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Integrated biomedical informatics for the management of cerebral aneurysms

Combining Text Mining and Microarray Analysis

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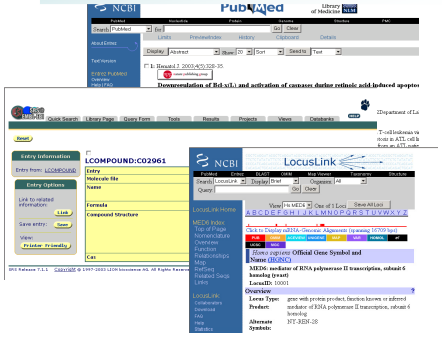
Outline

- Introduction
- Microarray Workflow
- Text mining – Named Entity Recognition for Genes
- Live Demo - Combining Text mining and Microarray analysis

@neuLink: Linking Genetics to Disease

Textual information



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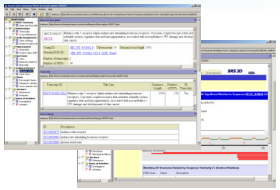
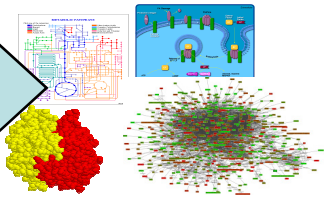
Public Biomedical Databases



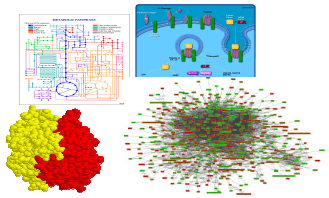
Text Mining

Disease Specific Genes



Candidate network of Genes with high Evidence

Disease Specific Genes



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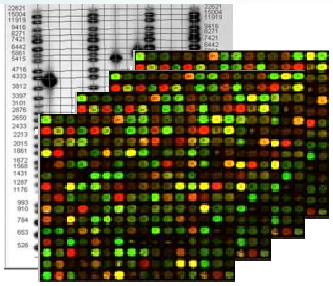
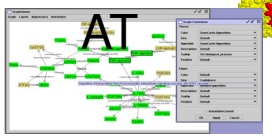
Experimental test



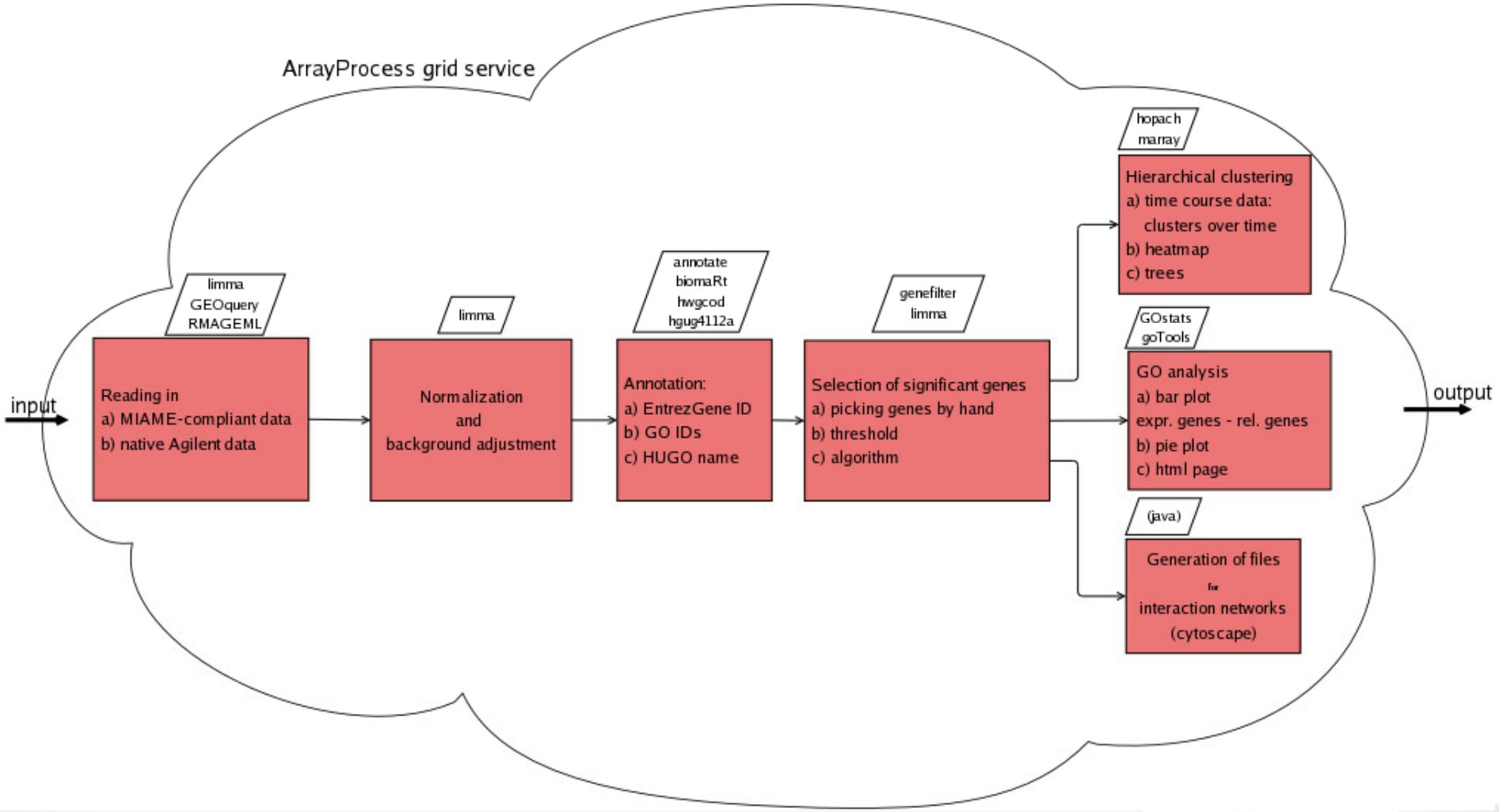
Data Mining

ATCGAATTA AT



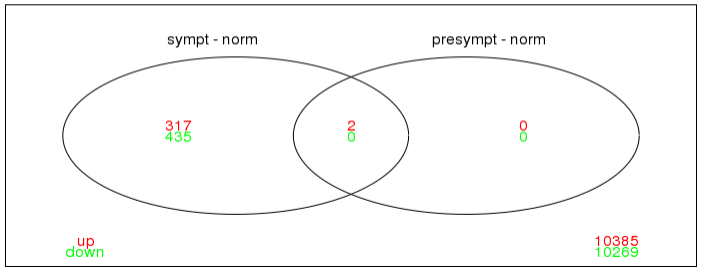
Friedrich, C. M.; Dach, H.; Gattermayer, T.; Engelbrecht, G.; Benkner, S. & Hofmann-Apitius, M.
@neuLink: A Service-oriented Application for Biomedical Knowledge Discovery
Proceedings of the HealthGrid 2008, IOS Press, **2008**, 165-172

Microarray Workflow

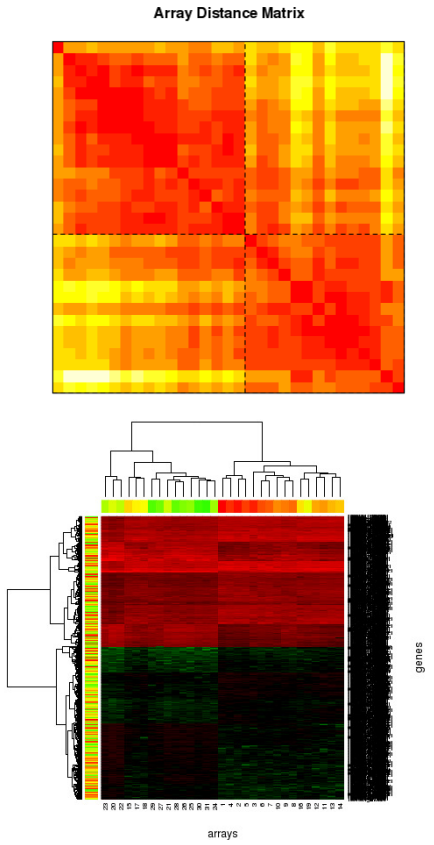


Microarray Workflow results master thesis Michaela Gündel (B-IT)

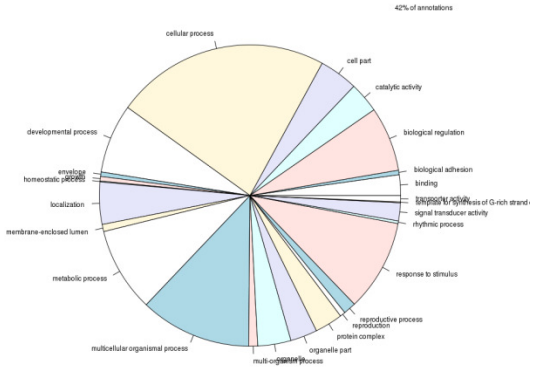
Venn Diagram (differentially expressed genes)



Clustering results



Gene Ontology analysis



Gündel, M. *ArrayProcess:* ***Work Flow for Microarrays***; Masters thesis, Life Science Informatics at Bonn-Aachen International Center for Information Technology (B-IT); *Germany*, **2007**

ProMiner: Dictionary based Named Entity Recognition

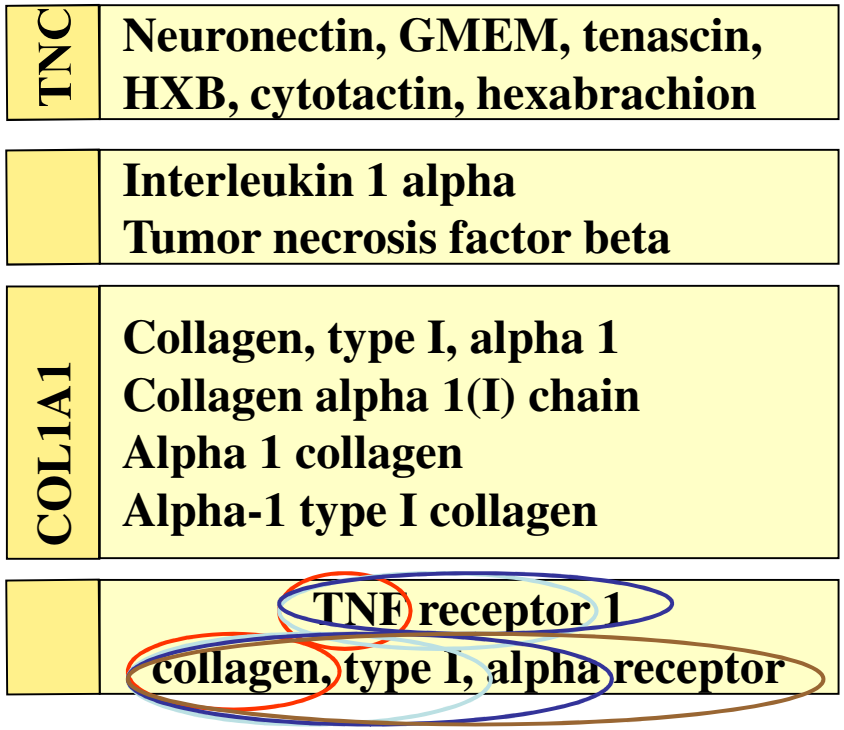
A Nomenclature Human for Gene names exists (HUGO) but nobody uses it.

J. Tamames and A. Valencia "**The success (or not) of HUGO nomenclature**", Genome Biol. 2006; 7(5): 402.

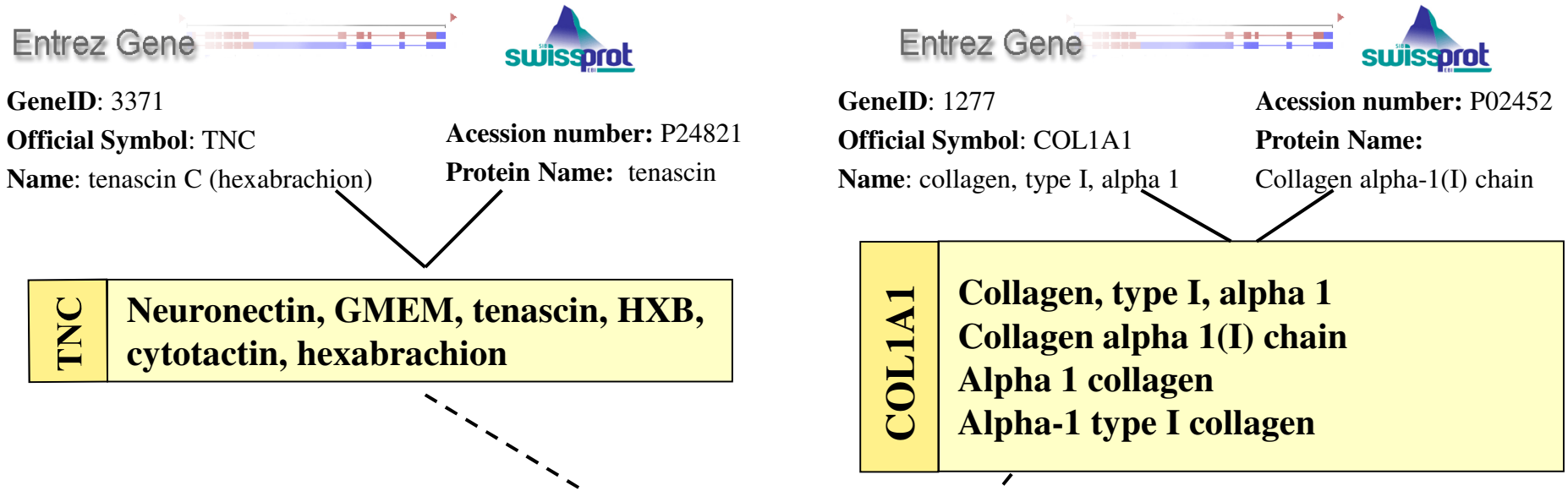
We need Named Entity Recognition but:

Gene and protein name constraints:

- Multiple synonyms
- Multi word terms
- Spelling variants
- Nested names
- Common names – AND, CAD



ProMiner: Entity Recognition and Normalization



In the second case, a missense mutation in COL1A1 (substitution of arginine by cysteine) results in a type I EDS phenotype with clinically normal-appearing dentition. Tooth samples are investigated by using light microscopy (LM), transmission electron microscopy (TEM) and immunostaining for types I and III collagen, and tenascin.

ProMiner: Performance in International Benchmarking

Participation of SCAI in „Critical Assessments of Text Mining in Biology“ (BioCreAtIvE) 2004 and 2006

	Mouse BioCreAtIvE I		Fly BioCreAtIvE I		Yeast BioCreAtIvE I		HUMAN BioCreAtIvE II	
	best automatic system	ProMiner system	best automatic system	ProMiner system	best automatic system	ProMiner system	best automatic system	ProMiner system
F-measure	0,79	0,79	0,82	0,82	0,92	0,9	0,81	0,8

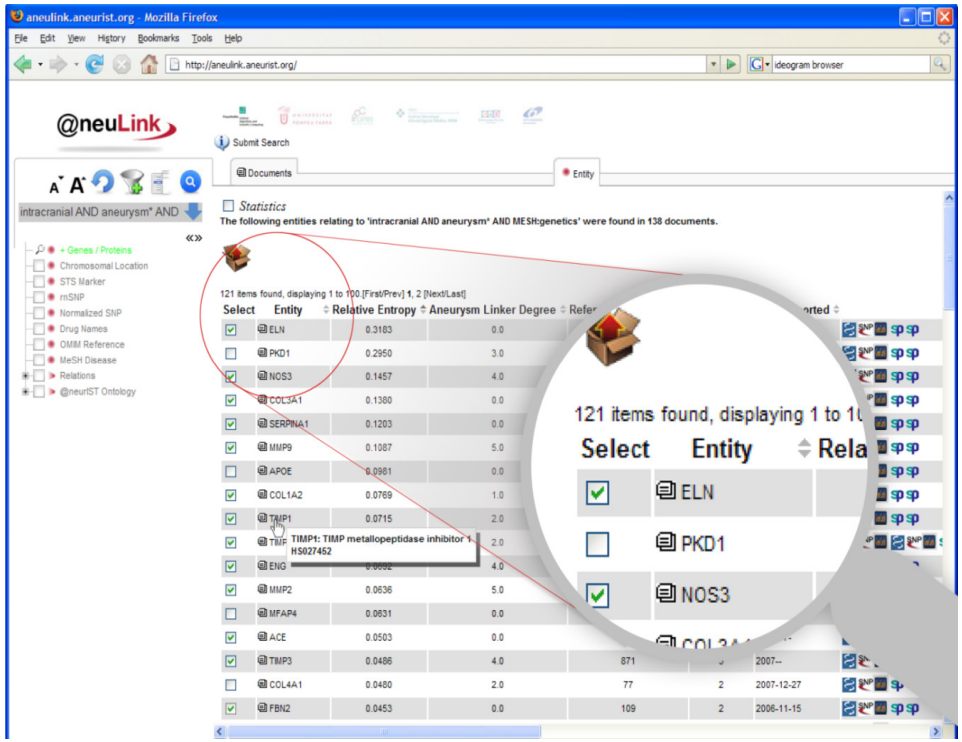
•Lynette Hirschman; Alexander Yeh; Christian Blaschke & Alfonso Valencia „**Overview of BioCreAtIvE: critical assessment of information extraction for biology.**“ *BMC Bioinformatics,* **2005***, 6 Suppl 1*, S1

•Alexander A. Morgan & Lynette Hirschmann, “**Overview of BioCreative II Gene Normalization**” *Proceedings of the Second BioCreative Challenge Evaluation Workshop,* **2007**, 17-27

•Special Issue on BioCreative II , *Genome Biology* 2008, **9**(Suppl 2)**:**S2

Fraunhofer SCAI Institute Algorithms and Scientific Computing

Combining Textmining and Microarray analysis
SCAIView – Knowledge Environment



SCAIVIEW

Best presented
in a Live Demo

M. Hofmann-Apitius; J. Fluck; L. I. Furlong; O. Fornes; C. Kolarik; S. Hanser; M. Boeker; S. Schulz; F. Sanz; R.Klinger; H.-T. Mevissen; T. Gattermayer; B. Oliva & C. M. Friedrich, „**Knowledge Environments Representing Molecular Entities for the Virtual Physiological Human**“, *Philosophical Transactions of the Royal Society A,* **2008**, 366(1878), 3091-3110.

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