

The [Laboratory of Intelligent Decision Support Systems](#) (IDSS)

within the [Institute of Computing Science](#)

at the [Faculty of Computing](#)

of the [Poznań University of Technology](#)

is chaired by [Professor Roman Słowiński](#),

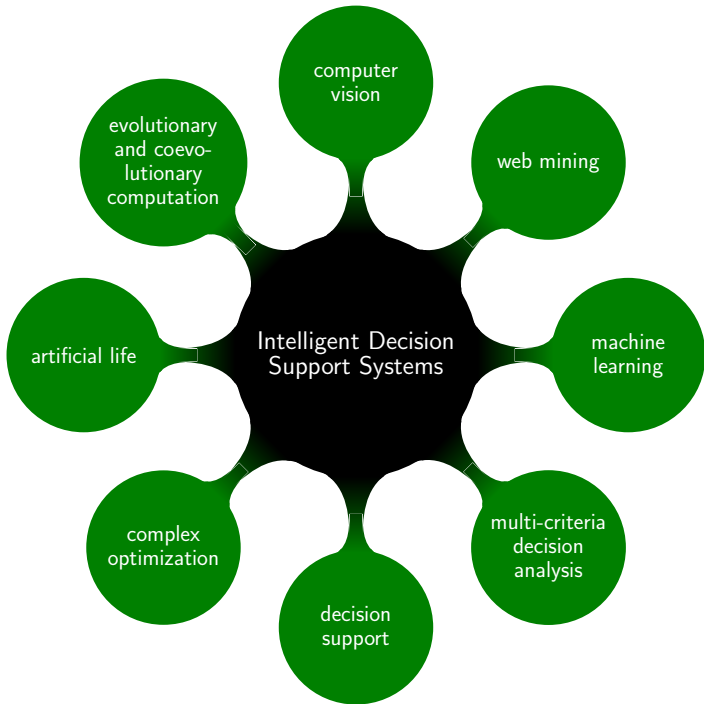
expert in methodology and techniques of decision support, including multiple criteria decision aiding,

preference modeling and knowledge-based decision support,

where he combines Operations Research and Computational Intelligence.

- IDSS is headed by **Roman Słowiński**:
  - ▶ EURO Gold Medal (1991)
  - ▶ Doctor Honoris Cause of Polytechnic Faculty of Mons (2000), University Paris Dauphine (2001) and Technical University of Crete (2008).
  - ▶ Edgeworth-Pareto Award by International Society on Multiple Criteria Decision Making (1997)
  - ▶ Annual Prize of the Foundation for Polish Science (the most prestigious scientific award in Poland – 2005)
  - ▶ Coordinating editor of European Journal of Operational Research (since 1999)

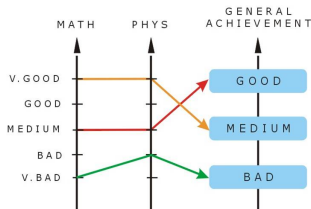




# Multi-Criteria Decision Support

- MCDA research areas:
  - ▶ Preference modeling from ordinal data
  - ▶ Rule-based models:  
**if** price  $\leq$  5000 and color = white  
**then** buy
  - ▶ Robust ordinal regression
  - ▶ Ranking methods
  - ▶ Multi-criteria optimization

- Over 200 publications and 10 000 citations (Roman Słowiński's  $h$ -Index  $\geq$  36)
- Industrial research projects: Philips Lighting, Wielkopolska Voivodship Office



## Mobile Emergency Triage

- Computer-based support for healthcare institutions:
  - ▶ Patient management process
  - ▶ Coordination and cooperation within an interdisciplinary healthcare team
  - ▶ Mitigation of adverse interactions between multiple clinical practice guidelines
  - ▶ Clinical decision making by constructing decision models from patient data
  
- Collaboration with University of Ottawa
- <http://www.mobiledss.uottawa.ca/>



# NaviExpert

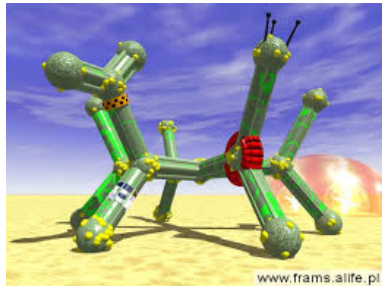
- Online car navigation system:
  - ▶ Use of floating car data
  - ▶ Online prediction of travel times
  - ▶ Online optimization of routes



- One of the most popular systems in Poland
- <http://www.naviexpert.com/>

# Framesticks

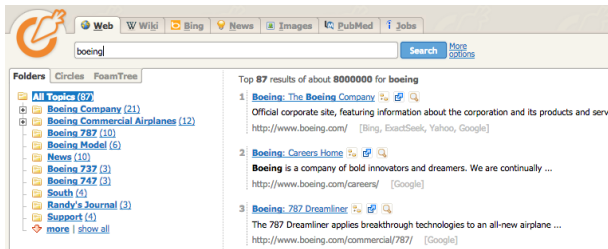
- Artificial life simulation project:
  - ▶ Evolutionary algorithms
  - ▶ Artificial intelligence
  - ▶ Neural networks
  - ▶ Biology
  - ▶ Robotics and simulation



- <http://www.framsticks.com/>

# Carrot

- Document clustering engine:
  - ▶ Hierarchical clustering of web search results
  - ▶ Based on the **description-comes-first** approach



The screenshot shows the Carrot search engine interface. At the top, there is a navigation bar with icons for Web, Wiki, Bing, News, Images, PubMed, and Jobs. A search bar contains the text "boeing" and a "Search" button with a "More options" link. Below the search bar, there are tabs for "Folders", "Circles", and "FoamTree". The "Folders" tab is active, showing a hierarchical tree of search results. The tree includes folders for "All Topics (37)", "Boeing Company (21)", "Boeing Commercial Airplanes (12)", "Boeing 787 (10)", "Boeing Model (6)", "News (10)", "Boeing 737 (3)", "Boeing 747 (3)", "South (4)", "Randy's Journal (3)", and "Support (4)". A "more | show all" link is at the bottom of the tree. To the right of the tree, there are "Top 87 results of about 8000000 for boeing". The first three results are:

1. **Boeing: The Boeing Company** [Bing, ExactSeek, Yahoo, Google]  
Official corporate site, featuring information about the corporation and its products and servi  
<http://www.boeing.com/>
2. **Boeing: Careers Home** [Bing, ExactSeek, Yahoo, Google]  
**Boeing** is a company of bold innovators and dreamers. We are continually ...  
<http://www.boeing.com/careers/> [Google]
3. **Boeing: 787 Dreamliner** [Bing, ExactSeek, Yahoo, Google]  
The 787 Dreamliner applies breakthrough technologies to an all-new airplane ...  
<http://www.boeing.com/commercial/787/> [Google]

- <http://carrotsearch.com/>



# Machine Learning

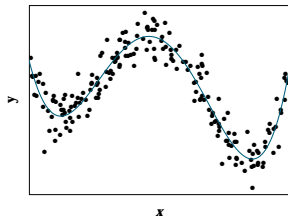
- Research areas:
  - ▶ Ordinal classification and ranking, multi-label classification and structured output prediction
  - ▶ Imbalanced data
  - ▶ Data streams
  - ▶ Ensemble methods
  - ▶ Deep learning
  - ▶ Statistical and online learning theory
- Industrial projects:
  - ▶ B&R Diagraphe Orange Labs,
  - ▶ Allegro Group

**Theorem 3.2.** Let  $\text{Reg}_{\text{exp}}(h, P)$  and  $\text{Reg}_{\text{log}}(h, P)$  be the regrets for exponential and logistic loss, respectively. Then

$$\text{Reg}_{\text{rank}}(h, P) \leq \frac{\sqrt{6}}{4} C \sqrt{\text{Reg}_{\text{exp}}(h, P)}$$

$$\text{Reg}_{\text{rank}}(h, P) \leq \frac{\sqrt{2}}{2} C \sqrt{\text{Reg}_{\text{log}}(h, P)}$$

where  $C < m$ .



## International Collaboration

- European Union
- Foundation for Polish Science
- National Science Centre
- National Centre for Research and Development
- Scholarships for Distinguished Young Researchers

## Funding of research projects

- University Paris Dauphine
- University of Catania
- Polytechnic Faculty of Mons
- Centrum Wiskunde & Informatica (CWI)
- University of California, Santa Cruz
- Massachusetts Institute of Technology (MIT)
- University of Ottawa
- Ghent University
- University of Paderborn
- University of Marburg
- ...