功能性近紅外光事件相關性分析
fNIRS Event Correlation Analysis

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本週課程內容

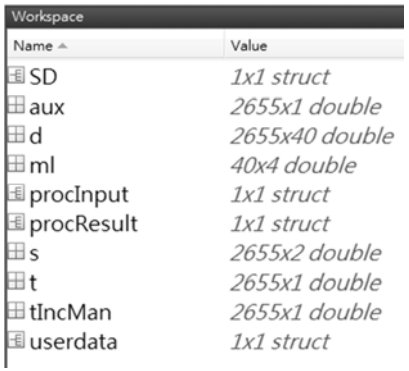
- fNIRS analysis package: HOMER2
  - http://www.nmr.mgh.harvard.edu/PMI/resources/homer2/home.htm
- HOMER Event-Signal Extraction
- Correlation Analysis

Please download the materials_L14.zip from
http://www.ym.edu.tw/~cflu/CFLu_course_fnirs.html

HOMER事件訊號擷取
HOMER Event-Signal Extraction

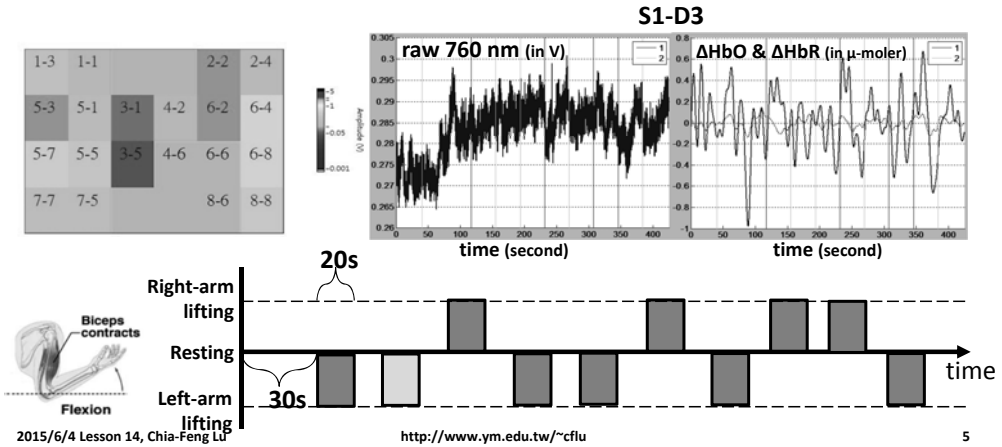
Processed Data from HOMER2

- **MATLAB mat-file format (*.nirs)**
- **s**: event time points
  - data length x conditions
- **procResult.dc:** Hb concentrations
  - data length x Hb components (HbO, HbR, Hbtotal) x channels
- **procResult.dcAvg:** block averages of Hb
  - Block length x Hb components x channels x conditions
- **SD.MeasListAct:** Enable/Disable channels
- **tIncMan:** Manually excluded time interval



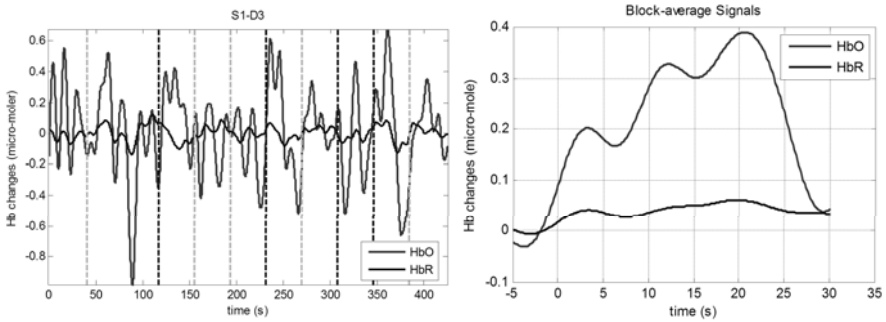
Bilateral Arm lifting

2015-05-07_002



Extract Event Signals from *.nris

- Please run **getEventSignal.m**
- load data_motor\NIRS-2015-05-07_002.nirs



Data Output to Excel files

- Output data (HbO and HbR for each trial)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		1	2	3	4	5	6	7	8	9	10	11	
2	Trial #1	0.304368	0.197776	-0.12985	-0.03229	0.196503	0.139079	0.015239	0.599601	0.096239	0.078081	0.401737	0.245
3	Trial #2	0.204666	0.110073	0.101516	0.164543	0.15698	0.089759	0.066582	-0.89352	0.085	0.066051	0.269519	0.245
4	Trial #3	0.029193	-0.11937	-0.23903	-0.12918	0.044276	-0.17	-0.05575	-0.51523	-0.03705	-0.25642	-0.15471	-0.26
5	Trial #4	0.73426	0.596244	0.588389	0.551218	0.965103	1.087566	0.640934	-0.71028	0.594467	0.622571	0.856479	0.660
6	Trial #5	0.819095	0.64145	0.733557	0.534508	0.742478	0.255548	0.604345	3.209016	0.753445	0.678904	1.06671	0.925

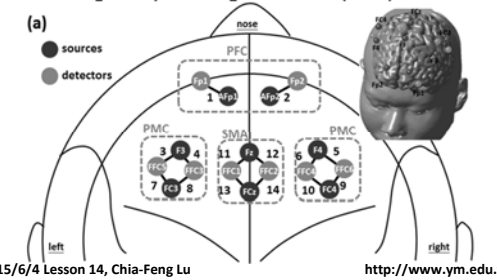
Rt_Avg Lt_Avg

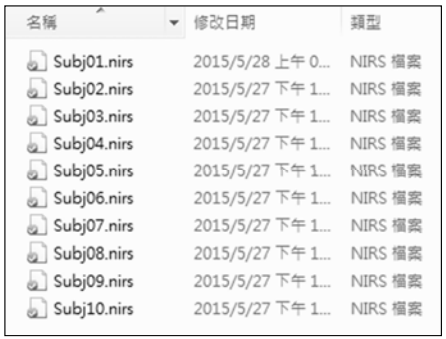
相關性分析
fNIRS Correlation Analysis

Example Dataset

- 10 subject processed files in the downloaded data folder
- 14 channels, 3 conditions (60 s)

1. Normal-pace walking (NW)
2. Walking while performing a cognitive task (WCT)
3. Walking while performing a motor task (WMT)





Correlation Analysis

- Cerebral oxygenation vs. behavior !?

	A	B	C	D	E	F	G	H	I	J	K
1		speed(com)	cadence	stride time	stride length	speed(cog.)	cadence	stride time	stride length	speed(motor)	cadence
2	Subj01										
3		1	89.2	113.2	1.055	94.92	88.1	120.2	1	88.605	100.4	12
4		2	102.8	127.7	0.94	97.235	103.8	127.7	0.94	98.045	98.8	12
5		3	95.1	116.1	1.025	98.815	93.6	117.6	1.02	95.74	103.1	13
6	Subj02										
7		1	107.1	103.2	1.15	124.61	99.9	101.7	1.175	117.02	107.7	11
8		2	105.1	108.2	1.1	116.005	105.1	104.7	1.125	119.86	109.7	1
9		3	107.5	109.4	1.09	119.22	103.1	105.8	1.13	117.795		
10	Subj03										
11		1	115.1	111.8	1.065	125.025	90.7	101.5	1.17	107.73	114.7	11
12		2	109.4	106.8	1.12	122.745	98.1	105	1.14	112.805	107.2	1
13		3	110.1	109.7	1.08	122.035	104	109.1	1.09	115.12	113.5	11
14	Subj04										
15		1	108.6	112.3	1.055	116.02	113	108.2	1.1	113.485	103.4	11

Perform Correlation Analysis

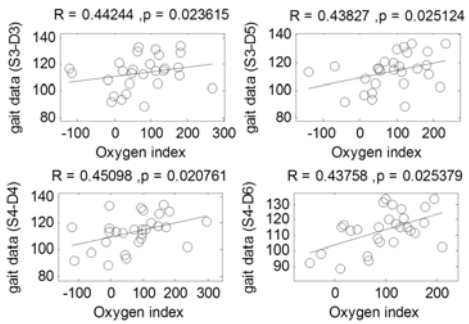
- Please run **HbCorrAnalysis.m**
- load data_gait folder

Correlation Results

List

```
[Cond.3: motor] Significant Correlations with Speed :
  (Ch.3: S3-D3) R = 0.49472, P = 0.0074442.
  (Ch.4: S3-D5) R = 0.53995, P = 0.0030193.
  (Ch.7: S5-D3) R = 0.66982, P = 9.6699e-05.
  (Ch.8: S5-D5) R = 0.44878, P = 0.0166.
  (Ch.13: S8-D7) R = 0.50211, P = 0.0064758.
  (Ch.14: S8-D8) R = 0.41047, P = 0.030037.
[Cond.3: motor] Significant Correlations with Cadence :
[Cond.3: motor] Significant Correlations with StrideTime :
[Cond.3: motor] Significant Correlations with StrideLength :
  (Ch.3: S3-D3) R = 0.44914, P = 0.016504.
  (Ch.4: S3-D5) R = 0.51752, P = 0.0047961.
  (Ch.7: S5-D3) R = 0.73847, P = 7.2398e-06.
  (Ch.8: S5-D5) R = 0.39815, P = 0.03587.
  (Ch.9: S6-D4) R = 0.52222, P = 0.0043636.
  (Ch.13: S8-D7) R = 0.53457, P = 0.0033835.
  (Ch.14: S8-D8) R = 0.47762, P = 0.01016.
```

Scatter plots



Notes

- Use the partial correlation analysis to remove confounding effects (age, gender,…).
- Use false discovery rate (FDR) to correct for the multiple correction.
- Use the scatter plots to check the data distributions.

THE END

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