

From Strings to Graphs, and Back Again: A Festschrift for Roberto Grossi's 60th Birthday

Grossi's Festschrift, July 25, 2025, Venice, Italy

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A collection of articles written in honor of the 60th birthday of Roberto Grossi, a great academic and much more.

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■ Preface

This Festschrift volume celebrates the 60th anniversary of Professor Roberto Grossi, in short Roberto in the following, accompanying a workshop scheduled on 25th July 2025, as a satellite workshop of SEA 2025, 23rd Symposium on Experimental Algorithms. The contributors of this volume, as well as the attendees to the workshop, are gathered from all over the world to express their admiration for Roberto as a researcher and educator, as well as their love for him as a person.

The contributions of Roberto to the academic world, particularly in the fields of algorithms and data structures for strings and graphs, have left an indelible mark on both his students and colleagues. Roberto's work is characterized by a profound commitment to research and teaching, and his ability to seamlessly integrate theory with practical applications has made his contributions invaluable. In this sense, we believe the collocation of the workshop, namely as a SEA satellite workshop, reflects the contamination of theory and practice which have pervaded the work of Roberto. His passion for knowledge and teaching extends beyond the classroom, fostering environments of intellectual curiosity and rigorous inquiry.

This collection of papers, gathered from colleagues, students, and collaborators, serves as both a tribute to his legacy and an exploration of the ideas and discussions that have shaped his academic journey. The variety of topics covered by this volume reflects the broad scope of his influence, showcasing the depth and breadth of his intellectual pursuits. It is our hope that this volume will serve as both a reflection of the profound impact Roberto has had on the academic community and as an inspiration for future generations to continue his work of intellectual exploration and discovery. Through this tribute, we honor a remarkable scholar, teacher, and mentor whose legacy will continue to inspire researchers over the years.

Beyond his scholarly achievements, Roberto is renowned for his unwavering kindness and generosity of spirit. Even during the busiest seasons of research and teaching, he always showed empathy, grace, and genuine care for those around him. His kindness has instilled a culture of respect, patience, and mentorship that will last beyond any publication or citation. The many contributions of this volume celebrate not only the academic achievements but also his kind and human impact on the community.

The story of Roberto: a very long CV made short

In the following, we are reporting a brief summary of Roberto's CV, mainly inspired by his home page and a very old CV we have found. This is far from being complete and updated as we realized that many of his achievements are not mentioned by him anywhere and we are aware of them only thanks to personal knowledge and the contributions will follow later in this volume.

Roberto got his degree (Laurea) summa cum laude in Computer Science (Scienze dell'Informazione) in the academic year 1987-1988 from Università di Pisa. He then obtained his Ph.D. degree in Computer Science (Dottorato di Ricerca in Informatica) from Università di Pisa in the academic year 1992-1993. He has been research and teaching assistant (Ricerca) at Dipartimento di Sistemi e Informatica, Università di Firenze, from March 1993 to October 1998 and then Associate Professor (Professore Associato) at Dipartimento di Informatica, Università di Pisa, from November 1998 to October 2010. He is currently Full Professor (Professore Ordinario) at Dipartimento di Informatica, Università di Pisa, since November 2010.

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He has been: Visiting scholar at Columbia University, Department of Computer Science, 1990-1991; Visiting researcher at AT&T Bell Laboratories, USA, 1993 and 1995; Visiting scientist at Berkeley, International Institute of Computer Science, USA, 1995; Visiting researcher at Aarhus University, Institute for Basic Research in Computer Science, Denmark, 1996; Visiting professor at the Universite de Marne-la-Vallee, Laboratoire de Informatique, France, 2001; Visiting researcher at Tohoku University, Graduate School for Information Sciences, Japan, 2002, and Haifa University, Department of Computer Science, 2005 and 2010; Visiting professor at the National Institute of Informatics, Japan, 2018-2019 and Tokyo University, Japan, 2024. He is member of ERABLE (European Research team in Algorithms and Biology, formal and Experimental), INRIA Rhone Alpes, France, since 2005.

Roberto has been the advisor of the following Ph.D. students (in chronological order): Gianni Franceschini (U. di Roma “La Sapienza”), Ankur Gupta (Butler U., advisor Jeff Vitter), Iwona Bialynicka-Birula (Microsoft), Giovanni Battaglia (ION Trading, Dimoco), Alessio Orlandi (Google), Mauriana Pesaresi (1983-2008, passed away during studies), Rui Andre’ Ferreira (Microsoft, Facebook, Spotify), Giuseppe Ottaviano (Facebook), Alessio Conte (NII Japan, U. di Pisa), Shima Moghtasedi (Milan), Luca Versari (Google), Giulia Punzi (U. Pisa), Giovanni Buzzega (U. Pisa).

Roberto has been (and still is) a very active member of the scientific and academic community, both nationally and internationally. He has been a member of the International Scientific Committee of the International Olympiad in Informatics. He has been the Treasurer of the Italian Chapter of the European Association for Theoretical Computer Science (EATCS). He has been the reviewer of international research projects for several Science Foundations, and international PhD Theses committees. He has been PC member of many prestigious conferences, to name a few ESA, SODA, FOCS, STACS, WWW, and CIKM. He is one of the few Italian authors cited in the second edition of the third volume of *The Art of Computer Programming: Sorting and Searching* by Donald Knuth for his contribution to the String B-Tree (along with P. Ferragina)

Roberto is internationally acknowledged for his outstanding and fundamental contributions to the area of the design and analysis of algorithms and data structures. His research interests are both in theoretical problems for core research and in applications and experimental work. Specifically, his interests are focused on algorithms for combinatorial pattern matching and mining on strings, sequences, trees, matrices, and graphs; design of algorithms and data structures for external and hierarchical memory; implicit, succinct and compressed data structures for (compressed) data sets; space- and time-efficient compressed indexing and fast searching in compressed text; text indexing and editing; multi-dimensional data structures; algorithm engineering for quick-access tables and dictionaries; routing algorithms for networks and robot.

Some testimonies

In this section, we report four extended testimonies about Roberto, respectively from his PhD Advisor, Fabrizio Luccio, from his long-term research collaborator Jeffrey Scott Vitter, from his colleague at Italian Olympiads in Informatics Luigi Laura, and from colleagues at the University of Pisa. In the resulting three orthogonal aspects of his work, first as a student, and later as a researcher, and educator, and colleague, Roberto is described as an extraordinary scholar, mentor, collaborator, and friend.

A great academic and much more

by *Fabrizio Luccio*

I met Roberto forty years ago in a classroom at the University of Pisa. He had enrolled to pursue a degree in Informatics, the Italian equivalent of a Master's degree in Computer Science, and was attending a course on Information Processing Systems that I was teaching. Roberto was a serious, responsible person, quickly mastering every aspect of the study material in all fields of CS and emerging as one of our top students. I was therefore particularly pleased when he asked me to supervise and discuss his final thesis for the Master's degree, in which the first signs of his groundbreaking research on the design and analysis of algorithms and data structures, for which he is now universally esteemed, began to emerge.

After graduating, Roberto was admitted to our PhD program under my supervision, then spent most of his academic life in our department, up to his current position as a highly regarded professor and an excellent research director. He initially joined a research group that I had led for many years. Eventually, the group split into two parts, and he took over the leadership of one of them. From the very beginning, our scientific work was carried out side by side, right up to the day of my retirement and, to some extent, even after that. As time went by, an unbreakable bond of friendship and mutual respect was established between us. Other colleagues, on this occasion, will present and discuss his research achievements and his commitment to teaching in various courses. I would like to highlight Roberto's fundamental role as a mentor to many young scholars in the PhD program and in guiding them toward research, as well as his openness to various activities where the experience gained during his academic career plays a crucial role.

First of all, Roberto has been and still is a great scientific leader, and this is perhaps the most important contribution that can be expected of a university professor. He has built relationships and collaborations with major research groups in Italy and abroad. Many excellent PhD students have studied or are studying under his guidance in our department, gaining top-level training and putting the acquired expertise and genuine enthusiasm at the service of the scientific and technical life of our country and abroad. Furthermore, several students who simply completed their Master's thesis under his supervision and then pursued professional or research careers have been able to approach their work on an excellent foundation of scientific knowledge.

Another activity of Roberto, which had significant international relevance, was the direction of training for the Informatics Olympiad, where young Italian university students had the opportunity to compete on equal footing with their peers from many other countries. Speaking with some of them years later, I appreciated their enthusiasm for that experience and the importance of the memory it left. Among other things, it is thanks to Roberto that a version of these Olympiads was organized in Italy. On a local level as well, he was among the organizers and evaluators of informatics contests for a large number of high school students eager to test their knowledge against others and to seek guidance on which university studies to pursue.

Finally, I want to highlight Roberto's commitment to initiatives aimed at enhancing both university and school-level teaching, as a contribution to education in the broader sense. Of particular importance is the ongoing professional development of teachers at all levels of education, achieved through courses that allow them to discuss the latest developments in their subjects and gain new inspiration for teaching.

In conclusion, Roberto has approached and developed his profession in the most intelligent and noble way, and everyone should be grateful to him for this.

My great friend and collaborator!

by Jeffrey Scott Vitter

I had the great fortune to meet Roberto 30 years ago. He and colleague Paolo Ferragina visited the USA to present their innovative way to index strings in external memory at the 1995 *STOC* conference. Much of my work was focused at that time on the field of external memory algorithms, in which the main bottleneck is the I/O communication between a small but fast memory (such as RAM) and a large but slow memory (such as disk, which utilizes block transfer). Roberto and Paolo's approach for strings met the optimal I/O bounds for processing strings, and they did it in a very elegant way. Shortly afterward, we had the opportunity along with our collaborator (the late) Lars Arge to work together on sorting strings in external memory, which we presented at the 1997 *STOC* conference.

Through the years, Roberto has truly become a great friend and collaborator. I don't think I know anyone who is more receptive and eager than Roberto when it comes to interacting with colleagues and developing new ideas. He gives of himself selflessly and is full of encouragement. And on a personal level, he is such a positive person. Sharon and our kids had great times visiting him and his family in Pisa during our sabbatical in 1998–1999, which was nearby at INRIA in Sophia-Antipolis, France.



■ **Figure 1** After a fun dinner in August 1998 with our families in Pisa.

As with all my favorite reminiscences, food and wine play an important part. Roberto and Paolo introduced me during my sabbatical to the delicacy of *alici*, which we had for lunch one day during a visit to Pisa. I make sure to order them whenever I'm in Italy.

And I think I can legitimately credit Roberto as the person most responsible for my ever-growing interest in wine. During our sabbatical visits, Roberto shared that his wife Antonella's dad – who was an avid wine connoisseur and collector – had to give up drinking wine for health reasons. And in order to avoid temptation, he began giving away his extensive collection, much of it to Roberto and Antonella. In the process, Roberto gifted us with several bottles of stellar wine, including a 1967 Giordano Barolo, which figures prominently in our 1998 Christmas card.

Sharon and I still talk about it to this day; that's how memorable both Roberto and the Barolo were! Barolo wines are notorious for containing a lot of sediment, so the wine generally needs to be filtered first, and then it's best to decant it for an hour for each year of



■ **Figure 2** At a 2009 dinner in Pisa with Roberto and family and Fabrizio Luccio.



■ **Figure 3** Our 1998 Christmas photo from our terrace in Valbonne, France, with Roberto’s gifted bottle of 1967 Giordano Barolo!

age. So given that it was 31 years old at the time, we filtered the wine and then aired it in a carafe for about a day and a half. And what an amazing wine it was!

On a professional level, Roberto is the person responsible for bringing me into the field of compressed text indexing. I was always interested in data compression – in the text, image, and video domains – but Roberto helped indoctrinate me into the fascinating world of stringology. I loved the elegant theory and was “all in.” Roberto was the lead in our 2000 *STOC* work on compressed suffix arrays, in which we presented the first provably succinct text index whose space requirement was within a constant factor of the input size. The space savings was a factor of $\log_{|\Sigma|} n$ over the well-known suffix tree and suffix array data structures, where $|\Sigma|$ is the size of the alphabet.



■ **Figure 4** At Bertinoro in 2006, with Gonzalo Navarro, Kunihiko Sadakane, Rahul Shah, and Roberto.

Roberto was also a great mentor to my graduate student Ankur Gupta. A couple of years later, the three of us developed the wavelet tree rank/select data structure, which generalized the famous RRR data structure for bit arrays in order to handle arbitrary alphabets Σ . Like RRR, the wavelet tree data structure provided 0th-order entropy compression with leading constant factor of 1, and when the portions of text sharing a common context of length k were each encoded in that manner, the resulting global structure provided k th-order entropy compression. Not only that, but the space bound had the constant factor of 1 in front of the leading nH_k term, which answered an open question of Giovanni Manzini and established asymptotic optimality for both compressed suffix arrays and the FM-index.

I feel very blessed to have had the opportunity to collaborate over the years with Roberto and witness his great understanding of the field as well as his scientific creativity. It was always fun to be at a conference with Roberto because the energy that developed led to many interesting collaborations. But mostly I am thankful for his friendship and for his being the person he is. Roberto, I hope this Festschrift lets you know how much you mean to us!

Twenty Years with Roberto: An Olympic Journey

by Luigi Laura

I have known Roberto for 25 years or slightly more. I probably met him when I was a PhD student in Sapienza, but our intense interaction started when Alberto Marchetti-Spaccamela came into my office in 2005, asking if I wanted to help with the Italian Olympiads in Informatics (OII): “it will not take you more than a few hours per year” Alberto said. It quite soon became my principal activity and still is today. Roberto was the head of the Italian organisation, for the scientific/educational part. In 2012 we also organized, in Italy, the International Olympiads in Informatics: 85 participating countries, with four students and two teachers (team leaders) per country. After that very tiring experience, Roberto stepped back (as much as he can, he has been also later very involved) and we switched roles.



■ **Figure 5** Pisa, 2007: a consciousness-raising sessions; from left to right Sebastiano Maggiolo, Roberto Grossi, Nicola Pierazzo and Romeo Rizzi.



■ **Figure 6** Volterra, 2010: Alessio Guerrieri and Roberto Grossi are distributing food to the students. (Photo by Giuseppe Ottaviano)

Thus, over the last 20 years we have worked together extensively, and I can proudly say that the overall OII organization grew a lot under “our” guide (or despite it, depending on the point of view). We spent a lot of time together, and I can tell dozens of stories about Roberto. A few of them can be reported here (don’t worry Roberto, the couple that you fear will not be included, nor will the “few-lines-of-prolog-solving-every-problem” induced anger one).

Before diving into the stories, here’s a quick crash course on the organization of OII: we start (first phase) with approximately 15,000 students in their own schools... then (second phase) the best 1-2k compete in 40-50 schools distributed across all the Italian territory, and (national final) the top 100 students participate in the final contest, in a school (or, sometimes, in a university) that changes every year. Then, the top 20 from the final are selected to participate in 4 periods of few days of training and selection, until we have four students to send to the International Olympiads in Informatics (IOI).

The majority of my interactions with Roberto have been in the training camps and when we went together to IOI (2007 Croatia, 2008 Egypt, 2010 Canada, and 2011 Thailand).



■ **Figure 7** The Italian Team at IOI 2008 in Egypt: from left to right, first row: Matteo Boscariol, Massimo Cairo, Luigi Laura, one of the guides of the team, Marta Genoviè De Vita. Second row: the other guide, Roberto Grossi, Giovanni Mascellani, and Paolo Comaschi (Photo by Giuseppe Ottaviano)

A tradition of the training camps, started by Sebastiano Vigna, in charge of OII before Roberto, was the “Consciousness-raising sessions” (*sedute di autoscienza* in italiano), a post dinner activity with all the students, where each participant explained their first experience with coding in an Alcoholics Anonymous-style format. In Figure 5 we can see Roberto in one of the consciousness-raising sessions from 2007 in Pisa.

The most amusing thing about Roberto regarding the training camps was that the technical team would often pull all-nighters to prepare the competition for the students the next morning. At a certain point in the evening or night, Roberto would finish his part and have nothing else to do, but he felt bad about abandoning the others, so he would sleep on a bench. Roberto spent quite a few nights in the early years of the training camps sleeping on benches. In Figure 6 we can see Roberto in Volterra during a training camp.

The most interesting single experience, together with Roberto, has been in IOI Egypt, in 2008. Egypt was under Mubarak’s government. The venue of the IOI competition was the so called Mubarak Educational City, a complex of six large buildings, in a beautiful lawn (in the desert!), surrounded by a high wall, guarded by armed sentries, complete with the traditional changing of the guard. It was a suspicious location. We, as participants of IOI, had a map of the complex, and in the map one of the six buildings was not present! Most notably, whenever one of the participants tried to approach the *unmapped* building, someone would ‘coincidentally’ emerge from it, apparently to make a phone call or have a cigarette, who would politely invite the participant to move away from the building.

Now, if you know Roberto you might be aware that he has some inclination toward conspiracy theories (he would not state it in this form). So Roberto started developing a theory where the unmapped building was a missile base (in retrospect, he might be right). Instead of trying to reassure him, I would escalate with phrases like “you’re right, but at this point, if they realize you know, they might decide to kidnap you or eliminate you. If you disappear, I’ll immediately take our students to the Italian embassy. I already warned them that if both of us disappear they need to run and search for a safe place”. I had a lot of fun playing the spy game with Roberto in those days.

Giuseppe Ottaviano, who shared the room in Egypt with me and Roberto, might focus on the fact that every morning he complained to us, saying something like “you both snored all night, sometimes in unison, sometimes taking turns, and I didn’t sleep at all”. In Figure 7 the Italian team at IOI 2008.

Over these years we have seen many young people grow: we saw them first participate in competitions and then, while studying at university, they collaborated with the Olympics as tutors; many did a PhD, continuing to collaborate. Some of them, even after completing their studies and finding work, have continued to collaborate. Among them, we mention Giorgio Audrito, soon to be an associate professor at the University of Turin, who has been the scientific coordinator of OII since 2020. Luca Foschini and Alessio Signorini met at OII in 2001 and few years ago founded Evidation Health, a startup now valued more than a billion dollars. We’ll mention, in random order and with no claim to completeness, just a few others: Giuseppe Ottaviano works for Meta (formerly Facebook); Alessandro Dovis, Stefano Maggiolo, Andrea Ciprietti, Nicolò Mazzuccato, Alessio Orlandi, Marco Ribero and Luca Versari work at Google, the first two in London and the others in Zurich. Giovanni Campagna is in San Francisco, hired by Bardeen, while Gabriele Farina is an Assistant Professor at MIT, after working for a year as a Research Scientist at Meta. At MIT we also find Giada Franz, currently as an Instructor. Alice Cortinovis is an Assistant Professor at Stanford, where Matilde Padovano is completing a PhD in Machine Learning, while Federico Glaudo is a Postdoctoral Research Associate at Princeton. MIT, Stanford and Princeton: academically we can’t complain, and on the corporate front as well, between Google, Meta, Microsoft (where Ottaviano worked in the past), DeepMind (Matilde Padovano’s internship), Twitter (Emanuele Rossi, who now works for VantAI), we can say that the former Olympians are doing quite well for themselves.

Those young students might not have written a paper about succinct data structures or enumerating cliques in temporal graphs, but I am sure that at a certain point of their early careers they have been inspired, as much as I had, by the words and the works of Roberto. This is his legacy. Thank you Roberto!

Roberto: Master of Algorithms and Ceremonies

by Giovanni Buzzega, Alessio Conte, Veronica Guerrini, Andrea Marino, Giulia Punzi, Nadia Pisanti, Giovanna Rosone, Giorgio Vinciguerra

From tales of travels to work discussions, to fond memories of his students, Roberto always has a story to share, topped off with some good tea or coffee. His office has become famous for brewing traditional Japanese tea, a craft that he learned and perfected during his many travels to Japan, even attending a traditional tea ceremony. Recently, he moved on to specialty coffee as well, approaching it with a true scientific mindset and experimenting with different filters, techniques, and coffee varieties. During work breaks or meals, he is more than happy to prepare tea, infusions or coffee for anyone around. The kind and generous spirit that he shows in sharing with others is the same that he brings to research, teaching, and everyday life. Anyone who knows Roberto has seen his ability to make everyone feel welcome, at ease, and treated as equal, whether they are visiting scholars from around the world or first-year students.

It was during one of the shared meals in our department that we celebrated Roberto’s 60th birthday. He brought some pastries to have a small celebration in the office, thinking that nobody knew about his birthday. Not only were we and our colleagues fully aware of it, but we had also prepared a surprise for him.



■ **Figure 8** An overjoyed Roberto hugging his new grinder tightly, with some of his friends and colleagues. From left to right: (standing) Filippo Geraci, Roberto Grossi, Giovanni Buzzega, Veronica Guerrini, Alice Cortinovis, Francesco Landolfi, Giorgio Vinciguerra; (on the sofa) Alessio Conte, Linda Pagli, Giovanna Rosone, Giulia Punzi, Luca Mencarelli; (on call) Andrea Marino and Rossano Venturini.

There is a story behind it all, and it started during his trip to Tokyo in July 2024. Roberto was attending a seminar at Kanda lab, the lab of his collaborator and long-time friend Takeaki Uno. Kanda lab is Roberto’s home-away-from-home when he is in Japan, so he was, as usual, offering to prepare coffee for the seminar participants. When approaching the kitchenette of the lab, he noticed a high-end coffee grinder belonging to the lab postdoc Yuta. It was, as Roberto himself later put it, “the Ferrari of coffee grinders”. The postdoc, a fellow coffee enthusiast, saw Roberto’s excitement and gladly agreed to let him prepare the ritual coffee using his grinder. It was only after Roberto had happily completed the grinding, boiling, filtering, and handing out of cups to his colleagues that he realized there was no more coffee left for him. At the time, he hid his disappointment quite well; still, in the many meals we shared in Pisa after that incident, he often expressed his regret at not having tasted such a premium-ground coffee when it had been so close at hand.

When his fellow coffee drinkers, colleagues, and friends found out that his birthday was approaching, a plan was set in motion. We asked Yuta for the specific coffee grinder’s model and managed to have the same grinder delivered from a specialty coffee shop just in time for his birthday. On that day, imagine the surprise of Roberto, going from thinking that he was quietly announcing his birthday to oblivious people, to finally being able to prepare the coffee that he had been craving for months. . . the picture (Figure 8) says it all!

Roberto, this is for your $(2^6 - 4)$ th birthday, with wishes for many joyful coffee-grinding moments ahead.

Open Messages to Roberto

In this Section we have collected some open messages to Roberto from some of his colleagues and his friends. They talk about their experience with Roberto, whether personal or professional. This collection of heartfelt tributes highlight his impactful contributions to theoretical computer science – especially in string algorithms, data structures, and succinct indexing – as well as his inspiring personality. In particular, he is described by many as kind, humorous, down-to-earth, and joyful in collaboration. Praised for making research fun, inspiring, and deeply human, often accompanied by thoughtful touches – like sharing fine Japanese tea or musical interests. These tributes show how his intellect and humanity have deeply shaped the lives and work of many across the globe.

I arrived in Florence in November 1997 and had to share a work room (not really an office) in an apartment with Roberto and Alberto Del Lungo. Roberto's surprise when he saw me enter the room with a tennis bag made me immediately understand that it was the beginning of a beautiful friendship. And so it was, but it was also the beginning of a superlative collaboration with one of the most brilliant researchers I have ever worked with. Our first paper together was about the problem of the IP address lookup: Leandro Dardini had a very nice idea, Roberto quickly formalized it and made a great result, and I . . . well, I loved being part of it. And I remember that, when we discovered on the ESA website that the paper had been accepted (surprisingly, we had not yet received an acceptance letter), we started jumping and hugging each other in the room, as if Italy had won the world championship. Yes, that's what I miss the most: the enthusiasm that Roberto and other friends and colleagues allowed me to experience simply by proving theorems and writing code. Thanks, Robi!

Pilu Crescenzi

Dear Roberto,

The first memory that I have of you dates back to 2015, when I attended your course “Algoritmica 2” during my master’s studies. The course had an unconventional structure that I enjoyed a lot, especially for the exam format. However, what struck me the most was your availability to students and your charming personality, which made student-professor interactions very smooth.

This trait of yours became even more evident to me when, a few years later, you became my first academic mentor, as I started working on my master’s thesis under your supervision. I remember that, since day one, you asked me not to address you in a formal way by saying: “Dammi del tu, siamo colleghi adesso.” You were able to make me feel like I was really talking to a peer, even though I was just a student, while you were a well established and acclaimed professor. I consider that to be at the very beginning my academic career, and I will always keep close to my heart the sweet memory of those spring mornings spent in your office, sipping from a cup of fine Japanese tea while tackling research questions on strings and graphs.

Years have passed since that spring in 2018, and if I grew into a more mature researcher and person it is also thanks to your teachings. I am thankful for your trust in my ideas but, above all, for your constructive criticism. Thank you for so explicitly telling me that I was wrong when you thought so. I always admired this ability of yours; not so much for spotting technical mistakes, but rather for identifying a sterile line of research, as it is way easier to fall in love with new ideas than it is to divorce them. My warmest regards and wishes!

Massimo Equi

Epic times. I’ll never forget those legendary mornings in my apartment while we were preparing our STOC ’95 paper on String B-trees, taking inspiration from “the opening of a shutter” that, when discovered, brought both of us to be very very tight in the morning schedule I do not know whether those events sparked our creativity, or it was just good luck. Who knows – but man, those were epic times, Rob!

Paolo Ferragina

Dear Roberto,

We've watched you dance through **trees** and **strings**,
And build such clever **index** things!
You squeeze in **bits** where none should fit,
Then blaze new trails with endless grit.

From FOCS to SODA, peer review –
The world of **theory** knows what you do.
You set the tone with **Olympiad** flair –
While others blinked, you were just there.

You mapped out **patterns** hard to find,
And surely left no **clique** behind.
And in the land of cycles and paths,
You conquered even tricky **graphs**.

At Pisa's halls you made your stand,
With **succinct** structures close at hand.
Your **code** is clean, your **bounds** are tight,
Your papers? Always a delight!

And though we joke in rhyme today,
We mean each word – **chapeau**, we say!

Irene Finocchi

Hi everyone,

My connections to Italy are very strong. For over 30 years I spend part of every summer in Italy with one or two exceptions. I am actually in Italy right now. I have got to know and to interact with dozens of Italian computer scientists. Giorgio Ausioello sent me Pino Italiano, Alberto Apostolico sent me Raffaele Giancarlo. Pino and Raffaele were fantastic PhD students. Fabrizio Luccio sent me Roberto Grossi over thirty years ago. He was already in the middle of his PhD studies. If I remember correctly he spent a year at Columbia. Everybody liked Roberto. We have stayed in touch ever since and I have followed Roberto. He has had a very impressive career. He has had some beautiful results in stringology. Congratulations Roberto for your 60th birthday.

Zvi Galil

My passion for efficient algorithms has its roots in a beautiful algorithms course taught by Roberto. After the course I decided to ask Roberto to supervise my thesis. What I didn't know at the time was that that professor would later have become a good friend. In recent years, I've taught a few hours of one of Roberto's courses. To all the colleagues who asked me why I enjoyed doing it (at CNR we are not required to do teaching) I always replied that the payoff of that course was the lunch with Roberto after class.

Thank you, Roberto for the thousands of scientific and human things I learned from you. I've learned that I am more likely to prove $P = NP$ (not sure about that) than I ever get to argue with you.

Filippo Geraci

Roberto personifies stringology – in fact, I can think of few others who deserve such a prominent recognition within the community. I am certain that others will speak of his well-deserved scholarly success, so I will talk more about how instrumental he was in my own career path. I remember Roberto fondly in his role as my second advisor. We worked extensively for several years on compressed suffix arrays and related work during my Ph.D. I had the pleasure of learning from his uncanny ability to attack problems in innovative ways until the solution was laid bare. Often, the elegance of the final result led to key insights in related problems. And you can 100% bet that is exactly what we did next.

Roberto also hosted my postdoc shortly after I was married. My wife (as of just a few days prior) and I stayed in Pisa for several months. I clearly recall one morning when we were working out how to represent the information-theoretic minimum space of the BWT on a whiteboard dense with combinatorics. It was electric fun, and there's no other way to describe it. Nevertheless, whenever I remember Roberto, I remember a warm, caring face, and a genuinely gracious host . . . and an Italian that did his best to avoid "Italian food" when visiting the United States. I have now eaten enough proper pasta from the experts to know that he was right all along. Congrats Roberto, on an amazing and awe-inspiring legacy!

Ankur Gupta

With Appreciation. Congratulations, Roberto, on your 60th birthday and such an influential career!

When I spent a year at KU as a visiting scholar with Jeff Vitter (too many years ago for me to say!), I learned so much from your research on compressed suffix arrays and graph algorithms. Your work has been a big influence on and inspiration for my research career.

I wish I could be in Venice in person, but unfortunately have conflicts that make that impossible. I hope my contribution with Jeff on graph edit distance heuristics will serve to memorialize the occasion. I look forward to meeting you sometime in person.

Hongwei Huo

Dear Roberto,

You made truly remarkable contributions to data structures, pattern matching theory and enumeration complexity, among other topics. Although we never collaborated on a common project, I keep a wonderful memory of our numerous meetings and discussions.

With my congratulations for your achievements, I wish you best of luck in all of your future scientific endeavors, and many happy returns with new beautiful discoveries!

Gregory Kucherov

To Roberto, a brilliant colleague and an even better friend – we’ve shared ideas, papers, research projects, and . . .sushi!

Giuseppe F. Italiano

In the (relatively short) time I’ve had the chance to work with Roberto, I discovered we share more than just a name – we’ve also got a common love for science and the sea. But here’s the catch: we approach both with very different levels of bravery. When it comes to the sea, I stick to sunbathing and the occasional cautious swim – and only in summer, of course. Roberto? He has no problem throwing himself into pre-dawn winter dives, clad in nothing but a wetsuit. Just thinking about it makes me shiver. Same story with research. Roberto dives headfirst into algorithms, data structures, and code – no clue if he wears a wetsuit there too, but one thing’s certain: he’s not afraid to go deep. Meanwhile, I sit on the metaphorical shore, waiting for him to come back up with something useful that we poor biologists can use to save our skins. For his 60th birthday, I send him my loudest, most thunderous best wishes – loud enough to reach him all the way down in whatever deepness he’s currently diving in his latest challenge with himself.

Roberto Marangoni



■ **Figure 9** In Pisa, on the terrace of the office of Linda Pagli. At that time the Department of Computer Science of University of Pisa was in Corso Italia. With Fabrizio Luccio, Linda Pagli, Elena Lodi, Roberto, and Geppino Pucci.

It was 2003 where I was in Japan and Veli Mäkinen was emailing me about an idea he had. His enthusiasm was contagious, and I got engaged in his line of thought about a data structure that, by hierarchically partitioning the alphabet, could represent a sequence in succinct space and recover the symbols in logarithmic time. After a few days he sent me a final email like: “Never mind, look at the SODA paper of Grossi et al. this year”. Yes, the wavelet tree was there, buried in a lot of other interesting stuff. Over time, I even managed to understand that paper. I remember when, again with Veli, we were writing in 2006 a survey on compressed full-text indexes, and I wrote the section for their paper. Veli said, impressed, “You actually went through it!”. That 2003 paper was my first “encounter” with Roberto. Over time, I had the pleasure of meeting him in person in many occasions, and we even wrote a paper together. Roberto was always easy to deal with, agreeable, and full of interesting ideas. I’m always eager to see him wherever life puts us together.
Happy Birthday, Roberto!

Gonzalo Navarro

Many wishes Roberto, colleague of many years but above all dear friend!

Linda Pagli

Dear Roberto, the three of us have walked side by side since the very beginning of our respective research journey. Indeed, we are siblings, since we share the same academic father and extended family. Due to this life-long acquaintance, we can authoritatively affirm that you are an outstanding researcher as well as an extraordinary human being, and a great friend. We wish you that the next 60 years of your life will be at least as successful and productive.

With love and affection,

Andrea Pietracaprina and Geppino Pucci

I came to know Roberto when I was a PhD student. This was longer ago than I like to admit... his hairs were longer than what I have now, and mine were all black!

Roberto was then just back in Pisa as an associate professor after having been assistant professor in Florence for a few years. Hence, we were both working in Pisa but - ironically - our collaboration started... in Paris!

I was visiting Marie-France Sagot at the Pasteur Institute for a few months, and he was visiting Maxime Crochemore in Marne-la-Vallée (at a University now named Paris Est). I was a regular visitor at Marne, where I had been master student a couple of years back, and in particular both Marie-France and I used to attend the weekly Tuesday seminars there. One of these Tuesdays Roberto was the speaker. I took the opportunity to introduce him and Marie-France to each other, and we shared with Roberto and Maxime the problem we were investigating. Working with him and Maxime was fun, and we end up with very nice results. That was the first one of many joint papers with many different co-authors, and also the beginning of a friendship. In these years, I have been admiring Roberto's curiosity, passion, and brilliance when it's about doing research, and the way he conveys this to his students for whom he is an excellent mentor. I find it very significant that his former students, whether now in academia or industry, keep on coming to visit him even years after earning their degree.

Last but not least, conversations with him are not just about strings, trees or graphs. Roberto has many hobbies and passions: there is hi-fi sound, bread making, coffee grinding, swimming, green tea tasting... one never gets bored with him.

In Italy we have a saying that well applies to Roberto, I believe: *se non ci fosse bisognerebbe inventarlo!* (translatable into "if he weren't there, then someone should invent him")... Happy Birthday, Roberto!

Nadia Pisanti

Wishing you a very happy 60th, Roberto! You've reached a wonderful milestone with the curiosity, energy, and sense of FUN of someone half your age! Ever since we met at that memorable Dagstuhl seminar on data structures in the now-distant '90s, it's been a pleasure to share ideas, laughs, and inspiring conversations with you. May the next decades be just as rewarding – and just as much FUN!

Guido Proietti

With sincere esteem and affection, and deep gratitude for each opportunity shared to collaborate with fulfillment as educators and researchers.

Romeo Rizzi

La storia siamo noi,
Collaborazioni e
Amicizia anche

Marie France Sagot

My first impression of Roberto was that he was an awesome researcher. The Phi function and wavelet trees were these magical structure. But when I started to interact with him (working on some research and then a joint paper), he came across not only as one of the smartest persons, but also as a kind, wise, humorous and down-to-earth person. I believe he has influenced many and I am one of them. At this milestone, I express my warm wishes to Roberto for best of the health, so that we see many more cool things coming out from his endeavors.

Rahul Shah

I would like to wish Roberto the happiest birthday ever! I have been involved few times in organizing conferences with Roberto and it has always been a great experience! Roberto and I share another passion: high-end music! I wish Roberto many cable building experiences :-)

Fabrizio Silvestri

Dear Roberto,
Congratulations with your 60th birthday. And thanks a lot for what you are to me and lots of other people. It is an enrichment of my life to know people like you. Working with you has always been a pleasure and made me realize how privileged I am working in this field of applied mathematics. It has given me a wonderful. By the joy you radiate I am sure the same feeling holds for you. So you are heading for the last 10 years of your academic life in the Italian system. Enjoy it fully!!!
With friendship and admiration,

Leen Stougie

You have shown me how to make international communication fun, pleasant, and fruitful through high-quality research discussions and exchanges. Thanks to you, our lab has grown, and many of our members have now made good friends overseas and are able to enjoy top-level research. I am truly grateful for this.

Takeaki Uno

Working and interacting with Roberto has always been an inspiring experience: he brings his passion for research and his deep insights to every conversation. On top of that, his great sense of humor makes every collaboration not only productive but genuinely a lot of fun. Wishing you a fantastic birthday, Roberto!

Fabio Vandin

Happy 60th Birthday, **Roberto!**

In Japan, turning 60 is a very special milestone known as Kanreki (還暦). It's a time for celebration, symbolizing a rebirth and a fresh start. As part of the tradition, the person celebrating Kanreki often wears red items, such as a red hat or clothing, to signify this significant occasion and ward off evil.

Wishing you all the best on your Kanreki, **Roberto!**

Kunihiro Wasa

When I joined Dr. Jeff Vitter's group as a postdoc in 2009, compressed data structures for string search was a new and unfamiliar field to me. I began my learning with Roberto's groundbreaking work: his papers on the compressed suffix array (with Jeff Vitter, STOC2000) and the high-order compressed suffix array (with Ankur Gupta and Jeff Vitter, SODA2003). Later, I had the privilege of collaborating with Roberto and Jeff on an experimental study of the wavelet tree, exploring various coding techniques for the bit arrays on the tree nodes.

I was deeply impressed by Roberto's humility and meticulousness. He thoroughly reviewed every data table in the paper, asking insightful questions that often led to improvements or corrections. When a visa issue prevented me from traveling to Italy to present our paper, Roberto's support was unwavering. I vividly recall him taking multiple trains from northern to southern Italy to present the work himself. Roberto, thank you for your selfless support – it meant so much, especially as you had little to gain. My warmest congratulations on your remarkable career and your 60th birthday!

Bojian Xu

Organization of the volume


The papers included in this volume are peer-reviewed scientific contributions dedicated to Roberto, reflecting the diverse areas of his research interests. Of course, even though these papers are related to Roberto's research, they do not include him as an author since this is meant as a surprise for him. The papers fall in two categories: *research* and *education*. The research category includes papers related to the research fields Roberto has contributed to, while the education category includes papers related to Roberto's activities in teaching, training, and educational development.


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From Strings to Graphs, and Back Again: A Festschrift for Roberto Grossi's 60th Birthday.
Editors: Alessio Conte, Andrea Marino, Giovanna Rosone, and Jeffrey Scott Vitter




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