PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

PhD Student: Giovanni Cozzolino

XXXI Cycle

Training and Research Activities Report – Second Year

Tutor: Antonino Mazzeo
co-Tutor: Flora Amato

1. Information

- Giovanni Cozzolino, Master's Degree in Computer Engineering, in 2013 from the University of Naples Federico II.
- XXXI Cycle – ITEE
- DIETI Grant
- Tutor: Antonino Mazzeo – co-Tutor: Flora Amato

2. Study and Training activities

Courses:

- *Testing automation*; Porfirio Tramontana
- *Knowledge Representation and Retrieval in the Digital Age*; Antonio Maria Rinaldi
- *Interoperability, Semantic technologies and applications*; Flora Amato

Seminars

- *DataFlow Super Computing for BigData*
- *MINIX3: A reliable and secure operating system*
- *Video coding/transcoding in HPC*
- *Using Process mining and cloud technologies for dependability*
- *Opportunità dell'applicazione delle tecnologie Big Data nel contesto della gestione dei dati multimediali*
- *Wireless opportunistic networking*
- *LEDs in multispectral applications*
- *Selected problems on lighting energy efficiency for indoors*
- *TAROT 2017 Summer School*
- *Fuzzy Logic, Genetic Algorithms and their applications to next generations networks*

Activities schedule:

	Credits year 1								Credits year 2								Credits year 3									
		1	2	3	4	5	6			1	2	3	4	5	6			1	2	3	4	5	6			
	Estimated	bimonth	bimonth	bimonth	bimonth	bimonth	bimonth	Summary	Estimated	bimonth	Bimonth	bimonth	bimonth	bimonth	bimonth	Summary	Estimated	bimonth	bimonth	bimonth	bimonth	bimonth	bimonth	Summary	Total	Check
Modules	20		6		6		6	18	12	0	3	3	3	0	0	9	6							0	27	30-70
Seminars	5							0	10	0,8	0,2	1,8	3,5	0	1,1	7,4	5							0	7,4	10-30
Research	35	6	5	8	6	4	6	35	45	8	7	8	6	8	8	45	60							0	80	80-140
	60	6	11	8	12	4	12	53	67	8,8	10	13	13	8	9,1	61	71	0	0	0	0	0	0	0	114	180

3. Research Activities

Title

Semantic Correlation of Digital information in Specialized Domain

Studies

Research activities in the second year of Ph.D. focused on the study of technologies related to Semantic Web, in order to deal with the problem of managing heterogeneity in distributed and collaborative environments.

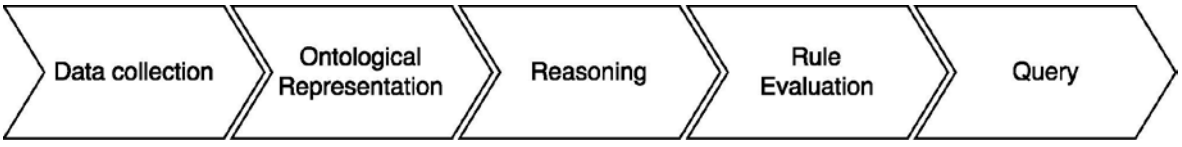
Contents of two of the courses we attended ("*Knowledge Representation and Retrieval in the Digital Age"* and "*Interoperability, Semantic technologies and applications"*) included deep insights about semantic technologies. They discussed models and techniques for enhanced representation of information, in order to enable correlation and reasoning on data.

The "*Testing automation*" course, investigated the challenges of suites providing automatic testing for validation of semantic-based system.

Description of Research Activities

Research activities of the first year of this Ph.D. course had the main goal of designing a methodology, based on Semantic Web technologies, for integration, correlation and retrieval of complex information from heterogeneous data sources. The approach we proposed, which is based on semantics vocabularies, also enables the automation of some steps in the analysis of data by means of correlation.

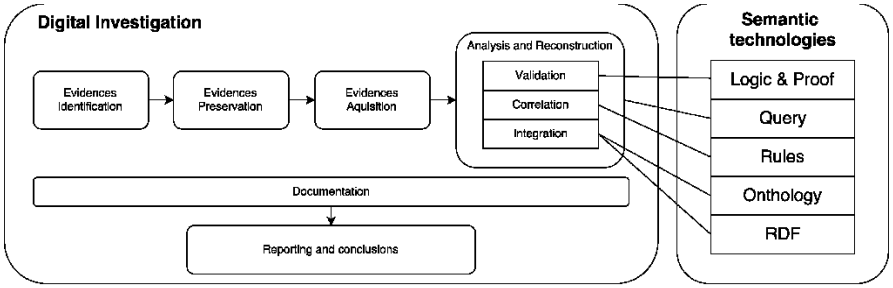
The following Figure shows the basic steps of the methodology:



Research activities during the second year of this Ph.D. course included the definition and the implementation of a system architecture able to enact the aforementioned methodology. We provided many use cases too, in order to test and validate the methodology and to evaluate its scalability and adaptability to different scenarios. The main application domains we considered were:

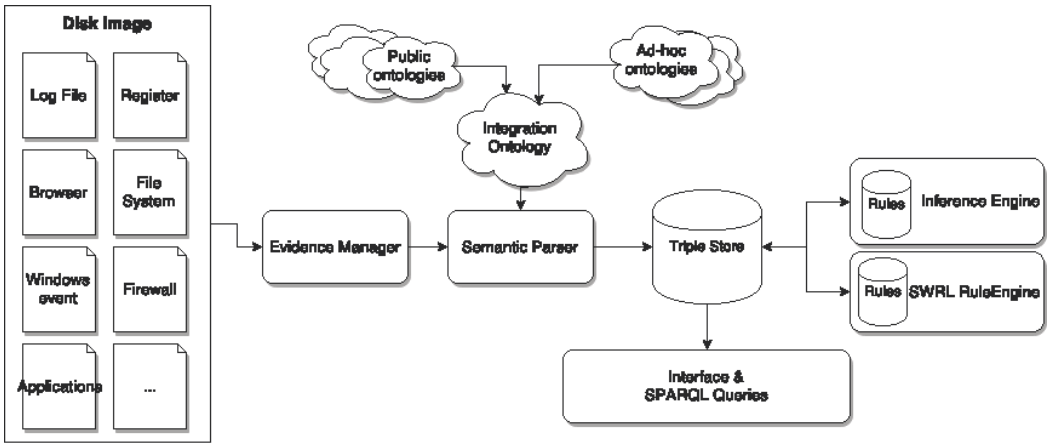
- Public security protection: this includes identification of fraudulent behaviour through Social networks content analysis, Forensic Investigations, etc.
- Justice Document Processing: Implicit correlation discovery, suggestion, search by content
- Healthcare Improvement: Diagnoses suggestion and clinical record management

In particular, we mainly focused this year on Forensic Investigation. The goal of Digital Forensics is not only the gathering, management and analysis of data stored on digital devices, but, above all, it requires interpretation of evidences. Correlation of information is very important in forensics analysis, because it is the only way to allow for the contextualization of digital evidences, promoting them as clues.



System Architecture consists of an ontology and five modules:

1. Evidence Manager: it loads binary content of digital evidences, identifying the type of given source and verifying its integrity by using hashing;
2. Semantic Parser: it generates an OWL representation of knowledge extracted from digital evidence; it instantiates the ontology that resumes concepts both from public and custom domains;
3. Inference Engine: it performs automated reasoning, according to the OWL specifications, and reflecting domain expertise reasoning.
4. SWRL Rule Engine: it uses SWRL rules in order to correlate different individuals or to establish relationships among individuals belonging to different ontologies but representing similar concepts.
5. SPARQL Queries: it is responsible for accepting SPARQL queries from users and for retrieving results by using a SPARQL query engine.



For the experimental campaign, we generated disk images from a virtual machine running Windows 7, where we performed a set of user actions to simulate malicious behaviour of some malware applications.

Collaborations

- Founded European Project CREA (Conflict Resolution with Equitative Algorithms). Justice Programme, Grant Agreement number: 766463 —CREA —JUST-AG-2016/JUST-AG-2016-05 Coordinated by University of Naples "Federico II".
- Conferenza dei Rettori delle Università Italiane, Ministero della Giustizia, Dipartimento dell'organizzazione giudiziaria, del personale e dei servizi – Direzione Generale per i sistemi informativi automatizzati (DGSIA): "*La gestione del servizio di formazione qualificata, ricerca applicata e certificazione di professionalità a seguito della riorganizzazione del Ministero della Giustizia per il tramite dei sistemi ICT, su strumenti e funzionalità del Processo Civile e Penale telematico, nell'ambito della riduzione dei tempi della giustizia, su profili di sicurezza dei sistemi informativi in uso presso il Ministero della Giustizia e gli uffici Giudiziari*".
    - Applied research on tools, functionality and security protocols of Ministry of Justice information systems.
    - Document management, encrypted full text indexing, semantic searches
    - System architecture, virtualization, authentication and authorization protocol

4. Products

Publications:

- Amato, F., Cozzolino, G., Mazzeo, A., Romano, S., "Detecting anomalies in Twitter stream for public security issues" (2016) - IEEE 2nd International Forum on Research and Technologies for Society and Industry Leveraging a Better Tomorrow, RTSI 2016

- Amato, F., Colace, F., Cozzolino, G., Moscato, V., Picariello, A., Sperli, G., "Sentiment analysis on yelp social network" (2017) - Proceedings - DMSVLSS 2017: 23rd International Conference on Distributed Multimedia Systems, Visual Languages and Sentient Systems
- Amato, F., Cozzolino, G., Mazzeo, A., Mazzocca, N., "Correlation of digital evidences in forensic investigation through semantic technologies" (2017) - Proceedings - 31st IEEE International Conference on Advanced Information Networking and Applications Workshops, WAINA 2017
- Amato, F., Cozzolino, G., Moscato, V., Picariello, A., Sperlí, G., "Automatic personalization of visiting path based on users behaviour" (2017) Proceedings - 31st IEEE International Conference on Advanced Information Networking and Applications Workshops, WAINA 2017
- Amato, F., Cozzolino, G., Mazzeo, A., Vivenzio, E. "Using multilayer perceptron in computer security to improve intrusion detection" (2017) - Smart Innovation, Systems and Technologies
- Flora Amato, Leonard Barolli, Giovanni Cozzolino, Antonino Mazzeo, Francesco Moscato, "ECT: A novel architecture for Evidence CollecTion in forensic investigation" (2017) - Advances on P2P, Parallel, Grid, Cloud and Internet Computing - Proceedings of the 12th International Conference on P2P, Parallel, Grid, Cloud and Internet Computing (3PGCIC-2017)
- Amato, F., Barbareschi, M., Cozzolino, G., Mazzeo, A., Mazzocca, N., Tammaro, A., "Outperforming Image Segmentation by Exploiting Approximate K-Means Algorithms" (2017) - Optimization and Decision Science: Methodologies and Applications, Springer International Publishing AG

5. Conferences and Seminars

- International Conference on Optimization and Decision Science (ODS 2017), XLVII Annual Meeting of AIRO – Italian Operations Research Society. Hilton Conference Center – Sorrento, September 4th-7th 2017
- The 11th International Conference on Complex, Intelligent and Software Intensive Systems . July 10-th - July 12-th, 2017, Istituto Superiore Mario Boella (ISMB), Torino, Italy
- Workshop on Big data processing in Online Social Network (BOSON-2017) del 31st IEEE International Conference on Advanced Information Networking and Applications (IEEE AINA-2017). Tamkang University, Taipei, Taiwan, March 27 - 29, 2017.
- 4th International Workshop on Cloud and Distributed System Applications (CADSA). In Conjunction with The 11-th International Conference on P2P, Parallel, Grid, Cloud and Internet Computing (3PGCIC-2016). Soonchunhyang (SCH) University, Asan, Korea. November 5th-7th, 2016

6. Tutorship

- Intelligenza Artificiale
  - Type: Seminar
  - Subject: Ontology engineering and Protégé
  - Hours: 4
- Sistemi informativi

Università degli Studi di Napoli Federico II

- Type: Seminar
- Subject: BPMN and Bonita BPM
- Hours: 6

CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Module Title:	Testing Automation
Lecturer:	Porfirio Tramontana
Dates:	12/01/2017 19/01/2017 26/01/2017 02/02/2017
Student	Giovanni Cozzolino
Cycle	XXXI
Credits earned	3

Lecturer signature

Above information are provided to attest that the student attended lessons relevant to the module held in the indicated period.

Earned Credits depend on the student performance in the module activities and are provided and certified by the lecturer. The amount of earned credits is usually limited to the number or credits reported in the List of Modules relevant to the ITEE PhD. If the case, the lecturer is kindly requested to shortly motivate why the earned credits exceeds this limit.

CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Module Title:	Interoperability, Semantic technologies and applications
Lecturer:	Flora Amato
Dates:	24/03/2017 29/03/2017 30/03/2017 31/03/2017
Student	Giovanni Cozzolino
Cycle	XXXI
Credits earned	3*

* Additional activities were made during this module

Lecturer signature

Flora Amato

Above information are provided to attest that the student attended lessons relevant to the module held in the indicated period.

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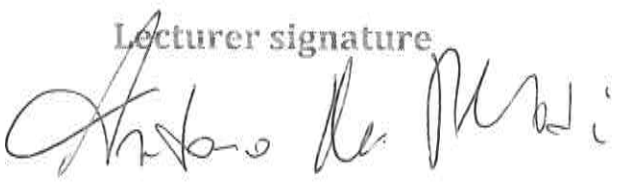
CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Module Title:	Knowledge Representation and Retrieval in the Digital Age
Lecturer:	Antonio M. Rinaldi
Dates:	19/06/2017 21/06/2017 26/06/2017 28/06/2017 03/07/2017
Student	Giovanni Cozzolino
Cycle	XXXI
Credits earned	3

Lecturer signature



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CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Seminar Title DATA FLOW SUPER COMPUTING FOR BIG DATA

Lecturer PROF. VELIJKO MILUTINOVIC

Organizer PROF. FLORA AMATO

Date 12/04/17

Student GIOVANNI COZZOLINO

Cycle **XXXI**

Credits earned 0.6

Organizer or Lecturer signature

Above information are provided to attest that the student attended the seminar held in the indicated date.

Earned Credits depend on the student performance in the seminar activities and are provided and certified by the organizer or the lecturer. The standard number of earned credits is usually of 0.2 credits per seminar hour and are credited providing the student actively participated to the seminar. Extra activities subsequently performed by the student and related to the seminar content can lead to extra credits up to 1 credit per seminar hour. If the case, the organizer is kindly requested to shortly motivate the number of extra earned credits.

CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

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Seminar Title MINIX3: A reliable and Secure Operating System

Lecturer A. TANENBAUM

Organizer D. COTRONEO

Date 30/11/2016

Student COTTOLINO GIOVANNI

Cycle XXXI

Credits earned 0.4

Organizer or Lecturer signature

Above information are provided to attest that the student attended the seminar held in the indicated date.

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CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Seminar Title VIDEO CODING / TRANSCODING IN HPC

Lecturer M. KOVAC

Organizer PROF. A. CILARDO

Date 7 DICEMBRE 2016

Student **Giovanni Cozzolino**

Cycle **XXXI**

Credits earned 0,4

Organizer or Lecturer signature

Above information are provided to attest that the student attended the seminar held in the indicated date.

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PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Seminar Title	Using Process Mining and Cloud Technologies for Dependability
Lecturer	Prof. Ingo Weber
Organizer	Prof. Marcello Cinque
Date	07/09/2017
Student	Cozzolino Giovanni
Cycle	XXXI
Credits earned	0,4

Organizer or Lecturer signature

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CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Seminar Title: **Opportunità dell'applicazione delle tecnologie Big Data nel contesto della gestione dei dati Multimediali**

Lecturer: **Prof. Ilaria Bartolini**

Organizer: **Prof. Antonio Picariello**

Date: **05/05/2017**

Student: **Giovanni Cozzolino**

Cycle: **XXXI**

Credits earned: **0.5**

Organizer or Lecturer signature

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CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Seminar Title: **Wireless Opportunistic Networking**

Lecturer: **Prof. GUNNAR KARLSSON**

Organizer: **Prof. Giorgio Ventre**

Date: **28/09/2017**

Student: **Giovanni Cozzolino**

Cycle: **XXXI**

Credits earned: 0,3

Organizer or Lecturer signature

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CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Seminar Title: **LEDs in multispectral applications**

Lecturer: **Prof. URSZULA BLASZCZAK**

Organizer: **Prof. LAURA BELLIA**

Date: **29/09/2017**

Student: **Giovanni Cozzolino**

Cycle: **XXXI**

Credits earned: 0,2

Organizer or Lecturer signature

Laura Bellia

Above information are provided to attest that the student attended the seminar held in the indicated date.

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CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Seminar Title: **Selected problems on lighting energy efficiency for indoors**

Lecturer: **Prof. Piotr Pracki**

Organizer: **Prof. LAURA BELLIA**

Date: **29/09/2017**

Student: **Giovanni Cozzolino**

Cycle: **XXXI**

Credits earned: 0,2

Organizer or Lecturer signature

Laura Bellia

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CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Seminar Title	Exploiting machine learning techniques in software development processes
Lecturer	Ing. Domenico Amalfitano
Organizer	Prof. Antonio Picariello
Date	18/01/2017
Student	Cozzolino Giovanni
Cycle	XXXI
Credits earned	0,2

Organizer or Lecturer signature

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TAROT 2017

Certificate of Attendance

This is to certify that

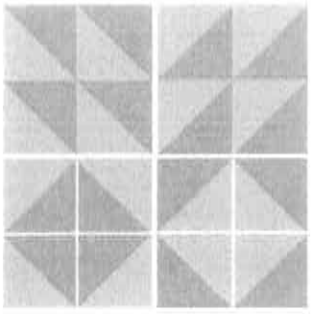
GIOVANNI COZZOLINO

has attended the 13th TAROT 2017 Summer School (Training And Research On Testing), that was held in Naples, Italy, from 26 to 30 June, 2017.

TAROT2017 Chair

Prof. Valentina Casola

Valentina Casola



ODS2017

International Conference on

Optimization and Decision Science

AIRO

XLVII Annual Meeting of AIRO – Italian Operations Research Society

Hilton Conference Center – Sorrento, September 4th-7th, 2017

http://www.airoconference.it/ods2017 - email: ods2017.airo@unina.it

This is to certify that **Giovanni Cozzolino** has attended ODS2017, International Conference on Optimization and Decision Science, XLVII Annual Meeting of AIRO – Italian Operations Research Society, held in Sorrento from September 4th to September 7th, 2017.

ODS2017 Coordinator

Antonio Sforza

ODS2017
c/o Dipartimento di Ingegneria Elettrica e Tecnologie dell'Informazione
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Via Claudio 21, I-80125 Napoli, Italy
C. F. 95240420638

DIETI (Dept. of Electrical Engineering and Information Technology)
University "Federico II" of Naples, Via Claudio 21, 80125 Napoli
Tel. +39.081.7685994 - 7685991 – Fax. +39.081.7683816

CREDITS ATTESTATION

PhD in Information Technology and Electrical Engineering

Università degli Studi di Napoli Federico II

Fuzzy Logic, Genetic Algorithms and their applications to next generations networks

Lecturer	Leonard Barolli
Organizer	Prof. Flora Amato
Date	10/03/2017 14/03/2017
Student	Cozzolino Giovanni
Cycle	XXXI
Credits earned	1,2

Organizer or Lecturer signature

Flora Amato

Above information are provided to attest that the student attended the seminar held in the indicated date.

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