SPARKS
(Scalable and Pervasive software and Knowledge Systems)

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http://www.i3s.unice.fr/fr/sparks
The Staff:
36 permanent members (researchers, professors, and engineers)
36 non-permanent members (postdocs, PhD students, and engineers)
Three Research Themes

- **Knowledge Extraction and Learning**
  - Machine Learning, Data Mining, Text Mining and NLP
  - Heterogeneous Data (structured, text, graphs, multimedia)

- **Formalizing and reasoning with users and models**
  - Reconcile formal semantics and social/folk semantics
  - Semantic Web, communities, human-centered computing, multi-disciplinary approaches

- **Scalable Software Systems**
  - Distributed computing models, scalability
  - Software system dynamic adaptation et composition
Knowledge Extraction from heterogeneous data
Text Mining

- Solutions: Semantic Random Forest
Multimedia Data Mining

- Solution: Hybridation (SVM, MOGA, LSH, Active Learning)

[Pighetti, Pallez, Precioso]
Conceptual Bi-clustering

- Concept Lattices
- Theoretical Framework for:
  - Association Rule Extraction
  - Classification Rule Generation
  - Conceptual Biclustering

[Pasquier]
Enrichment

Reasoning

Querying
Data query & federation engine

- KGRAM (Knowledge Graph Abstract Machine)
  Semantic query engine

- Distributed Query Processing engine
Question-Answering Systems

• Answer **questions** in **natural language** by a user

• Exploiting a structured DB: **Dbpedia** (semantic Wikipedia)
• Interpreting questions based on **matching of relations**
• Argumentation module **RADAR** (answer explanation and justification)
Research question: How to automatically extract (OWL 2) ontological axioms from a set of known facts (an RDF dataset)?

Epistemological Problem:
• Test of hypotheses → falsification (cf. Popper)
• Noise in the data → possibilistic treatment

Search Problem:
• Evolutionary algorithms
• Relational Learning/ILP

[Tettamanzi, Faron-Zucker, Gandon]
Formal Semantics - Social Semantics

Emotions, sentiments

User Communities

Social Networks

Representation
Emotions & Argumentation

- Correlations between emotions of participants and the argumentative structures of a debate
- Observe emotional reactions of people arguing during a debate on a given subject

[Reference: Villata et al.]
Scalability

Distributed Computing

Adaptation Composition Speed-Up

Federated Knowledge Bases
Scalable Software and Knowledge Systems?
Dynamic Adaptation of Ambient Systems

- End-User-Driven Adaptation and Programming
- Self-adaptation to Context Changes
- Self-adaptation to Platform Changes

**Réactivité**
- Ensure Continuity of Service for a mobile user in an ecosystem of connected objects

**Models** for dynamic adaptation
- User Experiments

Service Infrastructure and devices
Physical Environment
Sensor Networks

- Heterogeneous, limited capacity peripherals
- Continuous data streams to be merged
- Software Behavior Composition
Ontology-based data model

- Client
- Federator
- Mediator
  - Site 1
  - Site 2

Data querying

Medical domain ontology
(reference model)

Data alignment
Projects and Collaborations
Scientific Production

• Where do we publish?
  - AAMAS, ACL, AOSD, CAiSE, CHI, COLING, ECAI, ECSA, EDBT, EKAW, ESWC, Eurosyst, GECCO, Hypertext, ICSR, IJCAI, ISWC, KCap, TrustCom, UbiComp, WWW...

• We also organize:

• Publications (2011 – 2016): 600
  - 81 journal articles (76 international, 5 national)
  - 385 conferences (7 invited, 271 int’l w/ procs, 25 nat’l w/ procs, 28 posters)
  - 26 editorships
  - 140 books and book chapters
  - 24 theses (23 PhD, 1 HDR)
Some Highlights

• Start-ups:

  Pulse
  TOTEM
  mnemotix
  edX

• Prizes and distinctions
  – 6 best papers, 1 best poster, 1 best demo
  – EDx prize finalist (out of 1700 candidates) for a MOOC on HTML5 (+100 000 participants)

• Strong Local Involvement
  – I3S Director
  – 3 vice-presidents of UNS
  – Preparation and direction of the Labex UCN@Sophia
  – IDEX UCAJEDI: involvement in Academies 1 (co-direction) and 5

• Strong Involvement in Industrial Contracts
  – EDF, Alcatel Bell Lucent, SAP, Berger Levrault, Autodesk, …

• Teaching: direction of 4 Master 2 curricula; MIAGE, IUT, Polytech

• International: Vietnam, Tunisia, Egypt (Master + Joint Theses)
Thanks for your attention !