KERMIT
Research Unit Knowledge-based Systems

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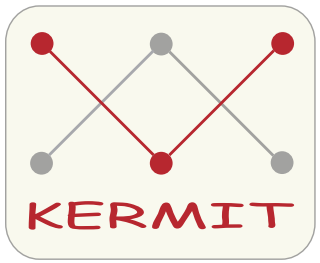

K nowledge

E xtraction

R epresentation

M agagement

I ntelligent

T echniques

Faculty of Bioscience Engineering, Ghent University

- **Ghent University** (1817): a pluralist university (40000 students), ranked 89 in the Shanghai ranking
- **Faculty of Bioscience Engineering** (1920):
  - offers academic education and services that support innovative applied scientific research with **living matter as the central subject**
  - teaching and research integrate biological, physical and chemical sciences with **engineering techniques**, with as objective the sustainable production and processing of plant and animal raw material and the management and protection of nature and the environment
- **Dept. of Mathemat. Mod., Statistics and Bioinformatics** (1993):
  - **BIOMATH**: model-based bio-process optimization (1 assoc. prof.)
  - **BIOSTAT**: applied biostatistics (1 full prof., 1 assoc. prof.)
  - **KERMIT**: knowledge-based modelling (1 full prof., 1 assist. prof.)
  - **BIOBIX**: bio-informatics (1,5 assoc. prof.)

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- **KERMIT** (2000):
  - draws upon intelligent techniques resulting from the cross-fertilization between the fields of **computational intelligence** and **operations research**
  - serves as an attraction pole for applications in the **applied biological sciences**
  - consists of one full professor and one assistant professor, 2 post-docs, 20+ PhD and some MSc students

KERMIT track record

Interdisciplinary team of (bio-)engineers, computer scientists and mathematicians:

- focus on **doctoral degrees**:
  - in the period 2001-2012: 39 PhD degrees awarded
  - at present: 20+ PhD students involved
- focus on **papers in top journals**:
  - in the period 2001-2012: 280 journal papers listed in Web of Science, the majority in the top quartile
  - in a broad range of subject categories

Three research lines

The activities of KERMIT are organised in three key research lines:

- **Knowledge-based modelling**: **fuzzy modelling**; **preference modelling**, (multi-criteria) decision making and voting; knowledge management, ontologies, ...
- **Predictive modelling**: **machine learning**, data mining, clustering, ...
- **Spatio-temporal modelling**: (partial) differential equations, **cellular automata**, individual-based models, coupled-map lattices, ...

Particular focus

Recurrent themes:

- mathematical and computational aspects of **relational structures** (preference relations, posets, graphs, ...)
- modelling of **imprecision** and **uncertainty**
- use of **(metaheuristic) optimization** techniques
- **high-performance computing** (Intel Blade server, over hundred cores)

Some fields of applications

Key fields of application:

- bioinformatics
- hydrology
- ecology
- microbiology
- remote sensing
- crop protection
- animal production
- hybrid breeding
- food science

Some future research themes

Interweaving our three research lines, opening up new research directions:

- analysis of **space-time series**: movement data
  (humans: mass events; animals: migration)
- analysis of **biological imagery**
- in silico testing of **ecological theories**
  (predator-prey models, cyclic competition)
- **food** safety and quality