Software and Knowledge Engineering Laboratory

http://skel.iit.demokritos.gr

Vangelis Karkaletsis
## SKEL People

<table>
<thead>
<tr>
<th><strong>Head of SKEL</strong></th>
<th>Karkaletsis Vangelis</th>
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<tbody>
<tr>
<td><strong>Researchers</strong></td>
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<td>Paliouras George</td>
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<td>Spyropoulos Konstantinos</td>
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<td><strong>Post-doctoral researchers</strong></td>
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<td>Artikis Alexandros</td>
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<td>Giannakopoulos George</td>
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<td>Karampiperis Pythagoras</td>
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<td>Konstantopoulos Stasinos</td>
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<td>Krithara Anastasia</td>
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<td>Petasis George</td>
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<td>Pierrakos Dimitris</td>
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<td>Vetsikas Ioannis</td>
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<td>Vogiatzis Dimitris</td>
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<td><strong>Visiting researchers</strong></td>
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<td>Athitsos Vassilis</td>
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<td>Makedon Fillia</td>
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<td>Mavridis Nikos</td>
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<td>Potamianos Gerasimos</td>
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<td><strong>Associate researchers</strong></td>
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<td>Giotis Panagiotis</td>
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<td>Katzouris Nikos</td>
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<td>Kioumourtzis George</td>
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<td>Konstantinidis Sotiris</td>
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<td>Kolliopoulou Eva</td>
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<td>Koukourikos Antonis</td>
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<td>Mouchakis Yannis</td>
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<td>Armeniakou Christianna</td>
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<td>Stamatakis Konstantinos</td>
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<td><strong>PhD Students</strong></td>
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<td>Galatas George</td>
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<td>Kosmopoulos Aris</td>
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<td>Skarlatidis Anastasios</td>
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<td><strong>Robots</strong></td>
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<td>Indigo</td>
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SKEL Research Areas

► Intelligent Content Analysis
  ▶ Knowledge Engineering
  ▶ Language Engineering
  ▶ Data Engineering

► Cognitive Systems
  ▶ Dialogue Systems
  ▶ Computational Creativity
  ▶ Personalization
  ▶ Intelligent Agents
  ▶ Robotics
## Knowledge Engineering

<table>
<thead>
<tr>
<th>Modeling</th>
<th>NOMAD (e-Governance)</th>
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<tbody>
<tr>
<td>Ontology Management</td>
<td>SemaGrow (Big Data)</td>
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## Language Engineering *(CLARIN-EL)*

<table>
<thead>
<tr>
<th>Opinion Mining</th>
<th>NOMAD (e-Governance), PREPARE (nuclear emergencies)</th>
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<tbody>
<tr>
<td>Argument Extraction</td>
<td>NOMAD (e-Governance), PREPARE (nuclear emergencies)</td>
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<tr>
<td>Summarization</td>
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<tr>
<td>Author Identification</td>
<td>REVEAL (journalism &amp; social media)</td>
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<tr>
<td>Speech Processing</td>
<td>AVISPIRE</td>
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## Intelligent Content Analysis (2/2)

### Data Engineering

<table>
<thead>
<tr>
<th>Event Recognition</th>
<th>REVEAL (journalism &amp; social media), USEFIL (e-Health), AMINESS (environmentally safe shipping), CPS (e-Health)</th>
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<tbody>
<tr>
<td>Content Classification</td>
<td>SemaGrow (Big Data), AMINESS (environmentally safe shipping)</td>
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<tr>
<td>Social Network Analysis</td>
<td>REVEAL (journalism &amp; social media)</td>
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<tr>
<td>Data Mining</td>
<td>AMINESS (environmentally safe shipping), AVISPIRE</td>
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### Experimental Testbeds

- **Question Answering Benchmarking**
- **Semantic Indexing Benchmarking**
  - BioASQ (Biomedical Data)
- **Triple Store Benchmarking**
- **Distributed Querying**
- **Ontology Alignment**
  - SemaGrow (Big Data)
- **Recommendations for positive content**
- **Content for children Benchmarking**
  - POSCON (Safer Internet)
Cognitive Systems (1/2)

### Dialogue Systems

<table>
<thead>
<tr>
<th>Topic</th>
<th>System/Tool</th>
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<tbody>
<tr>
<td>Question-Answering</td>
<td>PREPARE (nuclear emergencies)</td>
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<tr>
<td>Adaptation</td>
<td>CPS (e-Health)</td>
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<tr>
<td>Dialogue Management</td>
<td>C2Learn (e-Learning)</td>
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### Computational Creativity

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<th>Topic</th>
<th>System/Tool</th>
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<tbody>
<tr>
<td>Creativity Assessment</td>
<td>C2Learn (e-Learning)</td>
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<tr>
<td>Computational tools fostering creativity</td>
<td>C2Learn (e-Learning)</td>
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Cognitive Systems (2/2)

### Personalization

<table>
<thead>
<tr>
<th>Behavioral Models</th>
<th>C2Learn (e-Learning)</th>
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<tr>
<td>Emotion Profiling</td>
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### Intelligent Agents

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<tr>
<th>Policy analysis</th>
<th>AMINESS (environmentally safe shipping)</th>
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<tr>
<td>Actor Incentivization</td>
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### Robotics

<table>
<thead>
<tr>
<th>Object Recognition</th>
<th>AVISPIRE</th>
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## Exploitable Research Results

### Intelligent Content Analysis

<table>
<thead>
<tr>
<th>RESULT</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
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</thead>
<tbody>
<tr>
<td>Ellogon</td>
<td>Platform</td>
<td>Language Engineering Platform</td>
</tr>
<tr>
<td>Ravel</td>
<td>Tool</td>
<td>Annotation tool for text and multimedia</td>
</tr>
<tr>
<td>NewSum</td>
<td>Tool</td>
<td>language-independent, summarization technology</td>
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<tr>
<td>AQUA</td>
<td>Platform</td>
<td>Platform for Assisting Quality Assessment of Medical Web Resources</td>
</tr>
<tr>
<td>RTEC</td>
<td>Framework</td>
<td>Real-Time Event Calculus</td>
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<tr>
<td>GovInsight</td>
<td>Service</td>
<td>Text analysis platform for public consultations</td>
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## Exploitable Research Results

### Cognitive Systems

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<tr>
<th>RESULT</th>
<th>TYPE</th>
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<tbody>
<tr>
<td>Pserver</td>
<td>Service</td>
<td>Personalization Server</td>
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<tr>
<td>Eleon</td>
<td>Platform</td>
<td>Ontology Authoring Tool</td>
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<tr>
<td>MAMA</td>
<td>Tool</td>
<td>Dialogue Management Tool</td>
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<tr>
<td>Radorec</td>
<td>Tool</td>
<td>Range data object recognition</td>
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<tr>
<td>RoboPers</td>
<td>Tool</td>
<td>Synthetic Personality Traits</td>
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Dissemination
Standardization

► POWDER
► A W3C Recommendation
► Serving meta-information about Web resources
  • Thematic
    – Everything under news.bbc.com is news
  • Child-safety, mobile OK, accessibility, etc
    – Everything under google.com/mobile is mobile-friendly
  • Provenance and data for trust policies, etc.

► Participation to W3C groups:
► Government Linked Data working group
► Multilingual Web - Language Technologies Working Group
► e-Government Interest Group
► Locations and Addresses Community Group
Dissemination
RoboSKEL

► RoboSKEL: Robotic software and knowledge elucidation (http://roboskel.iit.demokritos.gr/)
  A testing and dissemination platform for a variety of technologies
  • adaptive dialogue management
  • pattern recognition from range data
  • speaker diarization
Dissemination

Organized events

► Co-organisation, hosting of workshops, tutorials, competitions
  ► Co-organisation and hosting of the workshop on "Open Collaborative Governance" organized within the project NOMAD (22/2/2013)
  ► Organisation and hosting of the 1st PServer workshop (15/03/2013)
  ► Launching of the 1st BioASQ challenge: Large-scale online biomedical semantic indexing (22/04/2013)
  ► Co-organisation with Safer Internet Hellas of the national competition for positive content in the context of the European competition (starts mid May 2013)
  ► Co-organisation of the International Conference on PErvasive Technologies Related to Assistive Environments (PETRA) (29-31/5/2013)
  ► Organisation of Multilling-2013 at ACL 2013 (August 2013)
  ► Tutorials given in various international conferences
  ► Various presentations/interviews in news/media
Education

Students

► **PhDs**: 1 finished in 2012, 6 in progress

► **Diploma theses** (under or post graduate): 5 finished in 2012, 7 in progress

► **Internships**: 6 finished in 2012, 6 starting soon

► Announcement of topics for BSc/MSc theses, internships
  (http://www.iit.demokritos.gr/iis/subjects)
Education
Seminars/summer schools

► Co-organization and hosting of the International Research-Centered Summer School in “Cognitive Systems and Interactive Robotics, Social Media, Digital Preservation”
(http://www.iit.demokritos.gr/education/summer_school_2013)

► Organization of seminars-labs on research methodology. 2 out of 4 seminars have already taken place:

1) literature search and use
2) Writing an article and collaborative tools
(http://edu.demokritos.gr/ge/index.php/el/announcements/623-1232201323)
Education Collaborations

- Joint PhD programs with the following Universities:
  - Department of Computer Science and Engineering at the University of Texas at Arlington (UTA), ΗΠΑ (http://cse.uta.edu/)
  - Department of Computer Science at the University of Houston (UH), ΗΠΑ (http://www.cs.uh.edu/)
  - Department of Computer Science and Engineering at the University of North Texas (UNT), ΗΠΑ (http://www.cse.unt.edu)
  - Faculty of Computer Science at the Dalhousie University (DAL), Canada (http://www.cs.dal.ca/)
  - Technical School of Informatics at the University of Alcalá (UAH), Spain (https://portal.uah.es/portal/page/portal/investigacion/unidades/grupos)
THANK YOU
Projects - NOMAD

- Policy Formulation and Validation through non moderated crowdsourcing
  - Policy modeling
  - Argument extraction

- SKEL Role:
  - Knowledge modeling
  - Opinion Mining
  - Argument Extraction
  - Summarization
Projects - AMINESS

► Analysis of Marine Information for Environmentally Safe Shipping
► Safety, management and monitoring of the sea environment (Aegean Sea)

► SKEL R&D:
► Event recognition
► Data mining
Projects – SemaGrow

- Data intensive techniques to boost the real-time performance of global agricultural data infrastructures
  - Resource discovery
  - Distributed querying infrastructure
  - Big Data

- SKEL R&D:
  - Indexing data summaries for resource discovery
  - Ontology alignment
  - Querying distributed repositories and streams
  - Rigorous testing methodology and application
Projects - C2Learn

- Creative Emotional Reasoning Computational Tools
  - Fostering Co-Creativity in Learning Processes
    - Innovative digital gaming and social networking environment
    - Co-creativity in learning processes
    - Formal and informal educational settings

- SKEL R&D:
  - Creativity Assessment
  - Behavioral Models
  - Emotion Profiling
  - Computational tools for creativity
Projects - AVISPIRE

- Audio-Visual Speech Processing for Interaction in Realistic Environments
  - Audio-visual speech processing
  - Realistic noisy environments (classroom, automobile, meetings etc).

- SKEL R&D:
  - Speech recognition technology
  - Visual processing methods from multiple camera inputs
Projects - BioASQ

- A challenge on large-scale biomedical semantic indexing and question answering
  - Large-scale classification of biomedical documents onto ontology concepts (semantic indexing)
  - Classification of biomedical questions onto relevant concepts
  - Retrieval of relevant document snippets, concepts and knowledge base triples

- SKEL R&D:
  - Question Answering Benchmarking
  - Semantic Indexing Benchmarking
  - Challenge organization
Projects - USEFIL

- Unobtrusive Smart Environments for Independent Living
  - Advanced in-home unobtrusive monitoring

- SKEL R&D:
  - Event recognition
  - Knowledge representation for decision support systems
Projects - CLARIN-EL

- **Common Language Resources and Technology Infrastructure**
  - Design and implementation of the Research Infrastructure for language resources & tools
  - International standards and best practices
  - Interoperability of resources and tools

- **SKEL R&D:**
  - Development of linguistic services
Projects - PREPARE

► Innovative integrative tools and platforms to be prepared for radiological emergencies and post-accident response in Europe
  ► Nuclear and radiological preparedness
  ► Emergency management
  ► Rehabilitation strategies and expertise

► SKEL R&D:
  ► Information retrieval technologies
  ► Opinion mining
  ► Question answering
Projects - POSCON

Positive Online Content and Services for Children in Europe

- Recommendations for promoting positive content
- Enhanced landscape of positive online content for children
- A unique repository of the European landscape of positive content

SKEL R&D:

- Recommendations for promoting positive content
- National competition organization
Projects - CPS-Medium

► A Novel Human Centric CPS to Improve Motor/Cognitive Assessment and Enable Adaptive Rehabilitation
  ► Cognitive Assessment
  ► Adaptive Rehabilitation

► SKEL R&D:
  ► Event recognition
REVEALing hidden concepts in Social Media

- Multimedia content analysis
- Social Media
- Assessment of complex concepts (trustworthiness, reputation, or influence)

SKEL R&D:

- Social network analysis
- Author Identification
- Event recognition
Intelligent Agents

Goals / Aims:
- Design efficient autonomous software agents that represent humans in economic transactions
- Analysis of actor behavior, optimization and equilibrium computation in realistic scenarios (using realistic models)
- Designing mechanisms with desirable properties

Application areas:
- E-commerce scenarios (e.g. online auctions)
- Energy domain: the smart grid
- Resource allocation / Service procurement
- Policy analysis and actor incentivization
Exploitable Research Results

► **PServer: Personalization Server**

(http://www.scify.gr/site/en/pserver-en)

► A general purpose infrastructure for adding personalization functionality to sites or applications. It is also an extensible showcase of personalization methods.

► With Pserver you can offer a personalised experience to the users of your site / application / service. For instance, you can provide content that is really interesting to the user, you can help your application or service adapt its interface as it suits user needs.
ELEON (Ontology Authoring Tool):

- An editor for the creation of OWL ontologies as well as the enrichment of OWL ontologies with linguistic and user-related annotations.
- Interoperates with NaturalOWL NLG system
- Modular plugin architecture: consistency checking, estimator of numerical preference parameters
Exploitable Research Results

► Modular and Adaptive dialogue MAnager (MAMA):
  ► Software infrastructure for developing dialogue systems
  ► Modularity: defines mechanisms for limiting information structure sharing.
  ► Adaptivity: defines mechanisms for defining the scope of adaptation, separating the manually-authored part of the DM model from the machine learned transition parameters.
  ► Provides handles for deployment over a variety of interaction backends
    • Currently implementing Robot Operating System backend
Exploitable Research Results

► AQUA: Assisting Quality Assessment
► AQUA integrates tools for content collection, information extraction and resources management, using Semantic Web technologies in order to support the daily work of content labeling experts.
Exploitable Research Results

- **Ellogon Language Engineering Platform**
  
  ![Diagram of Ellogon Language Engineering Platform](http://www.ellogon.org)

  - Infrastructure, processing tools, annotation tools and graphical user interfaces targeting the analysis/processing/manual annotation of natural language texts.
GovInsight: Text analysis platform for public consultations (http://gov.insight.iit.demokritos.gr/)

Web portal providing added value to open consultations from the Greek open consultation portal (opengov.gr), by means of intelligent text analytics.
Exploitable Research Results

► NewSum
(http://www.scify.gr/site/en/newsum-en)

► Innovative language-independent, summarization technology.

► NewSum automatically summarizes information from many sources and combines them in a single text. It is an intelligent “collage” of all the different information that you would get if you read all the articles from all the sources you visit.
Ravel - Semantic Annotation of Text and Multimedia

An automated annotation tool for text and multimedia. Ravel is Web-based and most of its interface functionality relies on HTML5 Web Sockets.
Exploitable Research Results

► RTEC - Real-Time Event Calculus

► An open-source technology that supports real-time reasoning for the recognition of various types of events.
Exploitable Research Results

► **Radorec: Range data object recognition**
  - A novel representation for range data and a prototype system that applies it to recognizing humans in laser range data
  - Core idea: operate on thicker slices of time, rather than single frames
    - Alleviates the data association problem
    - Gives denser point clouds that can be better interpolated into objects
Exploitable Research Results

RoboPers: Synthetic Personality Traits

- A methodology and software infrastructure for parameterizing HCI modules (NLG, speech synthesis, etc.) in a way that mimics personality traits.
- System personality is explicitly configured using the OCEAN features, typically used in psychological profiling methodologies.
- Tested with school children (upper grade school) at Hellenic Cosmos

After a robot gave them a virtual tour of the Ancient Agora, children were asked to choose the image that best describes their experience, and every single one choose the intended personality.