

Procedura valutativa per la copertura di n. 3 posti di Professore Universitario di prima fascia per il Settore concorsuale 09/H1 – Settore scientifico disciplinare ING-INF/05 presso il Dipartimento di Ingegneria Informatica, Automatica e Gestionale “Antonio Ruberti” – Facoltà di Ingegneria dell’Informazione, Informatica e Statistica – codice concorso 2021POR039
Roma, li 04/10/2021

CURRICULUM VITAE et STUDIORUM
di
GIUSEPPE SANTUCCI

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Education

Prof. Giuseppe Santucci is associate professor (professore associato, settore scientifico disciplinare ING-INF/05) at Sapienza Università di Roma, Italy, Dipartimento di Ingegneria informatica, automatica e gestionale "Antonio Ruberti" (Department of Computer, Control and Management Sciences & Engineering) , since 1998.

He has been assistant professor (ricercatore universitario a tempo indeterminato, raggruppamento I25) in the same department since 1991. He holds national qualifications to full professor both in Computer Science (Informatica – 01/B1) and in Engineering in Computer Science (Ingegneria Informatica – 09/H1) .

Qualification to the engineering profession obtained in June 1988.

He previously studied Engineering in Electronics (Ingegneria Elettronica) at Sapienza Università di Roma, where he graduated on 25/5/87, with a grade of 106/110. Thesis title: " Un ambiente integrato per il progetto di diagrammi concettuali". Advisor: Prof. Carlo Batini.

He graduated from the "Liceo Classico Virgilio" in Rome on July 1977 with a grade of 56/60.

Appointments

IIIA – Academic Appointments

In September 1987 he won a competition, launched by the National Statistics Institute (ISTAT), for the award of a 12-month scholarship. From November 1987 to October 1988 he received this scholarship for a research activity on: "Preparation support for the conceptual design for the new investigations envisaged by ISTAT", carried out at the "Dipartimento di Informatica e Sistemistica", Sapienza Università di Roma.

From December 1988 to December 1989 he received a scholarship awarded by Arthur Andersen & Co., for a research activity on: "Data dictionaries based on conceptual schemes", to be carried out at the "Dipartimento di Informatica e Sistemistica", Sapienza Università di Roma.

In January 1990 he obtained the renewal for a second year of the Arthur Andersen & Co. scholarship, for a research activity on: "Metamodels and graphic interfaces", to be carried out at the "Dipartimento di Informatica e Sistemistica", Sapienza Università di Roma.

In January 1991 he obtained the renewal for a third year of the Arthur Andersen & Co. scholarship, for a research activity on: "Application of statistical models to the EULETERIA project of the Italian Exchange Office", to be carried out at the Department of Computer Science and Systems engineering at Sapienza Università di Roma and at the Italian Exchange Office.

In November 1991 he won the competition for 2 researcher positions (group I25) at the Engineering Faculty of Sapienza Università di Roma.

In August 1998 he won the competition for associate professor, (professore associato, settore scientifico-disciplinare K05A - Sistemi di elaborazione delle informazioni) .

He is member of the PhD Board in Engineering in Computer Science at Sapienza since 2003.

He was the advisor of two doctoral students, Enrico Bertini (currently Associate Professor at the New York NYU University) and Marco Angelini who discussed the thesis in December 2016 with an excellent judgment and is currently the winner of a research grant at the Department of Informatics and Systems at Sapienza University of Rome.

He is currently the advisor of three PhD students, Simone Lenti, who won the doctoral competition in September 2017, Graziano Blasilli, who won the doctoral competition in September 2018 and Alessia Palleschi, who won the doctoral competition in September 2018.

He participated to the juries of several PhD defenses (Vienna University of Technology, Centrale Supelèc, University of Konstanz, University of Stuttgart, University of Bari).

On 2004 he has been part of a selection committee for a position for associate professor (professore associato, settore scientifico disciplinare ING-INF/05, Sistemi di elaborazione delle informazioni) at University of Bologna.

On 2006 he has been part of a selection committee for a position for associate professor (professore associato, settore scientifico disciplinare ING-INF/05, Sistemi di elaborazione delle informazioni) at Politecnico di Milano.

On 2021 he has been part of a selection committee for a position for RTDB at Politecnico di Torino

IIIA – Other Appointments

He has participated as author and speaker at over 100 editions of international conferences, including International Conference on Information Visualization, IEEE Visualization Conference, IEEE Visual Analytics Science and Technology (VAST) , EG / VGTC Conference on Visualization (Eurovis) , IEEE Symposium on Visualization for Cyber Security (VizSec) , Visual Languages, International Conference on Very Large Databases (VLDB) , ACM International Conference on Management of Data (SIGMOD) , International Conference on Conceptual Modeling (ER) , EJC, ER, AVI, BELIV, EuroVa, ISCCSP, CoopIS, CHI, DIMACS Visualization and Data Mining, CMV, IS & T / SPIE Conference on Visualization and Data Analysis, ISCCSP, CADUI, SIFGRAPI, CHIItaly, DMS, Fet, CLEF, Lдав, SIGIR, WVvis, etc.

He served and continues to serve as PC member of the most relevant conferences of his research areas, including EG/VGTC Conference on Visualization (Eurovis), IEEE Visual Analytics Science and Technology (VAST), EuroVa, Infovis, Information Visualization, VizSec, IVAPP, INTERACT, CD-MAKE, etc.

He has organized 2 editions of conferences (AVI 2010, CLEF 2012) and 4 editions of international workshops Beliv (2006,2008), EuroVA (2011,2012) relevant in the field of Visual Analytics, Infovis and Information Retrieval:

ACM AVI is the most relevant visualization Italian conference (only as a location, but it has an international PC and international attendees);

CLEF is an internationally relevant European conference in the information retrieval sector;

EG EuroVA is the most relevant European workshop in the field of Visual Analytics: it is a Eurovis workshop, 80-110 participants, proceedings published on Eurographics DL;

Beliv, ACM International Workshop BEyond time and errors: novel evaluation methods for Information Visualization: Giuseppe Santucci is one of the promoters (together with Catherine Plaisant and Enrico Bertini) of the first edition on 2006. Beliv is currently a major European-American biennial workshop in the Infovis sector, now in its 8th edition as a VIS workshop, 40-60 participants, proceedings published on IEEE DL.

Giuseppe Santucci positions in international conferences and workshops:

- Co-promoter, General co-chair and Program co-chair of Beliv 2006

- He is Chair of the scientific committee (program co-chair) of BELIV 08, Florence, Italy, 5 April 2008, carried out jointly with ACM CHI 2008
- He is chair of the scientific committee (paper co-chair) of the International Workshop Data Management & Visual Analytics, carried out jointly with Eurovis09 (http://www.zib.de/eurovis09/?page_id=560). The workshop was organized within the framework of the European Vismaster CA
- He is chair of the scientific committee (program co-chair) and organizes (general co-chair) CHIItaly 2009
- He is chair of the scientific committee and organizes (program chair and general chair) the ACM International Conference AVI 2010
- He is chair of the scientific committee (program chair) of the 2010 International Workshop on Visual Languages and Computing, Oak Brook, Illinois, USA,
- He is chair of the scientific committee and organizes (workshop co-chair) the International Workshop EuroVa 2011, Bergen, Norway, on May 31st, 2011. It is major edition, with over 100 participants and proceedings published on Eurographics DL. It is carried out jointly with Eurovis
- He is general-chair of the 2011 International Workshop on Visual Languages and Computing, Florence, Italy,
- He is chair of the scientific committee and organizes (workshop co-chair) the International Workshop EuroVa 2012, Vienna, Austria, 3-4 June (<http://www.eurova.org/previous-events/eurova-2012>). It is an important edition, over 100 participants and the proceedings are published on Eurographics DL. It is carried out jointly with Eurovis
- He is chair of the scientific committee (program co-chair) and organizes CLEF 2012 in Rome (<http://clef2012.clef-initiative.eu/index.php?page=Pages/organizers.html>)
- He is Chair of the scientific committee (paper co-chair) of the IEEE Visual Analytics Science and Technology (VAST) at VIS 2012, Seattle, WA, USA (<http://ieevis.org/year/2012/info/committees/conference-committee>)
- He is chair of the scientific committee (paper co-chair) of the IEEE Visual Analytics Science and Technology (VAST) at Vis 2013, Seattle, Atlanta, Georgia, USA (<http://ieevis.org/year/2013/info/committees/conference-committee>)
- He is keynote speaker to the FIRE conference (FORUM FOR INFORMATION RETRIEVAL EVALUATION), Calcutta, 2012. Title of the talk: Visual Analytics and Information Retrieval (<http://www.isical.ac.in/~fire/2012/presentations.html>)
- He is the conference chair of the IEEE Visual Analytics Science and Technology (VAST) conference at VIS 2014, Paris, France (<http://ieevis.org/year/2014/info/committees/conference-committee>)
- He is Chair of the scientific committee (paper co-chair) of the EG / VGTC Eurovis 2015 conference (<http://www.eurovis2015.it/index.html>)
- He is chair of the scientific committee (paper co-chair) of the EG / VGTC Eurovis 2016 conference (<http://www.cs.rug.nl/jbi/eurovis2016/Organization/Organization>)

He is currently in the steering committee of some of the most relevant international conferences and workshops in the in the Visualization, Infovis, and Visual Analytics sectors:

- He is in the steering committees of the IEEE Visual Analytics Science and Technology (VAST) conference from 01-10-2014 to today
- He is in the steering committee of EG / VGTC Eurovis (<http://eurovis2017.virvig.es/index.php/organization>) from 01-11-2015 to 2021
- He is in the steering committee of the ACM International Workshop BEyond time and errors: novel evaluation methods for Information Visualization BELIV from 01-01-2017 to today

He served and continues to serve as reviewer of the most important international journals in his research area, such as IEEE Transactions on Visualization and Computer Graphics, Journal of Visual

Languages and Computing, Journal of Software Engineering and Knowledge Engineering, ACM – TIS, etc.

Since 2008 he has been part of the editorial review committee of the International Journal of Mobile Human Computer Interaction (IJMHCI).

He is a member of the Emeritus Editorial Board of the International Journal of Visual Languages and Computing (JVLC).

He coordinates the A.WA.RE (Advanced Visualization and Visual Analytics Research) research group at the Department of Automatic Computer Engineering and Management Antonio Ruberti (DIAG), University of Rome "La Sapienza" (<http://www.diag.uniroma1.it/~santucci/AWARE/>) whose members are authors of over 50 scientific papers related to visualization and Visual Analytics.

Teaching experience

From 1995 to 2021 he has taught courses as professor at bachelor and master levels at Sapienza Università di Roma, ranging on architecture of computers, programming languages (C, Java, Python), Software Engineering, Software Quality, Information Visualization, and Visual Analytics, for a total of 65 courses, as detailed in the following:

1995-1996	"Calcolatori Elettronici" Bachelor
1996-1997	"Calcolatori Elettronici" Bachelor
1997-1998	"Calcolatori Elettronici" Bachelor
1998-1999	"Calcolatori Elettronici" 5 CFU Bachelor "Ingegneria del SW" 5CFU Bachelor.
1999-2000	"Calcolatori Elettronici" 5CFU Bachelor "Ingegneria del SW" 5CFU Bachelor.
2000-2001	"Calcolatori Elettronici" 5CFU Bachelor "Ingegneria del SW" 5CFU" Bachelor.
2001-2002	"Calcolatori Elettronici I" 5CFU Bachelor "Calcolatori Elettronici II" 5CFU Master "Ingegneria del Software" 5CFU Bachelor
2002-2003	"Calcolatori Elettronici I" 5FU Bachelor "Calcolatori Elettronici II" 5CFU Master "Ingegneria del Software" 5CFU Bachelor Qualità nella Produzione del Software" 5CFU Master
2003-2004	"Calcolatori Elettronici I" 5CFU Bachelor "Calcolatori Elettronici II" 5FU Master "Ingegneria del Software" 5FU Bachelor Qualità nella Produzione del Software" 5CFU Master
2004-2005	"Calcolatori Elettronici I" 5FU Bachelor "Ingegneria del Software" 5FU Bachelor

	Qualità nella Produzione del Software" 5CFU Master
2005-2006	"Calcolatori Elettronici I" 5FU Bachelor "Ingegneria del Software" 5FU Bachelor
2006-2007	Qualità nella Produzione del Software" 5CFU Master "Calcolatori Elettronici I" 5CFU Bachelor "Ingegneria del Software" 5CFU Bachelor
2008-2009	Qualità nella Produzione del Software" 5CFU Master "Calcolatori Elettronici I" 6CFU Bachelor "Ingegneria del Software" 6FU Bachelor (Italian) "Software Engineering" 6FU Master (English) "Information Visualization" 3FU Master? (English)
2009-2010	"Calcolatori Elettronici I" 6CFU Bachelor "Ingegneria del Software" 6FU Bachelor (Italian) "Software Engineering " 6FU Master? (English) "Information Visualization" 3FU Master (English)
2010-2011	"Calcolatori Elettronici I" 6CFU Bachelor "Software Engineering " 6FU Master? (English) "Information Visualization" 3FU Master (English)
2012-2013	"Fondamenti di informatica I (Java) " 6CFU Bachelor "Software Engineering " 6FU Master? (English) "Information Visualization" 3FU Master (English)
2013-2014	"Fondamenti di informatica I (Java) " 6CFU Bachelor "Software Engineering " 6FU Master? (English) "Information Visualization" 3FU Master (English)
2014-2015	"Fondamenti di informatica I (Java) " 6CFU Bachelor "Software Engineering " 6FU Master? (English) "Information Visualization" 3FU Master (English)
2015-2016	"Fondamenti di informatica I (Python) " 6CFU Bachelor "Software Engineering " 6FU Master? (English) "Information Visualization" 3FU Master (English)
2016-2017	"Fondamenti di informatica I (Python) " 6CFU Bachelor "Software Engineering " 6FU Master? (English) "Visual Analytics" 6FU Master (English)
2017-2018	"Fondamenti di informatica I (Python) " 6CFU Bachelor "Software Engineering " 6FU Master? (English)

	"Visual Analytics" 6FU Master (English)
2018-2019	"Fondamenti di informatica I (C) " 9CFU Bachelor
	"Visual Analytics" 6FU Master (English)
2019-2020	"Fondamenti di informatica I (C) " 9CFU Bachelor
	"Visual Analytics" 6FU Master (English)
2020-2021	"Fondamenti di informatica I (C) " 9CFU Bachelor
	"Visual Analytics" 6FU Master (English)
2021-2022	Currently teaching: "Visual Analytics" 6FU Master (English)

Society memberships, Awards and Honors

2018	Vizsec 2018 Best Paper
2020	AVI Advanced Visual Interfaces (AVI '20) Honorable Mention

Funding Information [grants as PI-principal investigator or I-investigator]

- 2000
 - He is the scientific responsible of the local unit (Rome) of the COFIN 2000 project "Analysis, visualization of information and visual interrogation in databases for clinical monitoring". COFIN
 - Funding 30.000 €
- 2008
 - He is the scientific responsible of the local unit (Rome) of the European VisMaster project - Visual Analytics - Mastering the Information Age, CA. Fp7 Grant Agreement Number 225924
 - Funding 25.000 €
- 2013
 - He is the scientific responsible of the local unit (Rome) European Promise NoE (NoE, 258191) —Participative Research labOratory for Multimedia and Multilingual Information Systems Evaluation NoE, 258191
 - Funding 250.000 €
- 2015
 - He is the scientific responsible of a research contract between the Dipartimento di Ingegneria informatica, automatica e gestionale "Antonio Ruberti" (Department of Computer, Control and Management Sciences & Engineering) and the Telecom research center in Turin. Collaboration title: Visualization tools for traffic data.
 - Funding 20.000 €
- 2016
 - He is the scientific responsible of the local unit (Rome) of the Panoptesec European project FP7-ICT-2013-10 Objective ICT-2013.1.5 Trustworthy ICT item (c)
 - Founding 300,000 €
- 2014-2017

- He is the scientific responsible of a research contract between CIS (Cyber Intelligence and Information Security Research Center) and CREA (Ex CRA) Council for Research in Agriculture and Analysis of Agricultural Economy CIS - CREA
- Funding 100.000 €
- 2018
 - He is scientific responsible for a cyber security research contract between the CINI and MBDA
 - Funding 30.000 €
- 2019
 - He is the coordinator and the scientific responsible of the "PNRM SSCUDO" MBDA project
 - Funding 42.000 €
- 2020
 - He is the scientific responsible of the project "Innovative methodologies and tools to support software security tests of ordinary and embedded systems and components of interest for CVCN activities" with CIS - MISE - Ministry for Economic Development
 - Funding 700.000 €
- 2020
 - He is the scientific responsible of the project "Seminari di approfondimento della valutazione del software in Function Point" with Ministero della Giustizia
 - Funding 103.500 €

Research Activities

The main research interests of Giuseppe Santucci are in the broad area of Databases and Visualization, including Visual Query languages, Semantic Modeling, and Information Visualization and Visual Analytics that has been challenged in the domains of Information Retrieval and Cyber Security. The results of this activity lead to the publication of about 200 publications with more than 200 co-authors, including 38 Journal Papers, and about 120 peer-reviewed conference and workshop papers.

In the years 1988-1998, after winning a scholarship with ISTAT, he carried out research with researchers from “Dipartimento di Informatica e Sistemistica” at the University of Rome "La Sapienza" on two main topics: (a) visual query languages and (b) data dictionaries characterized by different levels of abstraction. With regard to point (a), the research investigated visual query languages on the Entity Relationship model, opening a practically unexplored research field, see the pioneering work [16] which lays the foundations of this idea and investigates the semantics of this type of language. Research activities also dealt with practical, proposing one of the first extensions to the SQL language able to manage the greater expressive power of visual languages compared to relational algebra, see [15]. From these results an application has developed, namely Query By Diagram (QBD*), used in commercial applications and presented at SIGMOD in 1994. Regarding the point (b) the research explored the innovative idea of using the Entity Relationship model to manage data dictionaries using different levels of abstraction, see the pioneering work [14] which describes the reference architecture and the formal properties of schema transformations. The work in [11] presents a formal characterization of the semantics associated with schema transformations, semantics expressed through relational algebra operators.

In 1991, in the context of the “Progetto Finalizzato Pubblica Amministrazione” project, in collaboration with the Provveditorato Generale dello Stato, he contributed to the definition of a reference methodological framework for the design of information systems in the public sector. This reference framework represents a first step towards the definition of a standard for the models and methods for

the description of information systems. The results of this activity are in the book : AAVV -Quadro Metodologico di Riferimento per il Progetto di Sistemi Informativi nel Settore Pubblico- Istituto poligrafico e Zecca dello Stato 1990. In particular, Giuseppe Santucci edited, together with other authors, chapters 2. 3, 2. 5, 5. 1, 6. 1 and 6. 2.

In 1992, following a one-month visit to Prof. S.K. Chang of the University of Pittsburgh, one of the leading international visual language experts, a new research activity begins, aiming at extending the visual languages produced in the first years of study to multiparadigmatic environments. The research activity also involved the University of Bari, see [13] that proposes the pioneering idea of combining different visual querying paradigms, defining and formalizing a general query mechanism on graphs.

From 1994 to 1997 he actively participated in the ESPRIT Working Group 8422 project, FADIVA, whose purpose is to provide the theoretical foundations for the development of three-dimensional data visualizations, pushing the research towards the field of Information Visualization.

In 1997 he participated in the MURST National Project "InterData", targeting the study of methodologies and technologies for the management of data and processes on Internet and Intranet networks.

In 1997 he participates in the MURST Project: Multimedia Program in the evolution towards UMTS, Research line "Application to Cultural Heritage".

In 1998 he participates Participates in the LAURIN project (Telematics Program, Libraries Project LB-5629 / A) whose goal was the construction of a prototype of a digital library of newspaper clippings.

In the years 1999-2006 the research moved from visual query languages to aspects related to Information Visualization, collaborating with researchers from various Italian Universities (Bologna, Padua, Calabria, Bolzano, Bolzano, Pavia, Udine). An innovative automatic and parametric system for data visualization was developed, Drawing Adequate REpresentation, DARE, presented at SIGMOD in 2001. Research activities focused on the idea of combining visualization techniques with data mining contributing to the emerging field of research Visual Data Mining and on general methodological aspects, contributing, together with his PhD student Enrico Bertini, to the pioneering research sector on Visual Quality Metrics, see [10] in which the first formal definition of Visual Quality Metrics appears; such metrics are used to validate and guide non-uniform sampling techniques.

In 2000 he is the scientific responsible of the Rome unit of the COFIN 2000 project "Analysis, visualization of information and visual interrogation in databases for clinical monitoring". He collaborates with researchers from Udine and Pavia for the definition of Infovis techniques for medical data. During the project, the prototype of the DARE environment (Drawing Adequate REpresentation) has been successfully used for exploring multidimensional data.

In 2001 he participates in research activities related to the use of visualization techniques connected to data mining processes, research activities carried out in collaboration with the University of Bologna and Calabria.

In the years 2001 and 2002, as part of the activities of the "SEWASIE" project, he collaborates with researchers from the University of Bolzano and Bologna for the analysis and testing of visualization mechanisms for ontologies.

In the years 2002-2004 he is the scientific responsible for Task 3.7 and task 4.5b of the European project DELOS NoE: MIMA: Multimedia Interfaces for Mobile Applications, and coordinates

researchers from the University of Rome, Florence, Foundation for Research and Technology - Hellas and University of Modena and Reggio Emilia for the definition of Information Visualization techniques on mobile devices.

In the years 2007-2020 the research moves on the emerging Visual Analytics and the research deals with methodological aspects for the clutter reduction, see [9] that presents a generalized approach for the application of non-uniform sampling guided by Visual Quality Metrics.

In the years 2008-2010 Giuseppe Santucci actively participates in the preparation of the proposal of the European project VisMaster-Visual Analytics - Mastering the Information Age, CA, (Fp7 Grant Agreement Number 225924), and he is the scientific responsible of the Rome unit and the Work Package 3.1 (Data Management and Visual Analytics) and a member of the VisMaster Scientific Coordination Committee. The aim of the project is to consolidate the understanding of the issues relating to the Visual Analytics research area and to build a European community of researchers active in the sector. To this end, the project has produced a book, Visual Analytics - Mastering the Information Age, which represents the final result of the two years of the project. Chapter 3 of the book, Data Management, was drawn up under the responsibility of Giuseppe Santucci by coordinating the research group of the Rome unit and the Bergen unit, Norway (<http://www.vismaster.eu/book/chapter-3-data-management/>).

In 2010 he actively participated in the proposal of the European project Promise for the evaluation of Information Retrieval systems (NoE, 258191), PROMISE — Participative Research labOratory for Multimedia and Multilingual Information Systems Evaluation (2011-2013). He is the scientific responsible of the Rome unit and of the Visual Analytics Work Package 5, coordinating a group of national and international researchers (University of Padua, University of Amsterdam, Zurich University of Applied Sciences, Swedish Institute of Computer Science, Information Retrieval Facility, Austria, Center for the Evaluation of Language Communication Technologies, Italy, Evaluations and Language resources Distribution Agency, France) to identify Visual Analytics solutions to support the evaluation of Information retrieval techniques, see [6, 8]. He is one of the editors of the book "Information Retrieval Meets Information Visualization: PROMISE Winter School 2012, Zinal, Switzerland, January 23-27, 2012, Revised Tutorial Lectures (Lecture Notes in Computer Science)" which contains the results of this research activity as a tutorial for a Winter School (<http://www.springer.com/us/book/9783642364143>)

In 2012 he creates the A.WA.RE (Advanced Visualization and Visual Analytics Research) research group (<http://www.diag.uniroma1.it/~santucci/AWARE/>), whose members are today authors of over 60 scientific papers related to Infovis, Visual Analytics, and Cyber Security.

In 2013 he actively participated in the proposal of the European Panoptesec project, (FP7-ICT-2013-10 Objective ICT-2013.1.5 Trustworthy ICT item (c)) and he is the scientific responsible of the CIS-URome unit and the scientific responsible of Workpackage 6 (Visual Analytics and Display). He collaborates and coordinates the Italian and European researchers of the project, defining the specifications of a Visual Analytics solutions to support Cyber Security activities, starting a research activity on the application of Visual Analytics techniques to attack graphs and vulnerabilities, see [3,5].

In 2014, the collaboration with researchers of the University of Rostock, Germany triggers research activities on the emerging and challenging Progressive Visual Analytics topic, producing theoretical contribution in the field, see [7] that defines a formal model for dealing with progressive visualizations.

In 2018 he actively participates in the proposal of the European Panacea project, (H2020-call topic SU-TDS-02-2018) and he is currently the scientific responsible of Workpackage 2 (Research on advanced

threat modeling, human factors, resilient response and secure interconnectivity), taking care in detail of task T2.4: Advanced Visual Analytics.

The most recent results of the research are about the analysis of the workload that a DBMS has to cope with when answering queries produced by demanding interactive visual system, producing a novel type of specialized benchmarks able to assess the DBMS performances in such challenging situation [2] and formal contributions to the Infovis discipline, proposing a technique for inserting images in a map with controlled distortion [4] and a formal metric and a tractable heuristic for improving the effectiveness of the RadViz visualization [1].

Summary of Scientific Achievements

Source of all data: Scopus

Journals	39
Journals in the last 10 years (2011-2020)	14
Journals in the last 5 years (2016-2020)	12

Conferences,workshops,editorials	94
Conferences and workshops in the last 10 years (2011-2020)	49
Conferences and workshops in the last 5 years (2016-2020)	23

Books [scientific]	2
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Number of co-authors	203
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Total citations	1173
Average Citations per Product	8.7
Hirsch (H) index	19
Normalized H index	0.63

It is not possible to compute the impact factor using Scopus.

Selected Publications

1) Angelini, M., Blasilli, G., Lenti, S., Palleschi, A., & Santucci, G. - Effectiveness error: Measuring and improving RadViz visual effectiveness. (2021) IEEE Transactions on Visualization and Computer Graphics, doi:10.1109/TVCG.2021.3104879

CiteScore 2020	11.4
SJR 2020	1.005
SNIP 2020	2.547

Abstract

RadViz contributes to multidimensional analysis by using 2D points for encoding data elements and allowing for interpreting them along the original data dimensions. For these characteristics it is used in different application domains, like clustering, anomaly detection, and software visualization. However, it is likely that using the dimension arrangement that comes with the data will produce a plot which leads users to make inaccurate conclusions about points values and data distribution. This paper attacks this problem without altering the original RadViz design: it defines, for both a single point and a set of points, the metric of effectiveness error, and uses it to define the objective function of a dimension arrangement strategy, arguing that minimizing it increases the overall RadViz visual quality. This paper investigated the intuition that reducing the effectiveness error is beneficial also for other well-known RadViz problems, like points clumping toward the center, many-to-one plotting of non-proportional points, and cluster separation. It presents an algorithm that reduces to zero the effectiveness error for a single point and a heuristic that approximates the dimension arrangement minimizing the effectiveness error for an arbitrary set of points. A set of experiments based on 21 real datasets has been performed, with the goals of analyzing the advantages of reducing the effectiveness error, comparing the proposed dimension arrangement strategy with other related proposals, and investigating the heuristic accuracy. The Effectiveness Error metric, the algorithm, and the heuristic presented in this paper have been made available in a d3.js plugin at <https://aware-diag-sapienza.github.io/d3-radviz>. IEEE

2) Battle, L., Eichmann, P., Angelini, M., Catarci, T., Santucci, G., Zheng, Y., Binnig, C., Fekete, J.-D., Moritz, D. - Database Benchmarking for Supporting Real-Time Interactive Querying of Large Data (2020) Proceedings of the ACM SIGMOD International Conference on Management of Data, pp. 1571-1587.

GCS	A++
CiteScore 2020	7.1
SJR 2020	0.949
SNIP 2020	2.541

Abstract

In this paper, we present a new benchmark to validate the suitability of database systems for interactive visualization workloads. While there exist proposals for evaluating database systems on interactive data exploration workloads, none rely on real user traces for database benchmarking. To this end, our long term goal is to collect user traces that represent workloads with different exploration characteristics. In this paper, we present an initial benchmark that focuses on "crossfilter"-style applications, which are a popular interaction type for data exploration and a particularly demanding scenario for testing database system performance. We make our benchmark materials, including input datasets, interaction sequences, corresponding SQL queries, and analysis code, freely available as a

community resource, to foster further research in this area: <https://osf.io/9xerb/?view-only=81de1a3f99d04529b6b173a3bd5b4d23>. © 2020 Association for Computing Machinery.

3) Angelini, M., Bonomi, S., Lenti, S., Santucci, G., Taggi, S. - MAD: A visual analytics solution for Multi-step cyber Attacks Detection (2019) *Journal of Computer Languages*, 52, pp. 10-24.

CiteScore 2020	2.1
SJR 2020	0.254
SNIP 2020	1.537

Abstract

Software vulnerabilities represent one of the main weaknesses of an Information Technology (IT) system w.r.t. cyber attacks and nowadays consolidated official data, like the Common Vulnerability Exposure (CVE) dictionary, provide precise and reliable details about them. This information, together with the identification of priority systems to defend allows for inspecting the network structure and the most probable paths an attacker is likely to follow to reach sensible resources, with the main goal of identify suitable mitigation actions that reduce the risk of an attack. Some of these mitigation actions can be applied without further delay, some of them, instead, imply a high operational impact on the organization business that makes their usage convenient only when an attack is really on the way. Dealing with this issue is particularly challenging in the context of critical infrastructure where, even if patches are available, organization mission constraints create obstacles to their straightforward application. In this scenario, security operators are forced to deal with known vulnerabilities that cannot be patched and they spend a noticeable effort in proactive analysis, devising countermeasures that can mitigate the effect of a possible attack. This paper presents a Multi-step cyber Attack Detection (MAD) Visual Analytics solution aiming at assisting security operators in improving their network security by analyzing the possible attacks and identifying suitable mitigations. Moreover, during an attack, the system visually presents the security operator with the relevant pieces of information allowing a better comprehension of the attack status and its probable evolution, in order to make decisions on the possible countermeasures. © 2019 Elsevier Ltd

4) Angelini, M., Buchmüller, J., Keim, D.A., Meschenmoser, P., Santucci, G. - Surgerycuts: Embedding additional information in maps without occluding features (2019) *Computer Graphics Forum*, 38 (3) , pp. 237-247.

CiteScore 2020	5.4
SJR 2020	0.578
SNIP 2020	1.385

Abstract

Visualizing contextual information to a map often comes at the expense of overplotting issues. Especially for use cases with relevant map features in the immediate vicinity of an information to add, occlusion of the relevant map context should be avoided. We present SurgeryCuts, a map manipulation technique for the creation of additional canvas area for contextual visualizations on maps. SurgeryCuts is occlusion-free and does not shift, zoom or alter the map viewport. Instead, relevant parts of the map can be cut apart. The affected area is controlledly distorted using a parameterizable warping function fading out the map distortion depending on the distance to the cut. We define extended metrics for our approach and compare to related approaches. As well, we demonstrate the applicability of our approach at the example of tangible use cases and a comparative user study. © 2019 The Eurographis Association and John Wiley & Sons Ltd. Published by John Wiley & Sons Ltd.

5) Angelini, M., Blasilli, G., Catarci, T., Lenti, S., Santucci, G. - Vulnus: Visual vulnerability analysis for network security (2019) IEEE Transactions on Visualization and Computer Graphics, 25 (1) , art. no. 8443131, pp. 183-192. Cited 5 times.

CiteScore 2020	11.4
SJR 2020	1.005
SNIP 2020	2.547

Abstract

Vulnerabilities represent one of the main weaknesses of IT systems and the availability of consolidated official data, like CVE (Common Vulnerabilities and Exposures) , allows for using them to compute the paths an attacker is likely to follow. However, even if patches are available, business constraints or lack of resources create obstacles to their straightforward application. As a consequence, the security manager of a network needs to deal with a large number of vulnerabilities, making decisions on how to cope with them. This paper presents VULNUS (VULNerabilities visUal aSsessment) , a visual analytics solution for dynamically inspecting the vulnerabilities spread on networks, allowing for a quick understanding of the network status and visually classifying nodes according to their vulnerabilities. Moreover, VULNUS computes the approximated optimal sequence of patches able to eliminate all the attack paths and allows for exploring sub-optimal patching strategies, simulating the effect of removing one or more vulnerabilities. VULNUS has been evaluated by domain experts using a lab-test experiment, investigating the effectiveness and efficiency of the proposed solution. © 1995-2012 IEEE.

6) Angelini, M., Fazzini, V., Ferro, N., Santucci, G., Silvello, G. - CLAIRE: A combinatorial visual analytics system for information retrieval evaluation (2018) Information Processing and Management, 54 (6) , pp. 1077-1100. Cited 5 times.

CiteScore 2020	8.6
SJR 2020	1.061
SNIP 2020	3.126

Abstract

Information Retrieval (IR) develops complex systems, constituted of several components, which aim at returning and optimally ranking the most relevant documents in response to user queries. In this context, experimental evaluation plays a central role, since it allows for measuring IR systems effectiveness, increasing the understanding of their functioning, and better directing the efforts for improving them. Current evaluation methodologies are limited by two major factors: (i) IR systems are evaluated as “black boxes” since it is not possible to decompose the contributions of the different components, e.g., stop lists, stemmers, and IR models; (ii) given that it is not possible to predict the effectiveness of an IR system, both academia and industry need to explore huge numbers of systems, originated by large combinatorial compositions of their components, to understand how they perform and how these components interact together. We propose a Combinatorial visual Analytics system for Information Retrieval Evaluation (CLAIRE) which allows for exploring and making sense of the performances of a large amount of IR systems, in order to quickly and intuitively grasp which system configurations are preferred, what are the contributions of the different components and how these components interact together. The CLAIRE system is then validated against use cases based on several test collections using a wide set of systems, generated by a combinatorial composition of several off-the-shelf components, representing the most common denominator almost always present in English IR systems. In particular, we validate the findings enabled by CLAIRE with respect to consolidated deep

statistical analyses and we show that the CLAIRE system allows the generation of new insights, which were not detectable with traditional approaches. © 2018 Elsevier Ltd

7) Schulz, H.-J., Angelini, M., Santucci, G., Schumann, H. - An enhanced visualization process model for incremental visualization
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CiteScore 2020	11.4
SJR 2020	1.005
SNIP 2020	2.547

Abstract

With today's technical possibilities, a stable visualization scenario can no longer be assumed as a matter of course, as underlying data and targeted display setup are much more in flux than in traditional scenarios. Incremental visualization approaches are a means to address this challenge, as they permit the user to interact with, steer, and change the visualization at intermediate time points and not just after it has been completed. In this paper, we put forward a model for incremental visualizations that is based on the established Data State Reference Model, but extends it in ways to also represent partitioned data and visualization operators to facilitate intermediate visualization updates. In combination, partitioned data and operators can be used independently and in combination to strike tailored compromises between output quality, shown data quantity, and responsiveness - i.e., frame rates. We showcase the new expressive power of this model by discussing the opportunities and challenges of incremental visualization in general and its usage in a real world scenario in particular. © 1995-2012 IEEE.

8) Angelini, M., Ferro, N., Santucci, G., Silvello, G. - VIRTUE: A visual tool for information retrieval performance evaluation and failure analysis
(2014) Journal of Visual Languages and Computing, 25 (4) , pp. 394-413. Cited 19 times.

CiteScore 2020	2.1
SJR 2020	0.254
SNIP 2020	1.537

Abstract

Objective: Information Retrieval (IR) is strongly rooted in experimentation where new and better ways to measure and interpret the behavior of a system are key to scientific advancement. This paper presents an innovative visualization environment: Visual Information Retrieval Tool for Upfront Evaluation (VIRTUE) , which eases and makes more effective the experimental evaluation process. **Methods:** VIRTUE supports and improves performance analysis and failure analysis. **Performance analysis:** VIRTUE offers interactive visualizations based on well-known IR metrics allowing us to explore system performances and to easily grasp the main problems of the system. **Failure analysis:** VIRTUE develops visual features and interaction, allowing researchers and developers to easily spot critical regions of a ranking and grasp possible causes of a failure. **Results:** VIRTUE was validated through a user study involving IR experts. The study reports on (a) the scientific relevance and innovation and (b) the comprehensibility and efficacy of the visualizations. **Conclusion:** VIRTUE eases the interaction with experimental results, supports users in the evaluation process and reduces the user effort. **Practice:** VIRTUE will be used by IR analysts to analyze and understand experimental results. **Implications:**

VIRTUE improves the state-of-the-art in the evaluation practice and integrates visualization and IR research fields in an innovative way. © 2014 Elsevier Ltd.

9) Bertini, E., Santucci, G. - Improving visual analytics environments through a methodological framework for automatic clutter reduction
(2011) Journal of Visual Languages and Computing, 22 (3) , pp. 194-212. Cited 3 times.

CiteScore 2020	2.1
SJR 2020	0.254
SNIP 2020	1.537

Abstract

One of the main visual analytics characteristics is the tight integration between automatic computations and interactive visualization. This generally corresponds to the availability of powerful algorithms that allow for manipulating the data under analysis, transforming it in order to feed suitable visualizations. This paper focuses on more general purpose automatic computations and presents a methodological framework that can improve the quality of the visualizations adopted in the analytical process, using the dataset at hand and the actual visualization. In particular, the paper deals with the critical issue of visual clutter reduction, presenting a general strategy for analyzing and reducing it through random data sampling. The basic idea is to model the visualization in a virtual space in order to analyze both clutter and data features (e.g., absolute density, relative density, etc.) . In this way we can measure the visual overlapping which may likely affects a visualization while representing a large dataset, obtaining precise visual quality metrics about the visualization degradation and devising automatic sampling strategies in order to improve the overall image quality. Metrics and algorithms have been tuned taking into account the results of suitable user studies. We will describe our proposal using two running case studies, one on 2D scatterplots and the other one on parallel coordinates. © 2011.

10) Bertini, E., Santucci, G. - Give chance a chance: Modeling density to enhance scatter plot quality through random data sampling
(2006) Information Visualization, 5 (2) , pp. 95-110. Cited 34 times.

CiteScore 2020	3.4
SJR 2020	0.179
SNIP 2020	0.536

Abstract

The problem of visualizing huge amounts of data is well known in information visualization. Dealing with a large number of items forces almost any kind of Infovis technique to reveal its limits in terms of expressivity and scalability. In this paper we focus on 2D scatter plots, proposing a 'feature preservation' approach, based on the idea of modeling the visualization in a virtual space in order to analyze its features (e.g., absolute density, relative density, etc.) . In this way we provide a formal framework to measure the visual overlapping, obtaining precise quality metrics about the visualization degradation and devising automatic sampling strategies able to improve the overall image quality. Metrics and algorithms have been improved through suitable user studies. © 2006 Palgrave Macmillan Ltd. All rights reserved.

11) Santucci, G. Semantic schema refinements for multilevel schema integration
(1998) Data and Knowledge Engineering, 25 (3) , pp. 301-326. Cited 1 time.

CiteScore 2020	4.7
SJR 2020	0.480
SNIP 2020	1.162

Abstract

Within the database field, schema refinements have been proved useful for documentation and maintenance purposes; moreover, schemata describing the reality of interest at different levels of abstraction are extensively used in Computer Aided Software Engineering tools and visual query languages. So, much effort has been spent in analyzing schema transformations and schema refinements. Till now, however, while the syntax of schema transformations has been deeply investigated, the semantics has been very often neglected. In this paper we present a full formal framework, supporting both the syntax and the semantics of schema refinements. Such a formal framework is used to support a methodology able to merge a set of schemata and the top-down chains of refinement planes produced during their design. The result of this kind of integration, that we call multilevel integration, is an integrated schema plus an associated top-down chain of schemata. The integrated schema and the chain are related to the input schemata by interesting properties, giving rise to a two-dimensional structure useful for exploring the data content of complex information systems.

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CiteScore 2020	6.0
SJR 2020	0.653
SNIP 2020	1.949

Abstract

During the past few years our research efforts have been inspired by two different needs. On one hand, the number of non-expert users accessing databases is growing apace. On the other, information systems will no longer be characterized by a single centralized architecture, but rather by several heterogeneous component systems. In order to address such needs we have designed a new query system with both user-oriented and multidatabase features. The system's main components are an adaptive visual interface, providing the user with different and interchangeable interaction modalities, and a "translation layer", which creates and offers to the user the illusion of a single homogeneous schema out of several heterogeneous components. Both components are founded on a common ground, i.e. a formally defined and semantically rich data model, the Graph Model, and a minimal set of Graphical Primitives, in terms of which general query operations may be visually expressed. The Graph Model has a visual syntax, so that graphical operations can be applied on its components without unnecessary mappings, and an object-based semantics. The aim of this paper is twofold. We first present an overall view of the system architecture and then give a comprehensive description of the lower part of the system itself. In particular, we show how schemata expressed in different data models can be translated in terms of Graph Model, possibly by exploiting reverse engineering techniques. Moreover, we show how mappings can be established between well-known query languages and the Graphical Primitives. Finally, we describe in detail how queries expressed by using the Graphical Primitives can be translated in terms of relational expressions so to be processed by actual DBMSs.

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(1996) IEEE Transactions on Knowledge and Data Engineering, 8 (3) , pp. 455-475. Cited 25 times.

CiteScore 2020	13.3
SJR 2020	1.360
SNIP 2020	4.097

Abstract

We describe an approach for multiparadigmatic visual access to databases, which is proposed to achieve seamless integration of different interaction paradigms. The user is provided with an adaptive interface augmented by a user model, supporting different visual representations of both data and queries. The visual representations are characterized on the basis of the chosen visual formalisms, namely forms, diagrams, and icons. To access different databases, a unified data model, the Graph Model, is used as a common underlying formalism to which databases, expressed in the most popular data models, can be mapped. Graph Model databases are queried through the adaptive interface. The semantics of the query operations is formally defined in terms of graphical primitives. Such a formal approach permits us to define the concept of "atomic query," which is the minimal portion of a query that can be transferred from one interaction paradigm to another and processed by the system. Since certain interaction modalities and visual representations are more suitable for certain user classes, the system can suggest to the user the most appropriate interaction modality as well as the visual representation, according to the user model. Some results on user model construction are presented. ©1996 IEEE.

14) Batini, C., Battista, G.D., Santucci, G. Structuring Primitives for a Dictionary of Entity Relationship Data Schemas

(1993) IEEE Transactions on Software Engineering, 19 (4) , pp. 344-365. Cited 48 times.

CiteScore 2020	14.9
SJR 2020	0.857
SNIP 2020	3.969

Abstract

The data dictionary contains the description of all types of data produced, managed, exchanged, and maintained in an organization. Data descriptions (very often hundreds of schemas) should be organized in such a way to allow all the users of the information system to understand the meaning of data and their relationships. In this paper, a new set of structuring primitives is presented for a dictionary of entity relationship data schemas. The formal properties of such structuring primitives are investigated and the feasibility of their usage is shown by providing a methodology for dictionary design. © 1993 IEEE

15) Santucci, G., Sottile, P.A. Query by diagram: A visual environment for querying databases

(1993) Software: Practice and Experience, 23 (3) , pp. 317-340. Cited 12 times.

CiteScore 2020	5.0
SJR 2020	0.437
SNIP 2020	1.168

Abstract

In recent years, several attempts have been made to define query languages characterized by both high expressive power and easy query formulation. Several issues concern graphical applications,

based on the diagrammatic representation of a semantic model and visual interaction. This paper describes the architecture and the implementation of a graphical query system, based on the diagrammatic representation of entity relationship schemata. The query language underlying the system allows the formulation of recursive queries; moreover, user interaction in both managing diagrams and expressing queries is simplified by the presence of a fully visual environment and a rich set of interaction strategies. Copyright © 1993 John Wiley & Sons, Ltd

16) Angelaccio, M., Catarci, T., Santucci, G. QBD*: A Graphical Query Language with Recursion (1990) IEEE Transactions on Software Engineering, 16 (10) , pp. 1150-1163. Cited 88 times.

CiteScore 2020	14.9
SJR 2020	0.857
SNIP 2020	3.969

Abstract

One of the main problems in the database area is to define query languages characterized by both high expressive power and ease of use. In this paper, we propose a system to query databases, using diagrams as a standard user interface. The system, called Query by Diagram* (QBD*) , makes use of a conceptual data model, a query language on this model, and a graphical user interface. The conceptual model is the Entity-Relationship Model; the query language, whose expressive power allows recursive queries, supports visual interaction. The main characteristics of the interface are ease of use and the availability of a rich set of primitives for schema selection and query formulation. Furthermore, we compare the expressive power of QBD* and G+, which are the only languages allowing recursive queries to be expressed graphically. © 1990 IEEE

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