

Uncertainty and complexity in Medicine

Information theory concepts are being invoked with increasing frequency in health sciences literature, concepts such as Medical uncertainty and complexity are frequent in medicine. These concepts are well studied and have been applied with enormous success in Engineering, Physics and Computer Science. Recently some new information measures have been revisited, computational depth and sophistication. Computational depth measures the amount of computational effort that we need to produce an object and sophistication is the ultimate limit of depth. We propose the elaboration of a systematic review on this subject and try to apply known measures in Medicine or even propose new information measures that can be successfully applied in Medicine.

Work plan:

1. During the first 4 months the student should perform a systematic review on the subject. He should look for papers on this subject on the major indexed engines, such as, pub-med and Scopus. After collecting all the papers found the student should read the Abstract of the papers and select those that use the concepts of uncertainty, complexity or any information measure in Medicine. To finish the student should build a database of the selected papers with the measures used and the field of Medicine applied.
2. During the next 3 months the student should study the information measures and its properties used in Engineering and Computer Science.
3. During 3 months the student should evaluate the proper use of the proper measures in the papers selected in the meta-analysis, e.g., the student should be able to justify the use of the proper measure in each of the selected papers and replace the used one if he could strengthen the results in the paper.
4. During the last 2 months the student will be provided with a database of clinical data that she is expected to analyze with the knowledge gained in the previous months.

Advisor: Luís Antunes (<http://www.dcc.fc.up.pt/~lfa>)

Associated Project: *POSC/EIA/60819/2004*

Applications: from 01/07/2008 to 23/07/2008. (email to: lfa@dcc.fc.up.pt)

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References:

1. [Costa-Santos C](#) , [Bernardes J](#) , [Vitányi P](#) and Antunes L. [Clustering Fetal Heart Rate Tracings by Compression](#). Special Track on Data Mining, *the 19th IEEE International Symposium on Computer-Based Medical Systems*. 2006.
2. Costa Santos C., Antunes L., Bland M., Bernardes J. An alternative approach for assessing observer agreement. Submitted.
3. Rickles, D., Hawe, P., Shiell, A. (2007). A simple guide to chaos and complexity. *J. Epidemiol. Community Health* 61: 933-937
4. Plsek PE, Greenhalgh T. The challenge of complexity in healthcare. *BMJ* 2001; 323: 625–28.