

## Understanding the Molecular Basis of Type-2 Diabetes by Means of Evolving Ontologies and Intelligent Modelling

Nutrigenomics is a new, emerging field involving nutrition and genomics, i.e. how food affects gene expression. Diabetes is a very common disease of the modern world, Type-2 diabetes (T2DM) being most common, with a very strong genetic component. T2DM is caused by the interplay of genes and environment i.e. nutrition. About 150 genes are likely involved in the disease, but little is known about the expression levels of these genes in diabetic vs healthy individuals. We are organizing metadata related to nutrition and T2DM in an ontological representation. Ontology is about making explicit descriptions of concepts and relationships among them in a domain. However, in new domains, such as nutrigenomics, concept understanding, relationships, classifications and so on are evolving over time due to new discoveries and rapid progress in research. We are developing a special Evolving Ontology to deal with modifications, adaptations and polymorphisms for representing meta-knowledge. The Protégé ontology tool is used as a flexible knowledge representation formalism, Protégé also enables the integration of different widely used ontologies, such as Gene Ontology, with disease ontologies and the development of specific knowledge acquisition tools. In this project we are designing an Evolving Ontology to integrate knowledge about: 1) T2DM 2) Genes related to T2DM 3) Micro array data at gene expression level 4) Clinical data, including symptoms of T2DM and 5) Nutritional data related to T2DM. This approach aims to support further discovery by the integration of the knowledge base to build an expert system and artificial intelligence methods, such as Evolving Connectionist System and other neural network systems, in order to pinpoint genes of interest and relevant diet components. The expert system is to be used for personalized advice on healthy life-style and disease-preventing nutrition and eating habits, based on ones genetic profile and medical history.