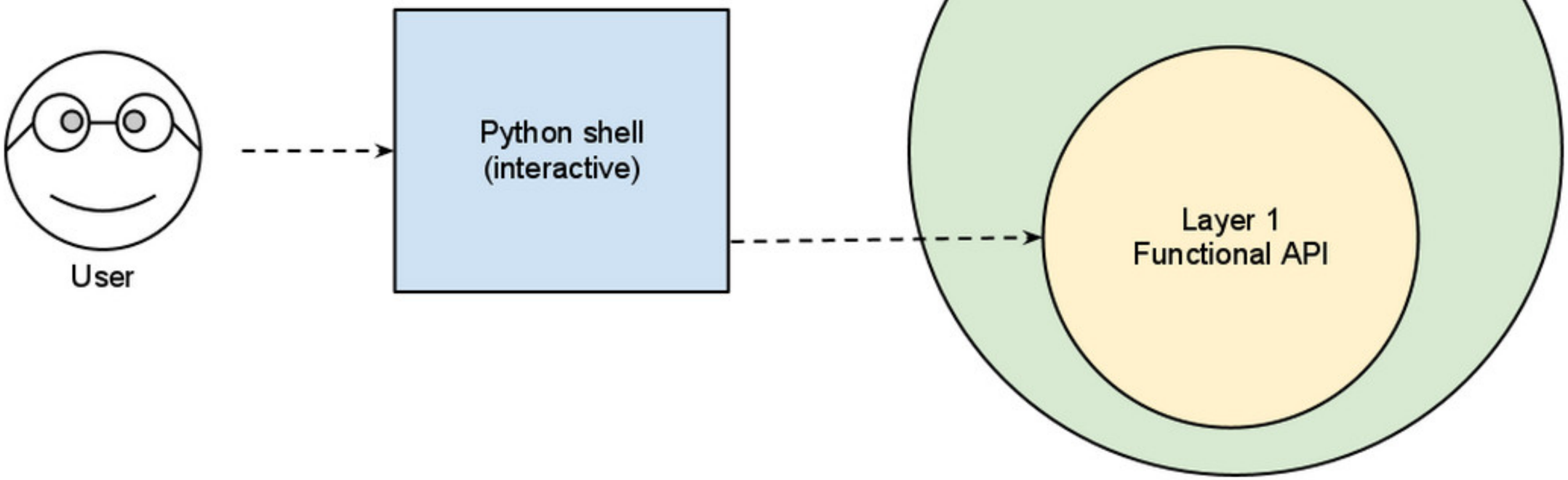
$ python -i
```

interactive


Functional API
(spike_sort)
io
Input /
Output
core
Data
processing
ui
Visualization
Data
Numpy
Matplolib
Scikits.learn
PyTables


Component-based API
(spike_beans)
SpikeDetector
ClusterAnalyzer
. . .
MyComponent1
FeatureBroker /
Event manager
Functional API
(spike_sort)
io
Input /
Output
core
Data
processing
ui
Visualization
Data
Numpy
Matplolib
Scikits.learn
PyTables


User
Python shell
(interactive)
Layer 2
Component-based API
Layer 1
Functional API


User
Python shell
(interactive)
Layer 2
Component-based API
Layer 1
Functional API

Implemented components

Input / Output:

- BakerlabSource
- PyTablesSource
- ExportCells

Data processing:

- *SpikeDetector*
- *SpikeExtractor*
- *FeatureExtractor*
- *ClusterAnalyzer*

Visualization:

- *SpikeBrowser*
- *PlotFeatures*
- *PlotSpikes*
- *Legend*

Програми Місця Система

23 °C вт 23 сер, 17:35 dmytro США

dmytro@dmytro-R580: ~/work/SpikeSort/exam

Файл Правка Вигляд Знайти Термінал Довідка

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>>>
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>>>
>>> browser.show()
>>> features.show()
>>> waveShapes.show()
>>> legend.show()
>>>
```

Figure 3

Cell 4

Cell 3

Cell 2

Cell 1

Figure 2

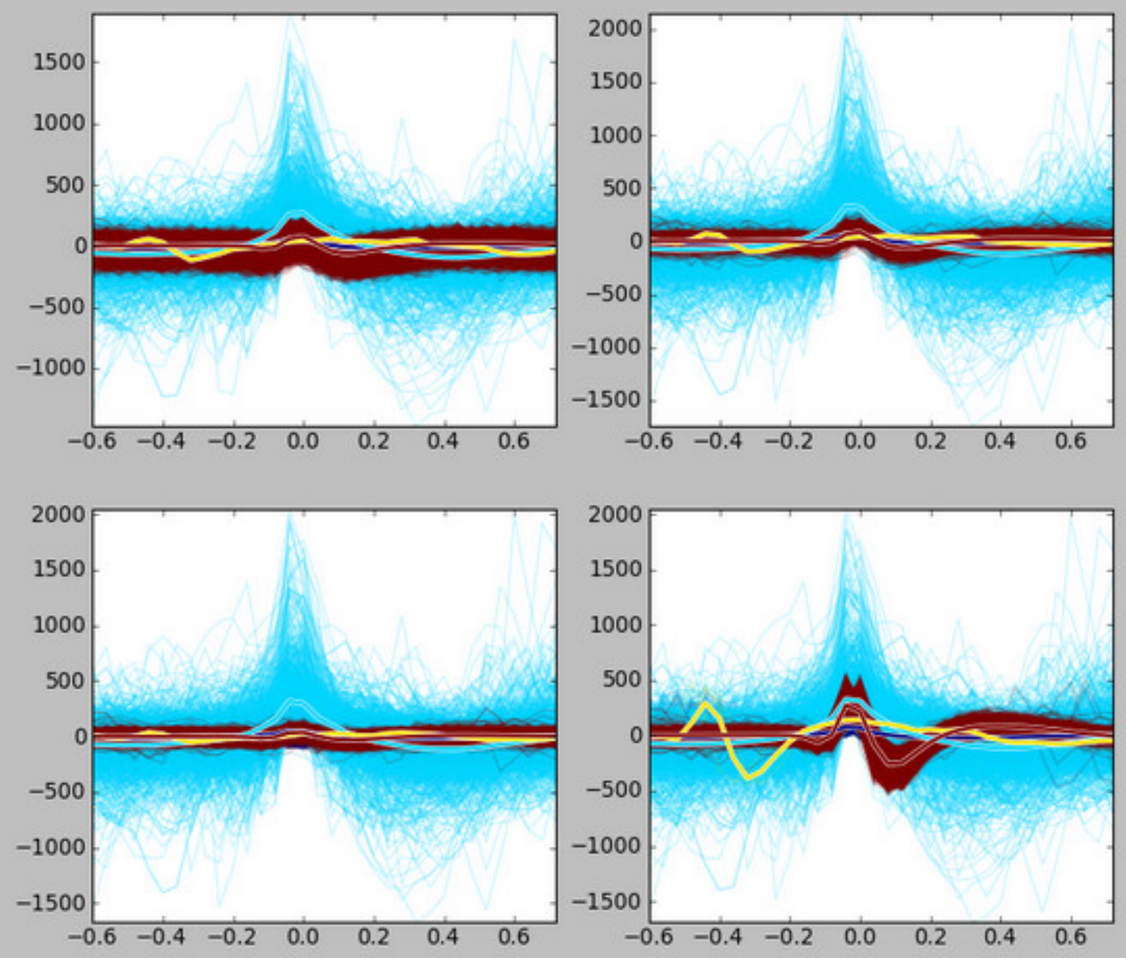
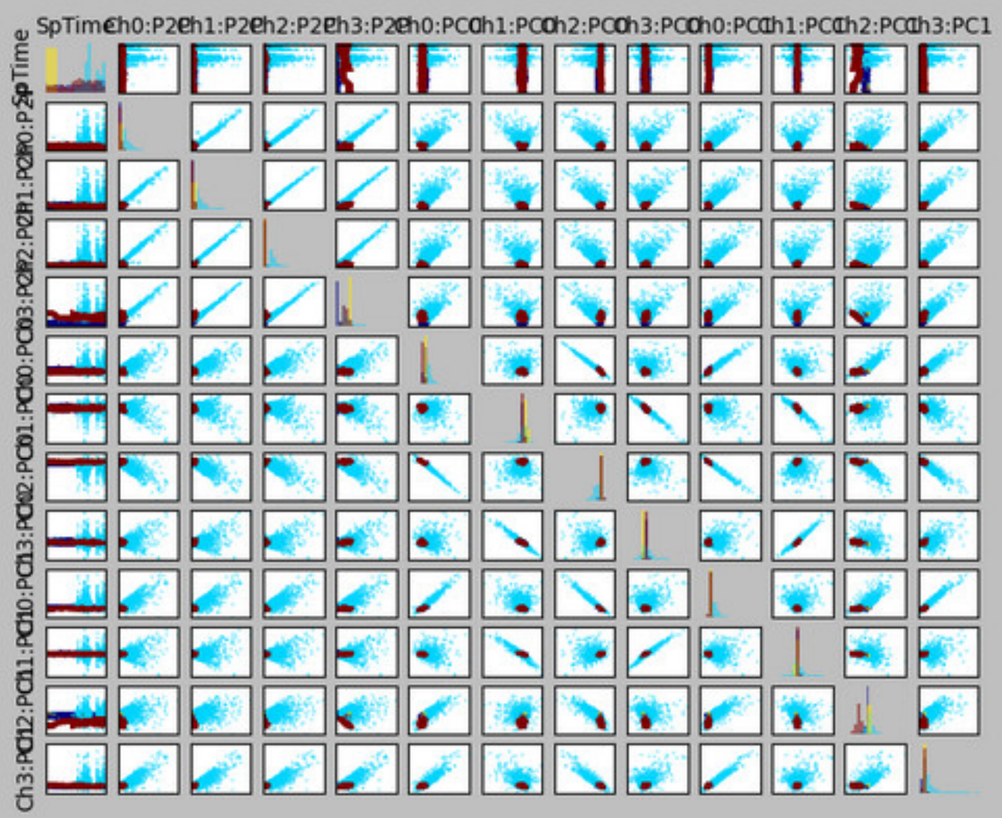


Figure 1



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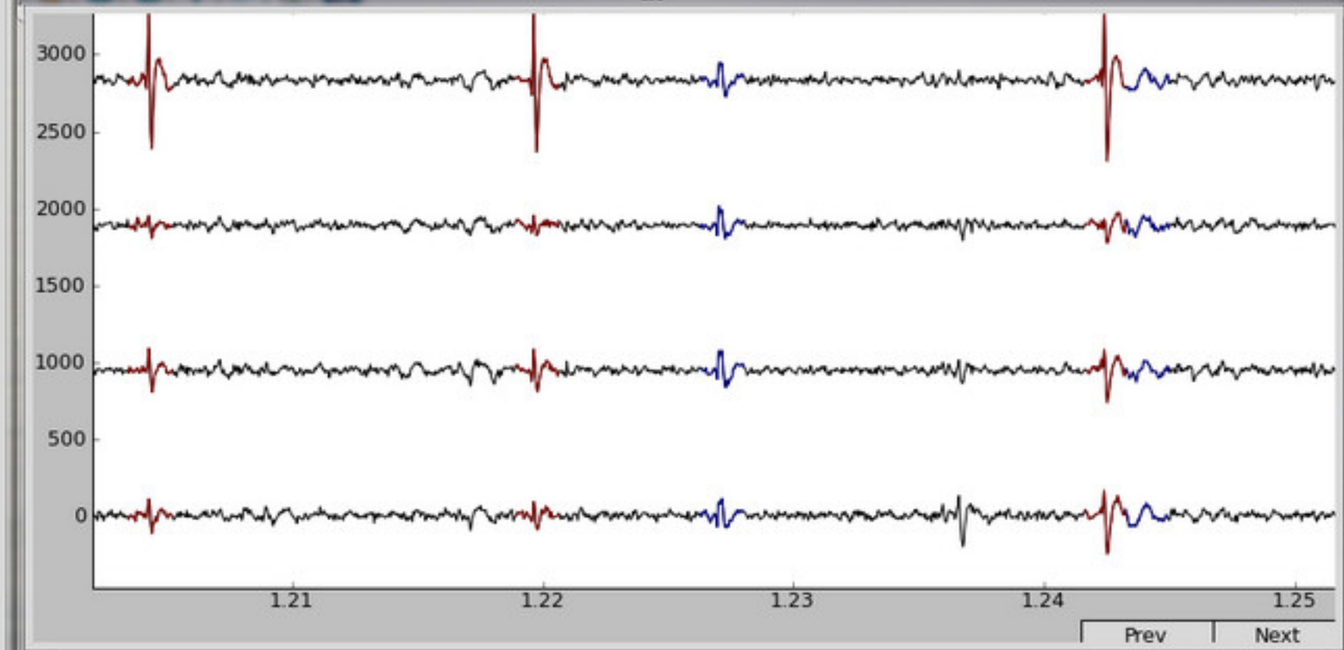

Програми Місця Система

23 °C вт 23 сер, 17:37 dmytro США

dmytro@dmytro-R580: ~/work/SpikeSort/exam

Файл Правка Вигляд Знайти Термінал Довідка

```
>>>
>>>
>>>
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>>>
>>>
>>>
>>>
>>>
>>>
>>> browser.show()
>>> features.show()
>>> waveShapes.show()
>>> legend.show()
>>> clusterAnalyzer.delete_cells(2)
>>>
```

Figure 3

Cell 4

Cell 3

Cell 1

Cell 0

Figure 1

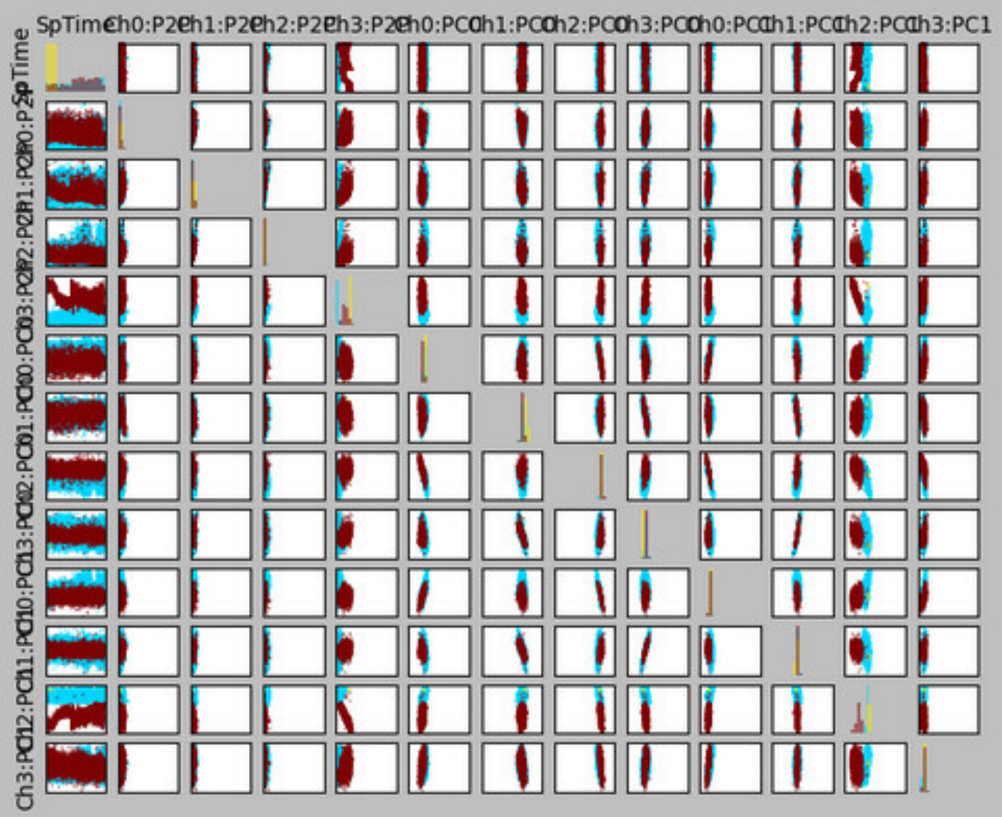
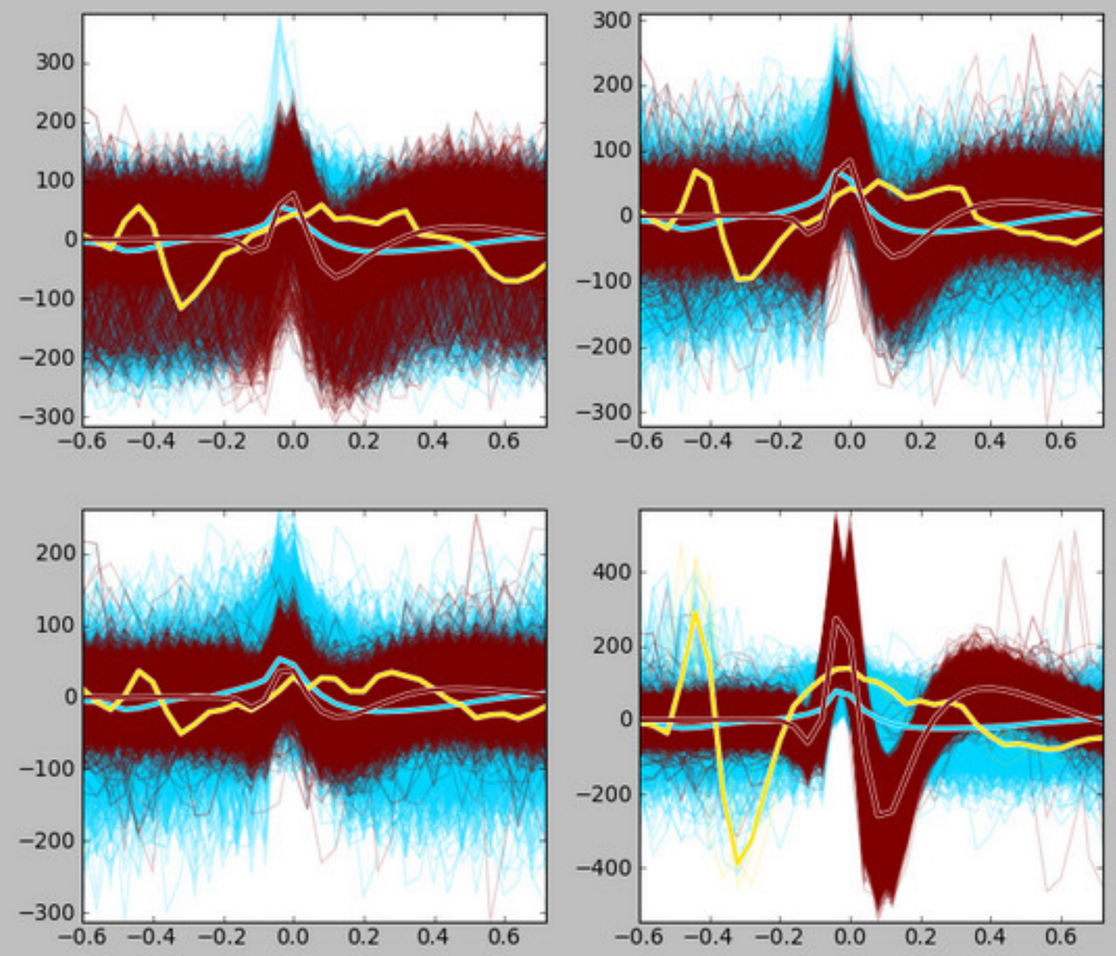
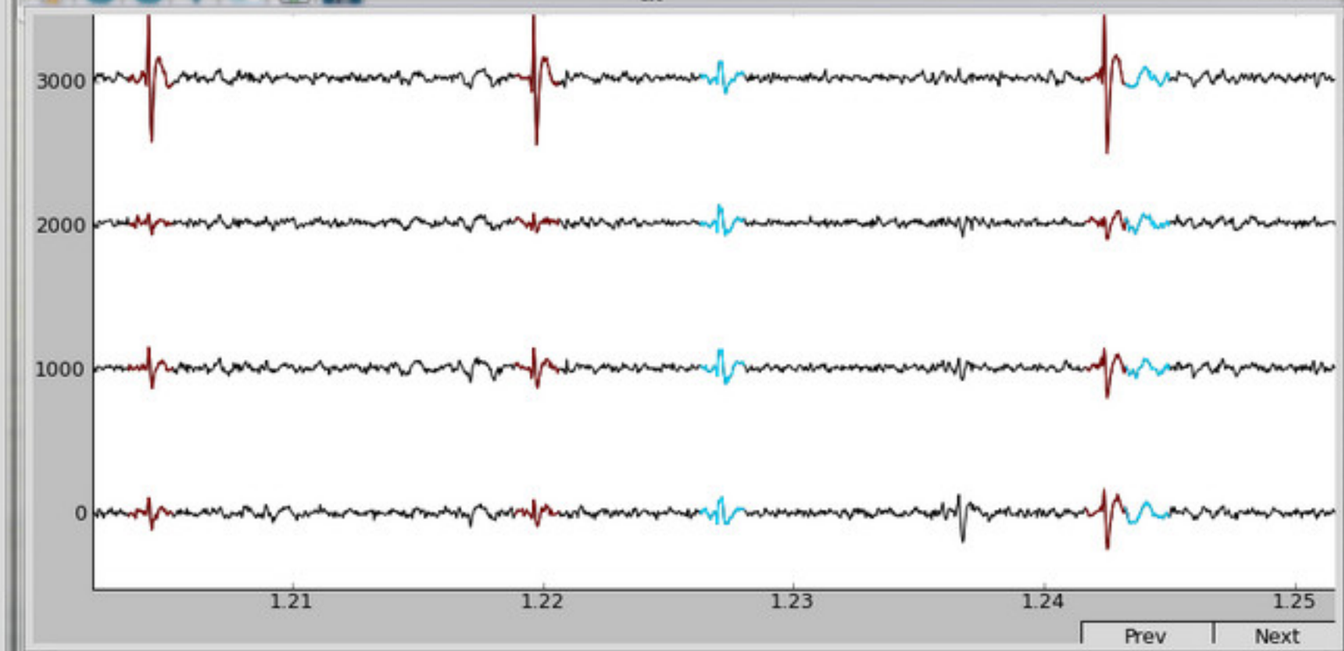


Figure 2



tk



Програми Місця Система

23 °C вт 23 сер, 17:39 dmytro США

dmytro@dmytro-R580: ~/work/SpikeSort/exam

Файл Правка Вигляд Знайти Термінал Довідка

```
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>>
>>> browser.show()
>>> features.show()
>>> waveShapes.show()
>>> legend.show()
>>> clusterAnalyzer.delete_cells(2)
>>> clusterAnalyzer.delete_cells(1,3)
>>>
```

Figure 3

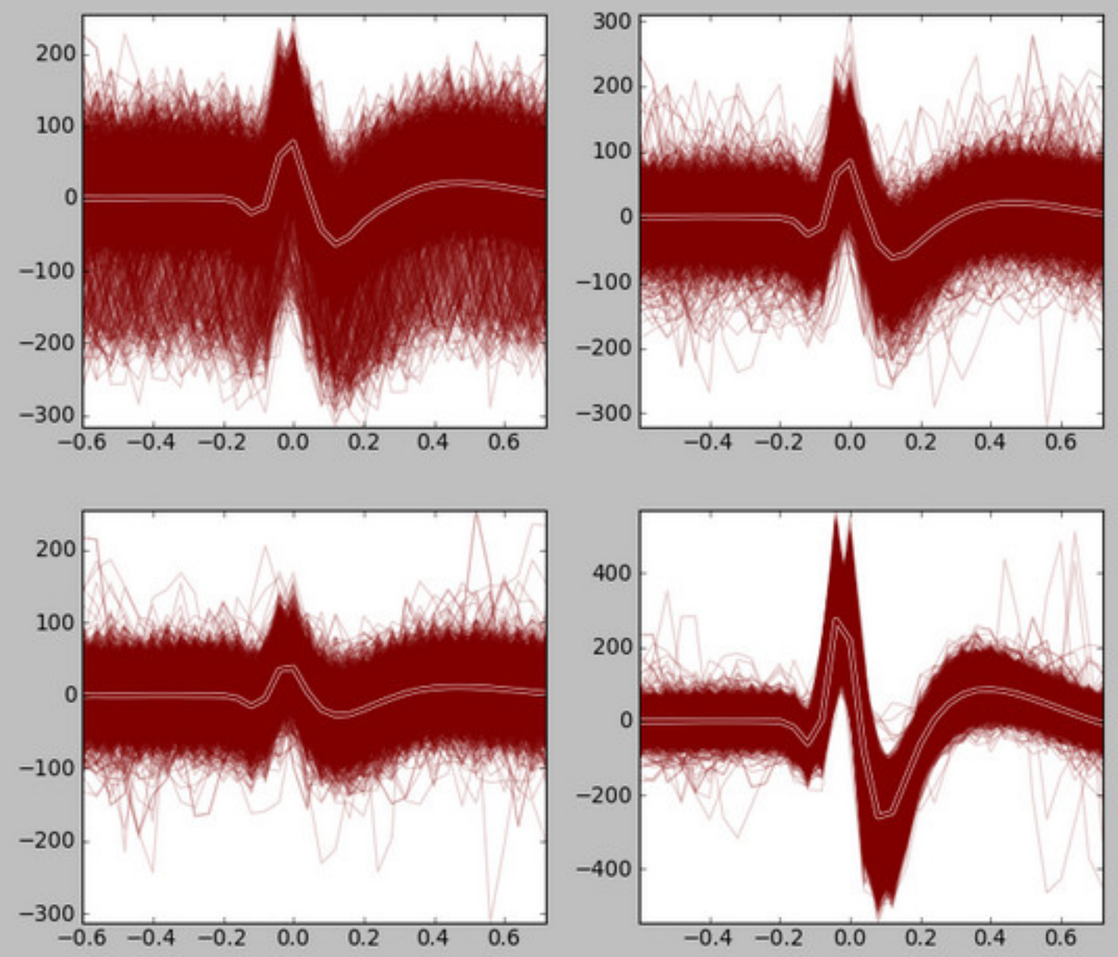
Cell 4

Cell 0

Figure 1

SpTime Ch0:P2 Ch1:P2 Ch2:P2 Ch3:P2 Ch0:PC0 Ch1:PC0 Ch2:PC0 Ch3:PC0 Ch0:PC1 Ch1:PC1 Ch2:PC1 Ch3:PC1

Figure 2



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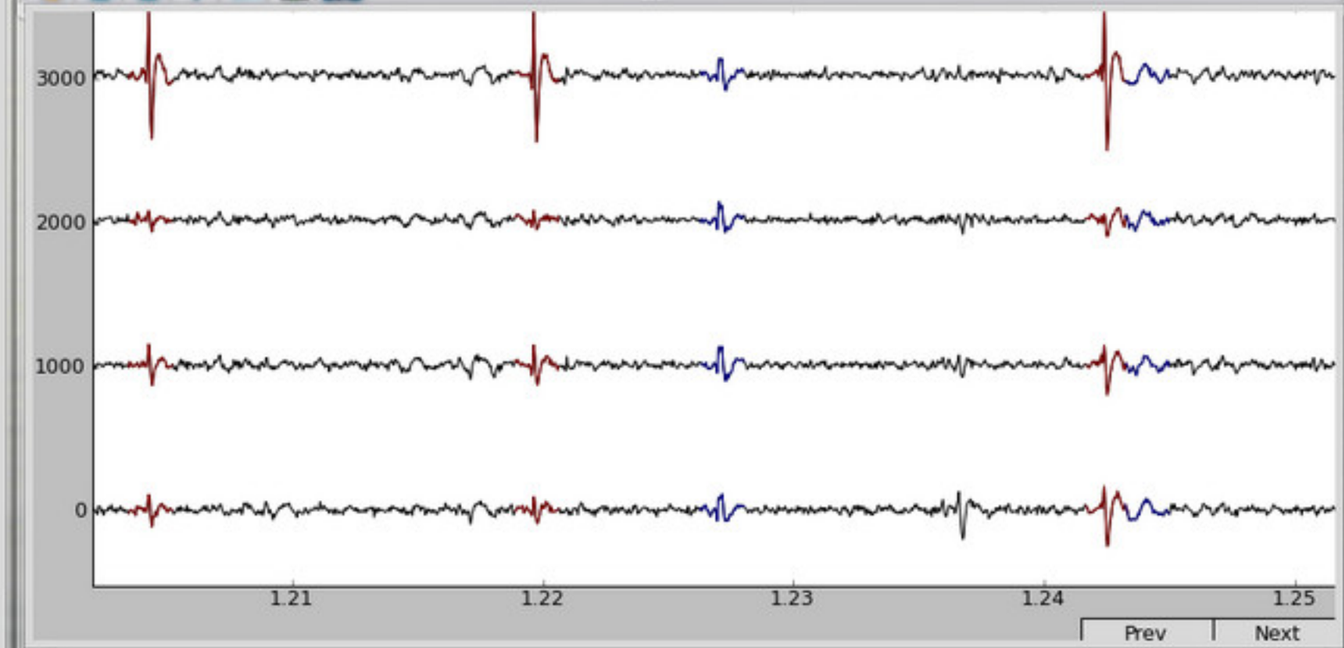


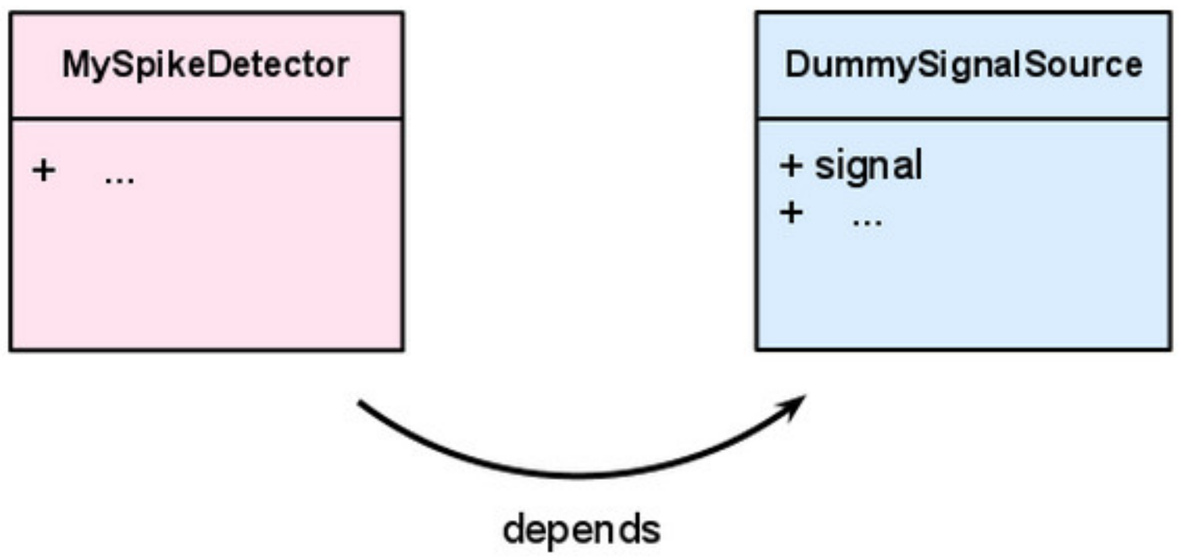
Data inputs:

Clustering:

Visualization:

Thanks for your attention!

SFB 618 (project B4)


MySpikeDetector
+ ...
DummySignalSource
+ signal
+ ...
depends

```
class DummySignalSource(base.Component):

    def __init__(self):
        signal = None
```

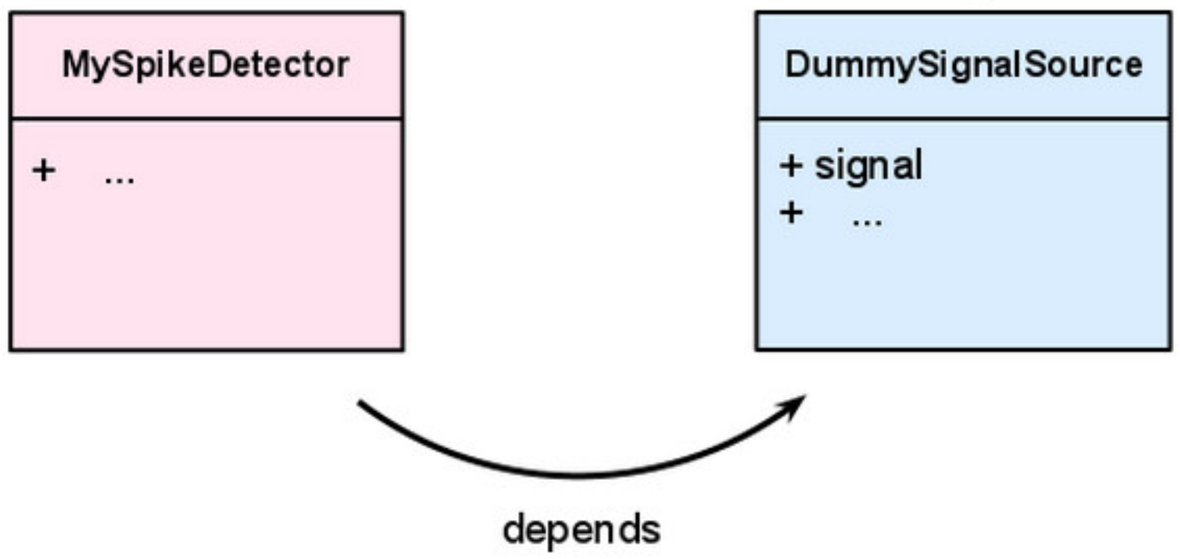
```
class MySpikeDetector(base.Component):

    signalSource = base.RequiredFeature("SignalSource",
                                        base.HasAttributes("signal"))

base.features.Provide("SignalSource", DummySignalSource())

detector = MySpikeDetector()

detector.update()
```



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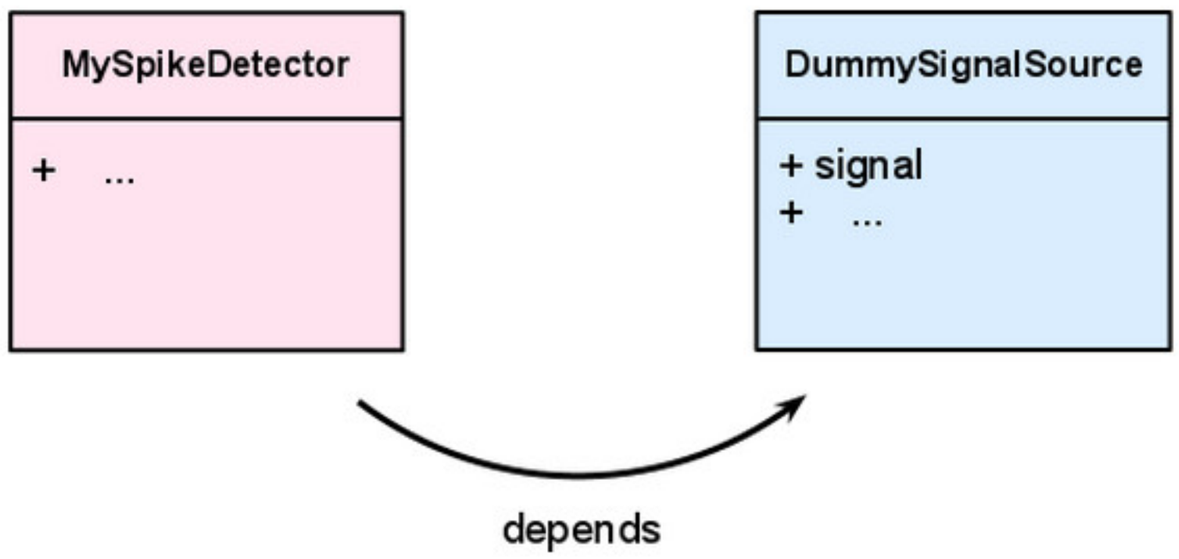

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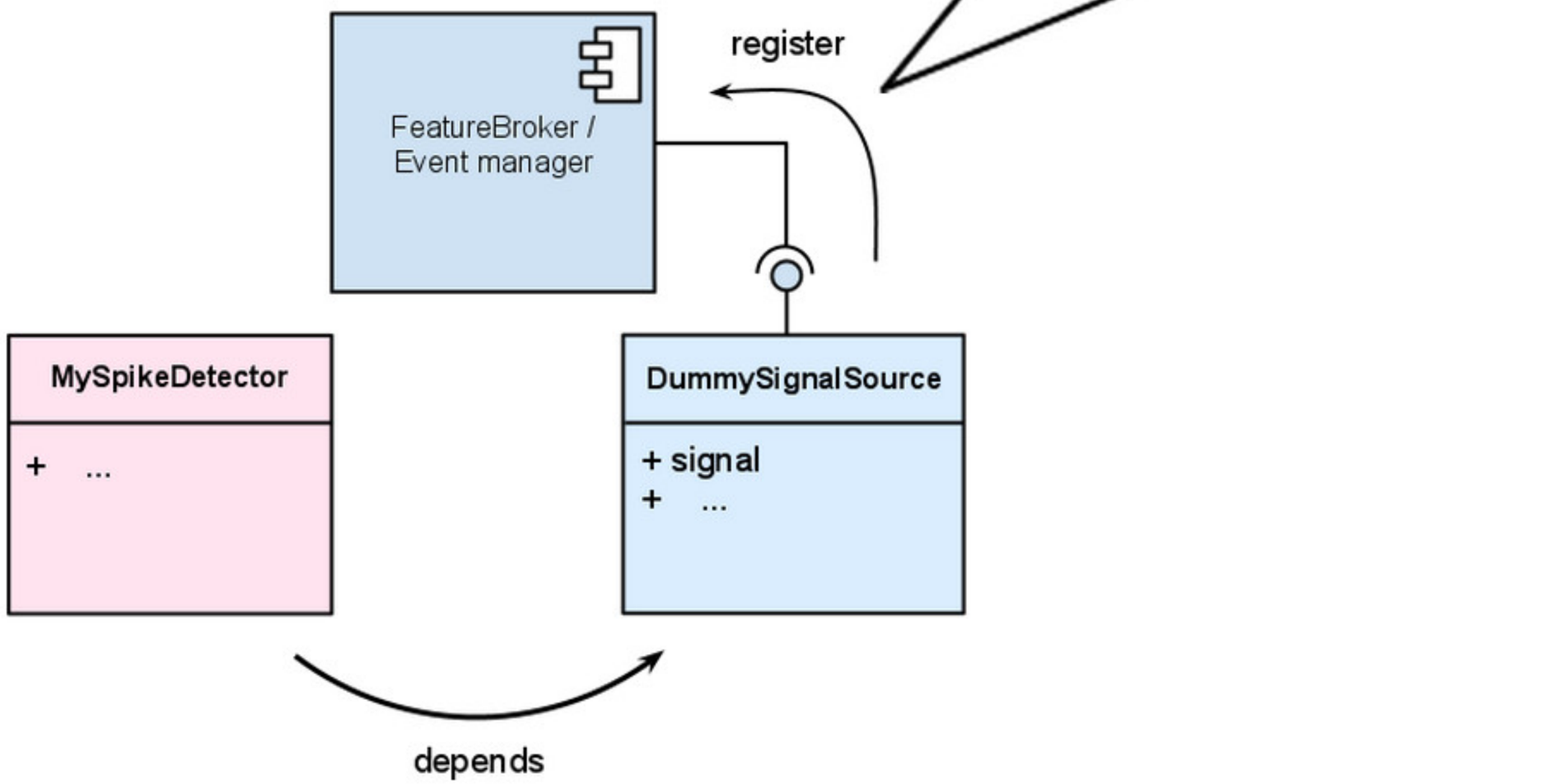

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