INTERNATIONAL CENTRE
OF EXCELLENCE FOR
EDUCATION IN
MATHEMATICS

Ontologies in Biomedicine

Catheryn Gray, School of Mathematics and Statistics, University of New South Wales

My summer vacation scholarship concerned the role of ontologies in various areas of biology and medicine. Developments in computing have resulted in a huge growth in our ability to collect and store biomedical data. However, often the sheer volume of data overcomes the capacity of individual humans to reason with it, so it is desirable to automate reasoning and inference making as much as possible. Ontologies are used in areas such as artificial intelligence and expert systems as a way to formally represent the main concepts in a particular domain of knowledge. Thus they are one strategy for dealing with the data explosion.

As I had never heard of ontology, at least in the computer science sense of the word, the first part of the project was spent doing some background reading. After that, it was thought that it would be better to focus on some specific examples of ontologies in use. We selected the international ImMunoGeneTics information system (IMGT), for closer investigation. IMGT is a French database that specializes in immunoglobulins, T-cell receptors and other related proteins of the immune system. Their data is sourced from generalist gene databanks, such as GenBank and the DNA Data Bank of Japan. IMGT analyses the DNA sequences that it receives from these sources according to the IMGT ontology, which is explicitly set out in the IMGT Scientific Chart (available at http://imgt.cines.fr).

We were also interested in temporal ontologies, which are used for reasoning about systems that change through time. In medicine, temporal ontologies are used in areas such as cardiology, oncology, infectious diseases and paediatrics. Once again, we looked at one particular approach to temporal reasoning, Knowledge Based Temporal Abstraction method (KBTA), in the treatment of diabetes patients. (Shahar, 1997)

To me, the CSIRO Big Day, 2007 was undoubtedly the highlight of the Summer Vacation Scholarship. It provided an invaluable opportunity to develop my own communication and presentation skills, and also to meet students from other universities and appreciate the variety of mathematical research that is done in Australia.

Finally, I would like to thank AMSI and UNSW for providing me with the opportunity to pursue this project, and my supervisor, John Murray, for his support throughout the project.

Catheryn received an ICE-EM Vacation Scholarship in December 2006.
See http://www.ice-em.org.au/students.html#scholarships2007