**CCA Run Time Analysis**

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**Part I. Python-based CCA** (Based on ***main\_mike.py***)

A picture containing text, electronics, computer, screenshot

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***Figure 1.*** *Major components time occupation with 1 iteration based on dataset s2. (a complete time profile file has been stored in directory McGill\_NeuroTech\_Signal\run\_time\_analysis\python\* *main\_mike\_runtime.Result)*

The major time-consuming functions are the CCA algorithms. One of the reasons why is they have been called for a large amount of time. For example, *filter\_bank\_cca\_it* has been called 9600 times. Therefore, to find out the real time for each function running once, we need to divide their total occupation time by the number of calls. Thus, a detailed run time map for each function has been summarized in Table I.

***Table I.*** *Function occupation time for each call*

|  |  |
| --- | --- |
| **Function names** | **Runtime for each Call (seconds)** |
| filter\_bank\_cca\_it() | 0.025 |
| standard\_cca\_it\_cca() | 0.00578125 |
| Standard\_cca() | 0.0016640625 |
| It\_cca() | 0.0025937499999999997 |
| Cheby1() | 0.0003475672877846791 |
| Filtfilt() | 0.0002427536231884058 |
| Corroef() | 0.00011197916666666667 |

Therefore, the time need to run 1 40-fundation-frequency-*filter\_bank\_cca\_it* is **1 second**.Which means in a real word situation, when analyzing 9-channels, 500-samples, 1 target data’s filter bank CCA requires 1 seconds. For a real-world spelling implementation, it is too slow.

**Part II. Matlab-based CCA** (Based on ***FBCCA\_experiments\_tun\_time.m***)

Table

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Figure 2. *Major components time occupation with 1 iteration based on dataset s2. (a complete time profile file has been stored in directory McGill\_NeuroTech\_Signal\run\_time\_analysis\MATLAB\* *Matlab-based CCA Run time analysis.pdf)*

A detailed run time map for each function has been summarized in Table II. From above we can tell that MATLAB requires much less time to run a filter bank CCA algorithm.

***Table II.*** *Function occupation time for each call*

|  |  |
| --- | --- |
| **Function names** | **Runtime for each Call (seconds)** |
| FBCCA\_IT() | 0.0049 |
| standardCCA\_ITCCA () | 6.2419e-04 |
| Standard\_cca() | 2.0262e-04 |
| It\_cca() | 1.2755e-04 |
| Cheby1() | 4.4093e-04 |
| Filtfilt() | 1.5357e-04 |
| Canoncorr() | 1.3570e-04 |

Therefore, the time need to run 1 40-fundation-frequency-*filter\_bank\_cca\_it* is **0.1960 second**.Which means in a real word situation, when analyzing 9-channels, 500-samples, 1 target data’s filter bank CCA requires 0.1960 seconds. For a real-world spelling implementation, it is Ok.