Conceptual Biology and Literature Discovery Supporting Articles

Organizing traditionally published literature into digital libraries and providing efficient indexing and retrieval tools over these libraries has had the consequence of making an unprecedented amount of information and knowledge readily available. To harvest this knowledge, we must find ways to leverage our technological awareness and learning. This need has recently opened the door for human assistance requirements through machine intelligence. Knowledge extraction, text mining and conceptual relationships are key parts of the sciences involved in processing and analyzing text collections to discover potentially useful and interesting knowledge. Discovering new knowledge from scientific literature using these and other emerging text mining methods is termed as literature-based discovery.

The rapid growth of textural knowledge collections such as the MEDLINE® database of over 16 million documents has been accompanied by collections of well defined ontologies and vocabularies provided by the Unified Medical Language System® (UMLS) and the Medical Subject Headings® (MeSH) make biomedical literature an active and attractive domain for the emergence of an even more advanced form of machine learning; computational literature-based discovery across the entirety of the MEDLINE corpus. This is the stage where new approaches to complex conceptual associations and the comprehension of relationships and hidden meanings lead to the new world of Conceptual Biology.

The following articles are descriptive of the field of Conceptual Biology from its inception, early work and successes, to current research and future trends. These articles are only a selection of published works in the field, but they provide background and an overview of Araicom and its collaborative academic research partner's approach to the field.
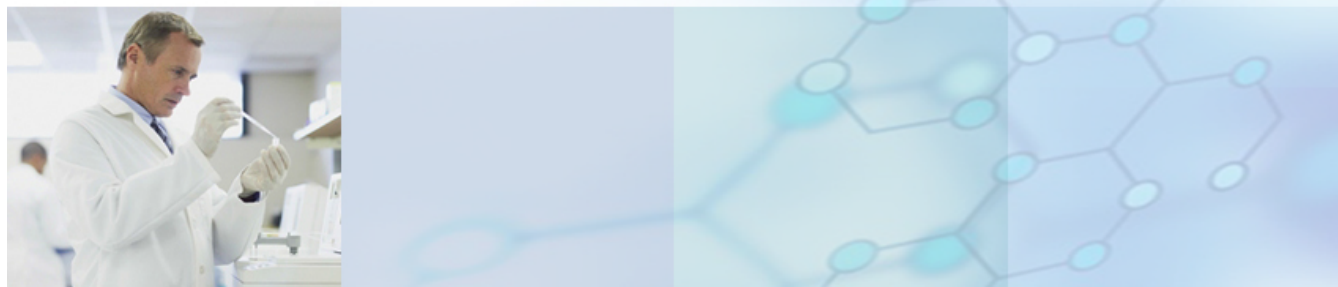
Conceptual Biology Research Supporting Platform: Current Design And Future Issues

The foundational paper co-authored by Araicom and its academic collaborators. The primary focus is the presentation of results from the Conceptual Biology and Literature Discovery research collaborative project. The paper provides background for the relevant sciences and challenges in prior work, innovations and validations with examples of the current work, and considerations for future research directions.

Full article: **http://www.springerlink.com/content/r614j6441x8181q5/**

Unearthing the Gems

This is the acknowledged source of the term "Conceptual Biology" as applied to the use of computational methodologies in sufficiently large data collections. This essay is credited with pointing out clearly how basic computational services can be useful in producing new approaches to the comprehension of large scale repositories. The essay explores computational examples related to p53, a significant protein related to cancer research, and points to the emergence of computational investigation of the literature as an appropriate and desirable basis for research based on the empirical evidence of the peer-reviewed literatures.

Full article: **http://www.nature.com/nature/journal/v416/n6879/full/416373a.html**

Conceptual Biology, Hypothesis Discovery, and Text Mining: Swanson's Legacy

This paper is a recent review of the field highlighting the current status of research in this area. It includes a discussion of the strengths, weaknesses, and challenges attributed to the emerging field of Conceptual Biology. Much of the prior work in Conceptual Biology is highlighted, and an overview discussion of the various academic approaches to the architecture and deployment of the Pairwise Algorithm in biomedical literature research is reviewed.

Full article: **http://www.bio-diglib.com/content/3/1/2**

Text Mining: Generating Hypotheses from MEDLINE

This paper presents one of the variations of the Pairwise algorithm implementations. The authors speak as Subject Matter Experts on the issues involving the details of the biomedical literatures and the UMLS® and MeSH® knowledge systems. A key perspective provided by this paper is found in the narrative and references to the prior works in Conceptual Biology; the issue of clinical validation of the computational research is very well documented.

Full article: **http://mingo.info-science.uiowa.edu/padmini/jasist03.pdf**

Generating Hypotheses by Discovering Implicit Associations in the Literature: A Case Report of a Search for New Potential Therapeutic Uses for Thalidomide

Another well executed paper with clear discussion and presentation of approach and results from the research team's application of the Pairwise algorithm. Of significant interest is the hypotheses targeting based on thalidomide. This paper was instrumental in pointing to the potential therapeutic applications of thalidomide as an anti-inflammatory. Thalidomide research is now at the center of a still growing $2.5 billion biomedical research and development space with three major biotech companies involved.

Full article: **http://www.jamia.org/cgi/content/abstract/10/3/252**

References for: **Conceptual Biology and Literature Discovery Supporting Articles**

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4. Srinivasan P., *Text mining: generating hypotheses from Medline*, Journal of American Society for Information Science and Technology, 55 (2004), pp. 396-413.

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