

### PhD thesis & related material

**Title:** Algorithms for Image Analysis and Combination of Pattern Classifiers with Application to Medical Diagnosis.

**Title (original):** *Αλγόριθμοι Ανάλυσης Εικόνας και Συνδυασμού Ταξινομητών Προτύπων με Εφαρμογή στην Ιατρική Διάγνωση.*

#### Abstract:

Medical Informatics and the application of modern signal processing in the assistance of the diagnostic process in medical imaging is one of the more recent and active research areas today. This thesis addresses a variety of issues related to the general problem of medical image analysis, specifically in mammography, and presents a series of algorithms and design approaches for all the intermediate levels of a modern system for computer-aided diagnosis (CAD). The diagnostic problem is analyzed with a systematic approach, first defining the imaging characteristics and features that are relevant to probable pathology in mammo-grams. Next, these features are quantified and fused into new, integrated radio-logical systems that exhibit embedded digital signal processing, in order to improve the final result and minimize the radiological dose for the patient. In a higher level, special algorithms are designed for detecting and encoding these clinically interesting imaging features, in order to be used as input to advanced pattern classifiers and machine learning models. Finally, these approaches are extended in multi-classifier models under the scope of Game Theory and optimum collective decision, in order to produce efficient solutions for combining classifiers with minimum computational costs for advanced diagnostic systems. The material covered in this thesis is related to a total of 18 published papers, 6 in scientific journals and 12 in international conferences.

#### Keywords:

computer-aided diagnosis (CAD), medical image, mammography, pattern recognition, classifier combination, game theory.

- PhD thesis presentation (in greek) (UoA, Feb.09): [ppt](#) / [pdf](#) / [swf](#) (read-only)
- PhD thesis, english summary (UoA, Feb.08): [pdf](#) (read-only) ( [arXiv:0910.3348v1](#) [cs.CV])

- PhD thesis manuscript (in greek) (UoA, Feb.09): [pdf](#) (read-only)
- PhD thesis at National Documentation Centre (NDC): [NDC:ref\(1\)](#) , [NDC:ref\(2\)](#) , [Openarchives.gr:ref\(3\)](#)

### MSc thesis & related material

**Title:** Design and Evaluation of Computer-Aided Diagnosis in Medical Images (Ultrasound). **Title (original):**

## Theses

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*Ανάπτυξη και Αξιολόγηση Αλγορίθμων Αυτόματης Ιατρικής Διάγνωσης σε Ψηφιακές Εικόνες (Υπερήχων).*

### **Abstract:**

Analysis, design and implementation of algorithms for textural features analysis for computer-aided diagnosis in medical images (ultrasound). The project was accompanied by the development of a prototype software suite for texture analysis, optimal feature selection and pattern classification for automated diagnosis in ultrasound images of liver, implementing a wide range of linear and non-linear classifiers. The project was completed and presented successfully in summer 2000.

### **Keywords:**

computer-aided diagnosis (CAD), medical image, ultrasound, image processing, pattern recognition.

- MSc thesis presentation (in greek) (UoA, Sept.00): [pdf](#) (read-only)
- MSc thesis manuscript (in greek) (UoA, Sept.00): [pdf](#) (read-only)
- MSc thesis programs & sources (C/C++) (UoA, Sept.00): [zip](#)

### **BSc thesis & related material**

**Title:** Distributed Internet Application in Java for the Analysis and Protein Prediction in DNA Sequences. **Title (original):** *Κατανεμημένη Internet Εφαρμογή σε Java για την Ανάλυση και Πρόβλεψη Πρωτεϊνών σε Ακολουθίες Νουκλεϊκών Οξέων (DNA).*

### **Abstract:**

Analysis, design and implementation of a distributed Internet application for the WWW using Java. The project aimed at the development of a useful tool for molecular biologists, available as a free web service, for analyzing DNA sequences as an automated protein prediction tool. Preliminary analysis and algorithm design was conducted in collaboration with molecular biologists and research groups working in this area, especially focused on protein prediction via neural network classifiers. The software project was initially developed as a networked wrapper service for the web, using various stand-alone (external) programs for DNA sequence analysis. The final version is written entirely in Java (no external programs), employing an applet-based client module and a multi-threaded stand-alone Java server that implements the core service. The server modules that feature the neural network classifiers implement several processing enhancements like state-full processing (sessions), priority queues, results caching, configurable thread pool for neuron firing (in parallel), etc. The project was completed and presented successfully in fall 1997.

### **Keywords:**

bioinformatics, protein prediction, sequence analysis, internet programming, neural networks.

- BSc thesis presentation (in greek) (UoI, Oct.97): [pdf](#) (read-only)
- BSc thesis manuscript (in greek) (UoI, Oct.97): [pdf](#) (read-only)
- BSc thesis programs & sources (Java) (UoI, Oct.97): [zip](#)

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