The international FBK summer program for data science and AI-based interdisciplinary research

Edited by
Webvalley Team

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QUADERNO DI SCUOLA

8

PROVINCIA AUTONOMA DI TRENTO

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WebValley
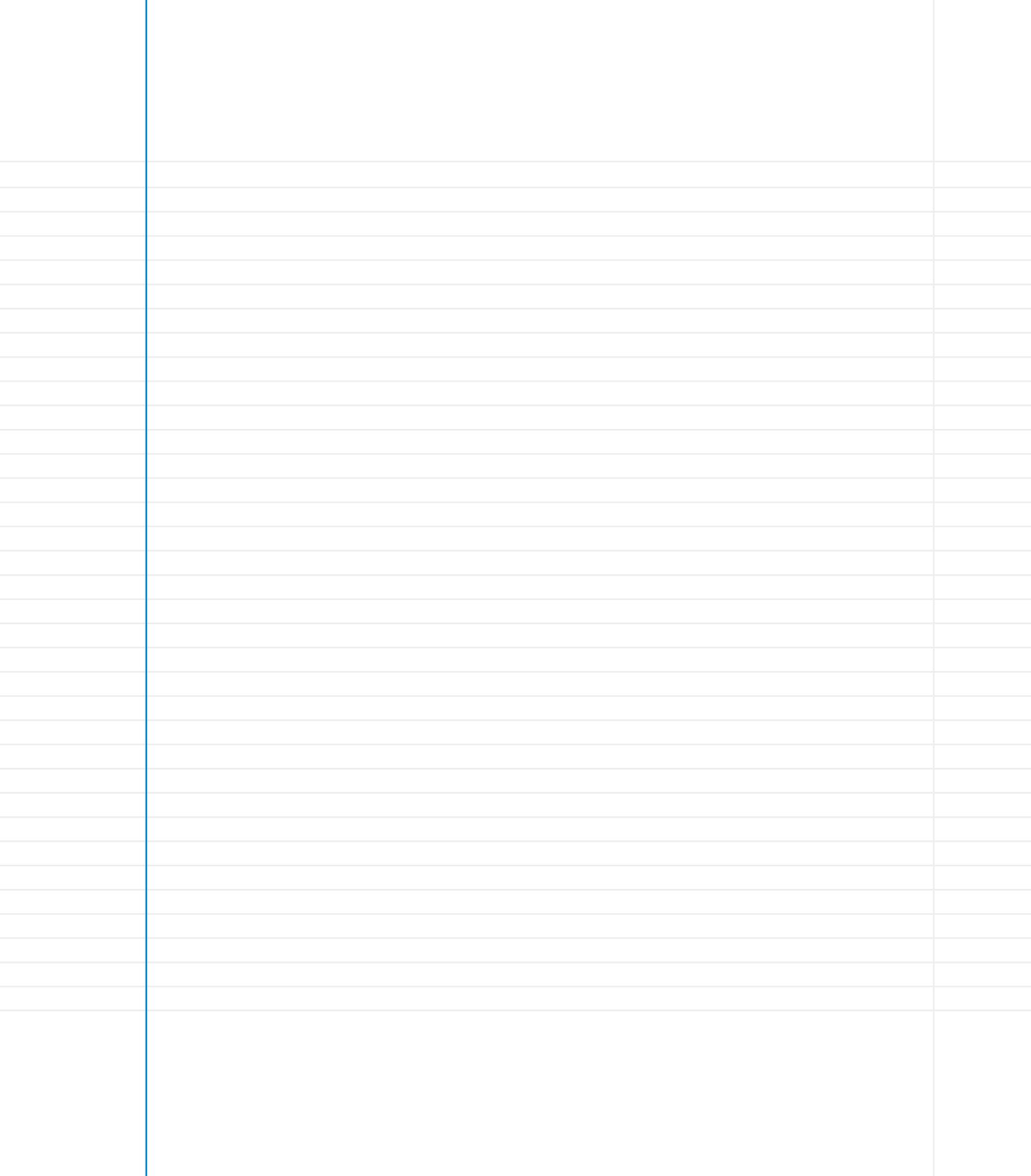
To Rachele

This notebook is a tribute to our friendship and the indelible mark you've left on our hearts.
In loving memory of the beautiful moments we shared.
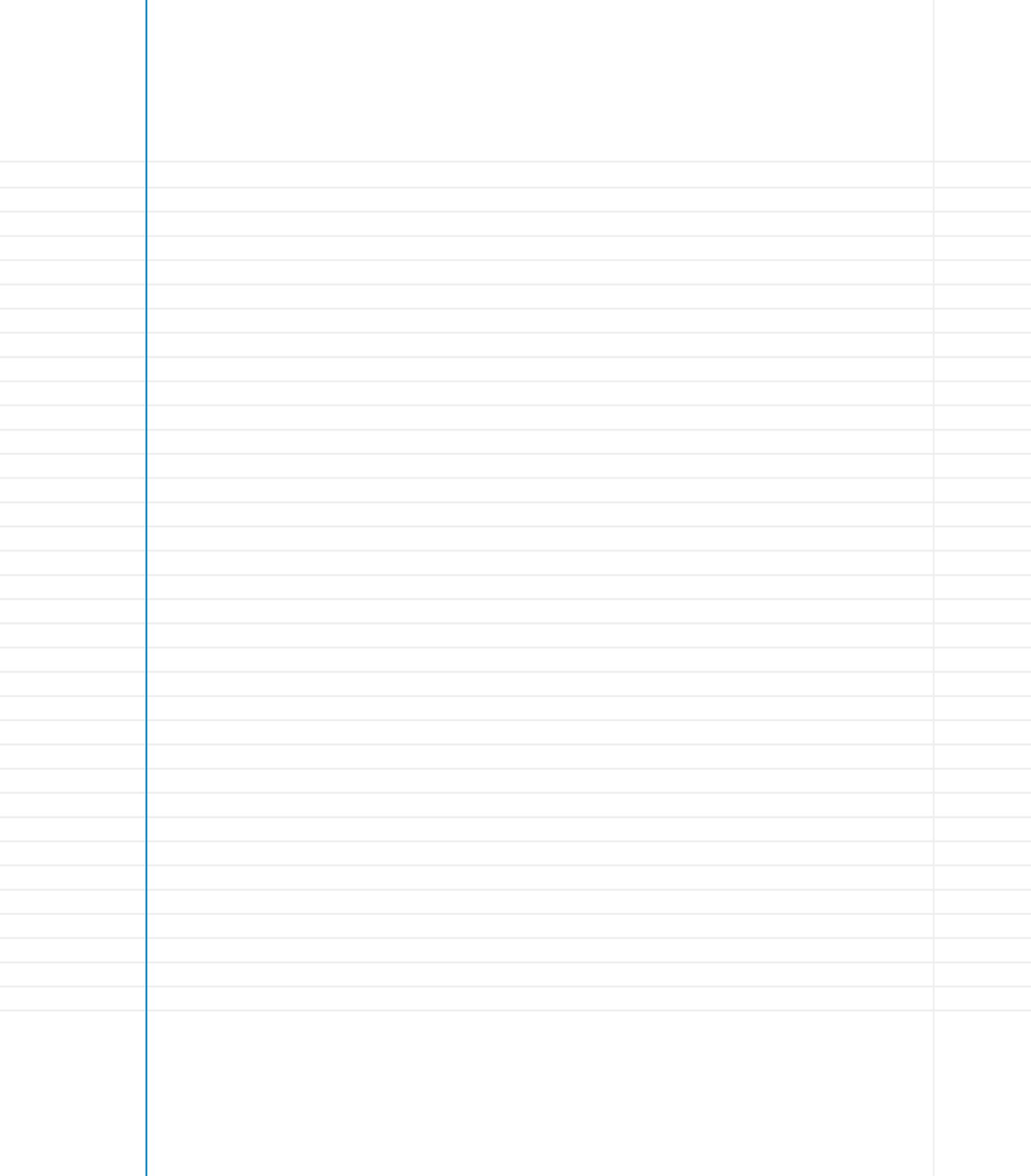
Prologue

The continuing evolution of the professions of the future is strongly marked by an environment in which innovation, practical problem-solving skills, and expertise in one's field are increasingly merging harmoniously together. The boundaries among these areas are blurring, thereby shaping a future in which all professions will be influenced and transformed by technology, and especially by Artificial Intelligence (AI).

It is clear that access to skilled human resources able to handle the rising tide of data with new AI systems is the new frontier for nations and continents, and for major technology players. A global existential question consequently arises: will we be prepared to coexist with AI systems capable of working together with humans on a wide range of data processing and decision-making tasks?

The world as we know it is changing rapidly. The skills required by AI-transformed professions are hard to acquire in terms of both training and work settings. Professional programming and data science have already undergone a revolution in just a few years.

In these pages, through an account of Webvalley's experience, we will explore a possible way to respond to these challenges by examining the implications of AI and emerging technologies in the education system, and how approaching science hands-on through the skilled and inspiring guidance of experts can prepare for the job market and the new mode of being in society as a whole.

We are therefore pleased to present you with this booklet dedicated to the FBK WebValley project, an exciting initiative by the Fondazione Bruno Kessler's driven with passion and expertise by the talented researchers who have been its mentors since its inception in 2001.

For more than two decades, WebValley has been an unprecedented opportunity for talented young people from around the world to immerse themselves in the world of data science and artificial intelligence. With the dedication and expert guidance of the Foundation's research team, participants have the opportunity to develop their skills, collaborate with top experts in the field, and work on cutting-edge projects that address real-world challenges.

Here, we invite you to explore the stories, successes, and challenges faced by participants and the FBK WebValley team, and to understand the profound impact this initiative has had on the lives of those who have taken part.

We hope this booklet will capture the vibrancy and importance of the FBK WebValley project and celebrate the remarkable contributions of its mentors and participants to the advancement of artificial intelligence education and research.

Enjoy your reading!

Ferruccio Resta
President of Bruno Kessler Foundation

'WebValley: training the Artificial Intelligence generation'

The novel jobs of the future will blend innovation, practical problem-solving skills, and domain expertise, with increasingly blurred borders among these aspects. All professions are expected to be impacted and transformed by technology, and especially by Artificial Intelligence (AI). It is clear that access to skilled human resources capable of managing the forthcoming wave of data with the novel AI systems is the new battleground for nations and major technology players.

It is a global existential question whether we will be ready and timely enough to coexist with Artificial General Intelligence (AGI) systems, which will be as capable as humans in a wide range of data processing and decision tasks. The world as we know is changing rapidly. Notably, the skills required by jobs being transformed by AI are hard to anticipate both in terms of education paths and of workplace contexts. Professional programming and data science has already been revolutionized within just a few years.

However, talents will undoubtedly play a crucial role, well beyond the technoscience aspects. Team skills, the capacity to adapt quickly to change, and interdisciplinary knowledge, including ethical aspects, are emerging as core features in the AI-driven economy. Indeed, AI development operates within environments characterized by continual and shared learning, where talents need to be part of teams.

As a visionary initiative for promoting early awareness and responsiveness toward this new scenario, a team of researchers from the Kessler research foundation (FBK) launched the first edition of the WebValley Summer School for high school students in 2001. A scientific computing lab was established in Palù del Fersina (Trentino, Italy), at the end of the Val dei Mocheni, one of the most magical and secluded areas in the Alps.

We were just a bunch of colleagues, eager to share our enthusiasm for technology-rich, data-driven science with young people. More than 400 talented students, 17-18 years old, have experienced working as a team with peers and scientists, learning interdisciplinary applications of Machine Learning.

Little did we know that WebValley would become one of the first structured applied-AI courses worldwide.

The WebValley School is strongly project-based, challenging teams to develop new technology to address research issues ranging from AI models for healthcare (e.g., deep learning for paediatric neuro-oncology, wearables monitoring in autism), to climate change monitoring and digital agriculture. The school's format was initially a three weeks retreat, offering computing resources and high-speed internet connectivity to the cloud from a temporary lab in a remote location of high environmental quality, such as a small Alpine village for the first 19 editions.

The key feature of WebValley is the experience of real research experience as a team, where combining different skills and personal growth contributes to a common goal. Everyone is treated as a colleague, from junior students with experienced researchers and top international scientists. The choice of ethically relevant themes and stakeholders' participation has demonstrated that AI applications can activate the potential of students of all genders and different personal stories, moving beyond a limited "geek-only" perimeter.
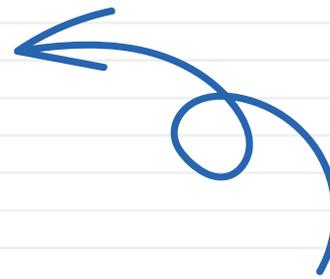
Participants typically include finalists from national STEM Olympiads and international finalists from the US-based ISEF competition.

Retrospectively, the design of the WebValley concept grew with a solid scientific background in education and neurodevelopmental research by Paola Venuti and the ODFLab of the University of Trento. Our students had the privilege of learning from top experts like Roberto Flor, who co-founded WebValley and instilled his enthusiasm, self-teaching, and hacking skills in multiple generations of colleagues. The gentle leadership of Claudia Dolci and Giuseppe Jurman has guided the organization and Scientific curiosity of the School for more than a decade.

Later, a partnership with an innovative high school focused on new teaching concepts and environments (Istituto Artigianelli) enabled expanding WebValley as an open innovation experience in a new coworking space in Trento, reaching a broader educational community of teachers, scientists and experts in teaching strategies and inclusive education.

WebValley has also been the cornerstone of a cohesive team of researchers and technologists, supported by the FBK administrative staff and its top governance.

What then could be now the scope of WebValley? The pervasive injection of AI is becoming the signature of tech giants' and institutions' flagship strategies. Large-scale public and private investments are being channeled to develop AI and related innovations. China was the first country to introduce AI into its educational system. The US, the EU, China, and all industrialized countries and emerging economies are running or planning strategic programs of research and development with budgets on par or exceeding those invested in space exploration. Strengthening the AI education at all levels is now a goal of institutional strategies worldwide. Beyond research and development, this goal widens to promote AI skills horizontally to enable awareness, trust, and adherence to ethical frameworks across society, as underlined by the AI Act and similar directives.

Along with the AI technical skills, there is thus a need to develop soft skills such as openness to change, confidence in one's abilities, quick and easy access to available resources, and an aptitude for teamwork. While specific subdomain expertise is often required (e.g. in large language model processing or deep learning based vision), most of AI researchers and entrepreneurs are generalists.

We envisioned that becoming a talent in the developing AI scenario required a state of the art competence and an attitude to lifelong learning.

They will be tasked to interact with AI systems to design software projects, often deriving a creative combination of existing methods. Furthermore, they will play a crucial role in assessing human safety risks and ensuring that only trustworthy and equitable AI solutions are put into deployment.

Assisting the new generation in acquiring such a varied skill set presents a considerable challenge. One aspect is nurturing scientists who will cooperate with specialized AIs or AGIs to push the boundaries of scientific discovery.

It will be vital to extend similar opportunities to other age groups enabling rapid assimilation of the necessary domain knowledge about AI algorithms to adapt to new roles. A critical challenge for all careers will be the ability to operate at the intersection of technology, practical problem-solving, soft skills, and disciplinary expertise.

In navigating this complex landscape, WebValley is set to play an essential role, equipping the next generation as well as reallocating workers with the necessary skills and mindset to participate in the AI-induced transformation.

Cesare Furlanello
WebValley Founder

# The WebValley International summer program formula

01

The Camp

WebValley is an international program organized by Fondazione Bruno Kessler (FBK), located in the province of Trentino, Italy, and dedicated to spreading knowledge in Data Science and AI-driven interdisciplinary research among teenagers aged 17-19 years of age.

Initiated in 2001, following a brilliant intuition by Cesare Furlanello, Head of the Predictive Models for Biomedicine and the environment Research Unit in FBK, WebValley was started out as an innovative initiative to promote dissemination of the concepts of data science for youngsters, well before data science being a major trend in the scientific community.

Since then, WebValley has consistently provided a unique educational experience, combining the charm and relaxing setting of the Trentino Alps with advanced technological learning.

The WebValley lab is equipped with state-of-the-art computing resources and devices. These tools enable participants to delve into applied Data Science and develop predictive models. The lab's environment fosters a blend of theoretical learning and practical application, making the learning process both engaging and effective.

During the program, the advanced student participants work in a lively and interactive environment together with a group of national and international scientists. Since its inception, almost 450 students in the 17-19 age bracket have participated in WebValley camps. These junior scientists do not just attend, but rather become the central figures in challenging research projects. This hands-on experience is invaluable in fostering a deep understanding of the Science, Teamwork, and Design Thinking, which ensures that human needs are addressed as a cental part of any final solution.

Throughout its several editions, the WebValley program has elaborated and adopted a specific formula to train young data scientists with a project-based approach.

It's an approach that has proven to be both inspirational and effective in nurturing the next generation of data science professionals.

Format

WebValley is typically a three-week program that is now held (since 2020) in a high-tech lab at the Artigianelli high school in the city of Trento. The Lab provides computing resources and devices to test new ways of exploring the principles of applied data science and predictive models.

The participants tackle challenges posed by collaborating scientists whose research impacts our daily lives, the quality of our health, and the well-being of the planet on which we live.

Throughout the camp, they focus on developing innovative web-based prototypes for data analysis and management.

① Specifically, from year to year, we may work on projects within the fields of ecology, environmental science, biology, medicine, astronomy and social sciences. Throughout the program, the participants focus on developing innovative web-based prototypes for data analysis and management. Knowledge in the specific domain of the year's chosen project are provided to the whole team by scientists and practicing experts. Such initial concentration equip the participants with a large spectrum of tools among which they can choose, select, and adapt the most appropriate ones for developing the research project.
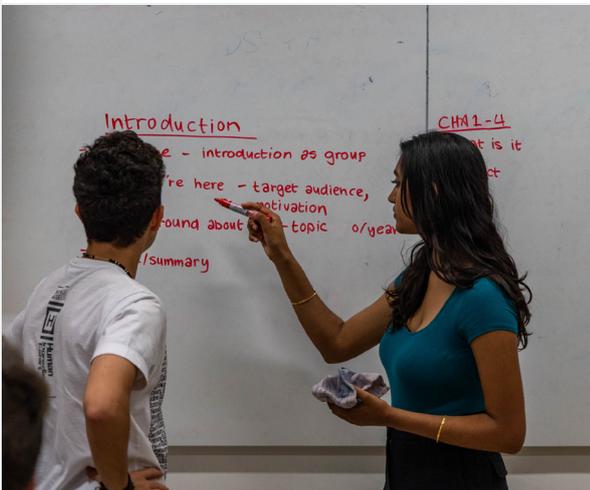
② In the second stage of the experience the learning environment for participants is outlined, which is specifically shaped by the WebValley directors and tutors.

Within this frame, the participants work on the research project, typically divided into smaller groups that are formed on the basis of the students' personal interests and skills as well as on the specific tasks required to tackle the team challenge.

Project Timeline

Webvalley

	Sunday	Monday	Tuesday
WEEK 1 **Lessons**			Lessons Specialis...
	Team presentation	Team Building workshop	
WEEK 2 **Training** **Project**			Group Tr...
		Invited guest Lecture	Brainstormi... Session
	Free time with Webvalley Team		
WEEK 3 **Project**			Team wo...
			Invited g... Lectur...

	Wednesday	Thursday	Friday	Saturday

(Data Science, data visualization, AI software, ...)

...stic talks on the project

Group definition

Invited guest Lecture

Team Building workshop

...raining (Hands-on tutorial) and Team work

...ing

Project Checkpoint

Invited guest Lecture

...ork

Preparing presentation

...uest ...re

Project Freeze

Final presentation

③ The teamwork sessions, which characterize the last two weeks of the program, also include interactive sessions that are designed to develop fundamental problem solving skills. In these sessions, participants learn how to set the goals of the challenge, share ideas or questions, and improve the quality of the cooperation among the break-out groups, or task groups, within the team. In the latest editions of the program, such activities have been increasingly designed according to a specific problem-solving methodology, which is modelled on Design Thinking.

What is particularly challenging for participants in this phase, is to achieve the specific product or output of each task group without neglecting the overall project, requiring coordination and cooperation among them. In fact, the results of the each task group must be assembled by participants so as to achieve a proper and effective, though embryonic, total solution.
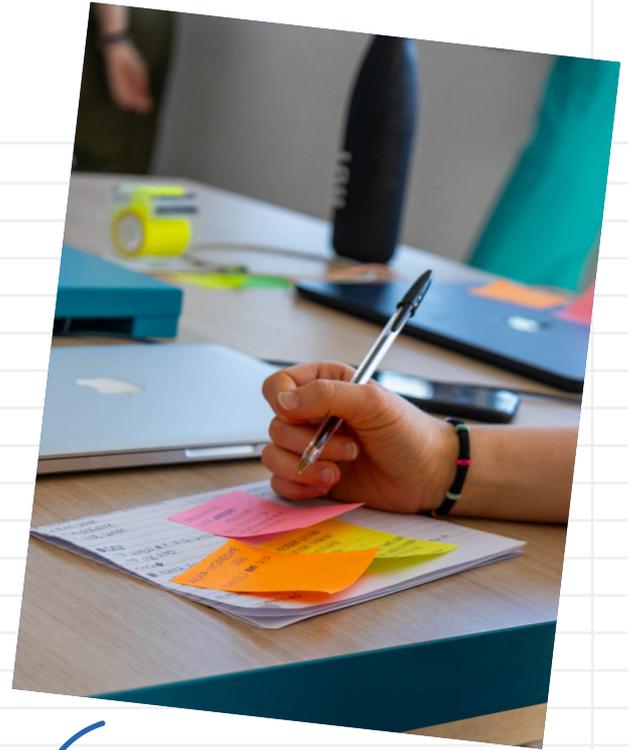
In its early years, WebValley moved from city to city in the Trentiono region. In more recent years, the program has found a permanent home at the Artigianelli High School. The collaboration with the Artigianelli Institute has enriched the WebValley program by the involvement of a diverse team, comprising designers and psychologists.

Their contribution has been pivotal in equipping participants with the tools to build essential soft skills (sometimes called "human skills"). These tools aid in navigating the complexities of teamwork, enhancing communication, and fostering a collaborative spirit, which are integral to the success of the projects undertaken in the WebValley program.
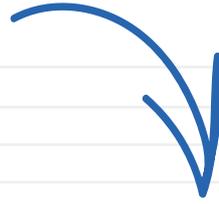
This concluding presentation is attended by field experts, researchers, technologists, and representatives of institutions who participated in the project and/or can be interested in its results as stakeholders, and it includes a Q&A session.

This year will mark the first time that a closing session will be streamed to a group forming at the University of South Florida (USA), in collaboration with FBK and the independent Science And Technology Society based in Sarasota, FL, USA, to study and eventually be the first to emulate our WebValley program in the US.

The lab is open all day and the project activities are developed as in a true research environment, with "organized informality", high quality resources, and featuring intereaction with highly competent individuals. Participants discuss, design and develop their unique approach to the defined problem, all the time interacting with scientists and domain experts. Each member of the team can contribute to the project with ideas, software code or data preparation, design of new web interfaces, and using new project presentation styles or methods. They learn to select tools, organize their own work plan, and respond with a new and ethical solution to a problem.

As far as leisure time and weekends are concerned, the WebValley Formula includes social and sports activities, such as trekking and/or organised trips in the Alpine nature. Last but not least, all informal gatherings among participants, tutors, and guests (e.g. before, during, after the meals, etc.) are of great importance for making the WebValley magic real, since they allow participants to get to know each other, get inspired, and build a real team.
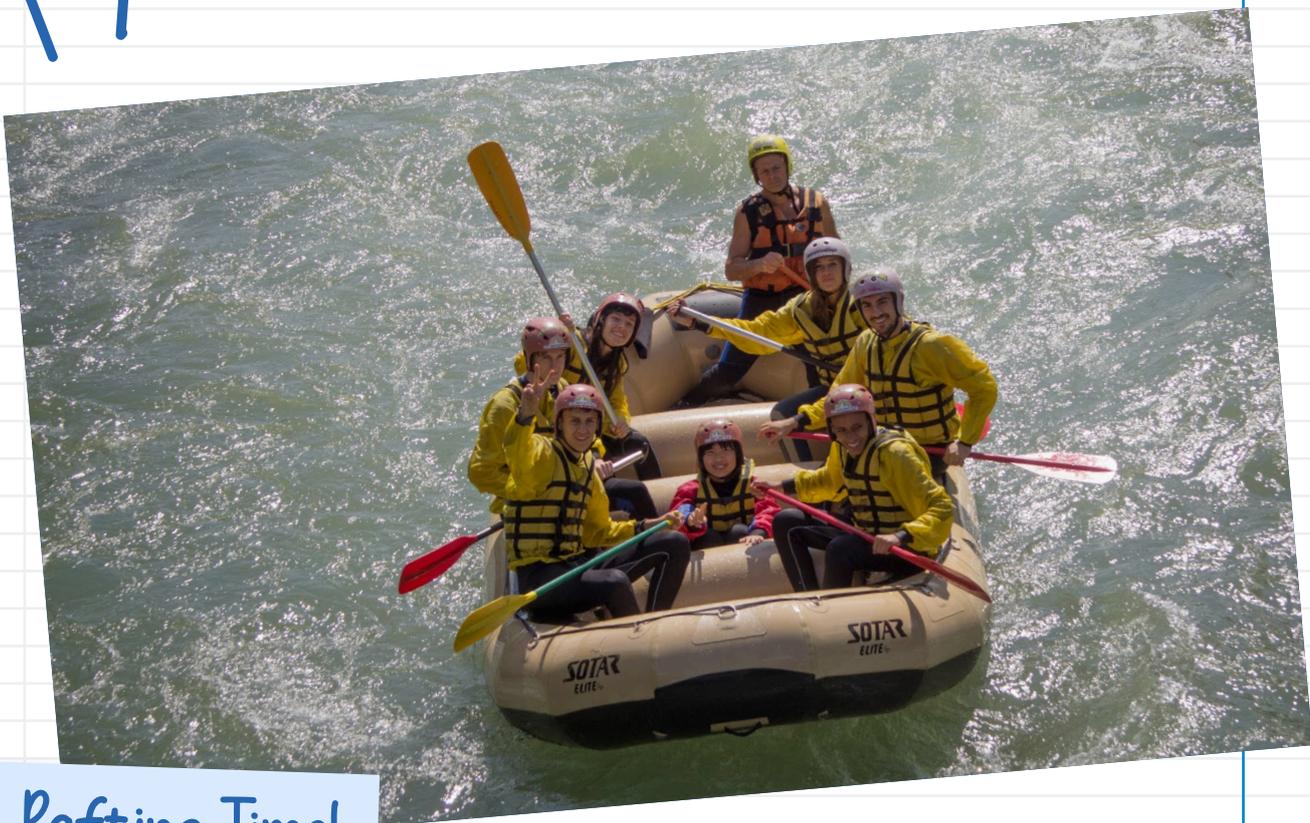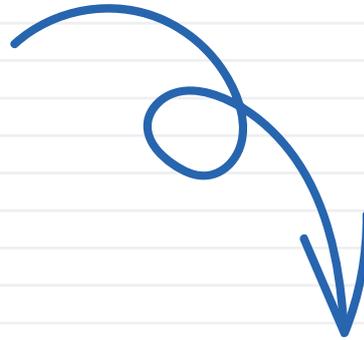
Rafting Time!

Goals

The Kernel: The team is given a challenge, or goal, by a collaborating scientist from the fields of Ecology, Environmental Science, Biology, Astronomy, or Social Sciences and sets out to develop in three weeks a new web-based prototype for data analysis and management.

The challenge emerges from FBK or other researchers who are looking for a technical solution to a real problem. The team is guided by scientists who are experts in the topic and who are personally invested in finding a real solution to aid their research efforts.

WebValley's mission comprises a diverse set of ambitious objectives, including the fostering of or exposure to the following:

⭐ Scientific Entrepreneurship: Motivating bright students and instilling confidence that they can make significant advances in science.

⭐ Interdisciplinary Exploration: Cultivating an environment where various fields intersect to spark innovation.

⭐ Internet for Innovation: Transforming online spaces into hubs for creative development.

⭐ Collaborative Dynamics: Strengthening skills in teamwork, joint problem-solving, and rapid prototyping.

⭐ Open Source scientific content: Employing and leveraging advanced open-source methodologies within a relaxed educational setting.

⭐ Ethical Research: Introducing youths to research topics that are ethically compelling and socially relevant.

⭐ Utilizing High-Caliber Data: Accessing and analyzing top-tier scientific and statistical data.

⭐ Data Standards and Sharing: Advocating for the use of standard data formats and open data policies.

⭐ Innovative Education and Communication: Developing and testing new, effective educational and communication strategies, with the potential to be integrated into world-wide educational frameworks.

This approach positions WebValley as a cradle of future scientific leadership and a model for modern educational practices.

Program

The WebValley program includes introductory & crash courses in several specific domains, aimed at equipping the participants with a large spectrum of tools among which they can select and adapt those most applicable to the assigned research project.
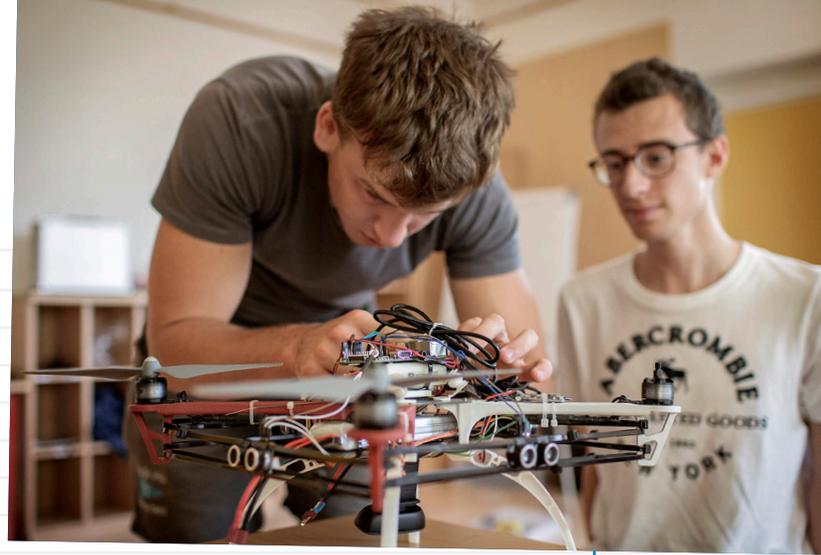
Knowledge and know-how concerning Data Science are provided:

- Data Science & Tools
- Unix + GitHub
- Python intro + clinic
- Numpy & Scipy
- Data Visualization
- Machine learning
- Data science & privacy

- Deep Learning theory, apps & implementations
- PyTorch
- DL implementations and solutions
- Project Data
- A primer on cartography: maps, GIS & databases

On the other hand, also contents and skills concerning the application domain are conveyed, according to the specifc challenge of each edition

Team

The WebValley team stands out for its blend of technical expertise, creative vision, and a deep understanding of the digital landscape, making it a key player in the field of web, digital technology and research. The team includes:

Directors

Claudia Dolci earned her PhD degree at ETH Zurich and began her career in 2009 at the Bruno Kessler Foundation (FBK) in the Predictive Models for Biomedicine and Environment (MPBA) Unit as Project Manager & GeoICT Expert. She began her leadership role in the RIS Unit (Research and Innovation for School) in 2017, which ensures that FBK's commitment to collaborate with institutions operating in this field are continually met. Each year more than 500 students are involved in networking projects between local bodies, including individual traineeships and camp. She promotes DomoSens®, a new model for projects with the schools.

Giuseppe Jurman is Co-Director and Head of the Data Science for Health (DSH, formerly MPBA) Unit at FBK. Contributing to WebValley since 2002, Giuseppe Jurman is a mathematician, with a PhD in Algebra, working at DSH on various aspects of data science, especially for in the field of life science and computational biology. His main research interests are statistical machine learning, mathematical modeling for high-throughput data and network analysis. He is also an expert in Python and other computing languages, and he teaches Data Visualization at the M.Sc. in Data Science at the University of Trento.

Junior Researchers

The junior researchers participating in the WebValley project are high school students from across the globe, united by their passion for mathematics and information technology. Usually, the participants team is composed of members from different students from Trentino, nationals, and internationals.

The school strongly encourages the participation of all genders and various backgrounds. These young, bright minds, deeply enamored with the intricacies of mathematical theories and the evolving world of IT, bring a diverse perspective and a shared enthusiasm for exploring the frontiers of technology and research. Their varied cultural backgrounds and unique approaches to problem-solving enrich the project, fostering a vibrant and globally-aware research environment.

Lab Team: Senior Researchers

At its core, the Tutor team is bolstered by various specialized groups and individuals, each contributing their distinct knowledge and skills from FBK and Artigianelli, an educational institution focused on graphic design and multimedia communication.

⭐ Technical-Scientific (Lab Team)

The presence and support of this team with its diverse expertise is a unique aspect of our program.

The tutors and experts supported the participants in understanding and solving the challenges. This team follows the participants step by step, building their confidence and answering their questions.

Our recent tutors included Gabriele Franch (WebValley Alumni, ed. 2002), Luca Coviello (WebValley Alumni, ed. 2012), Beatrice Dalpedri (PHD student in Computational Biology at the University of Trento - COSBI), Carlotta Cazzoli (student at the University of Trento) and FBK and other istitutions researchers in the scientific area of interest in the current edition (e.g. Andrea Gaiardo, Pietro Tosato, Marco Magoni).
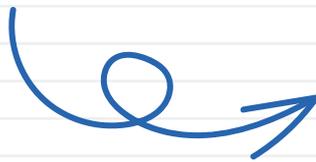
⭐ Scientific Secretary

The Scientific Secretary supports the WebValley Team with logistics and assisting WebValley participants.
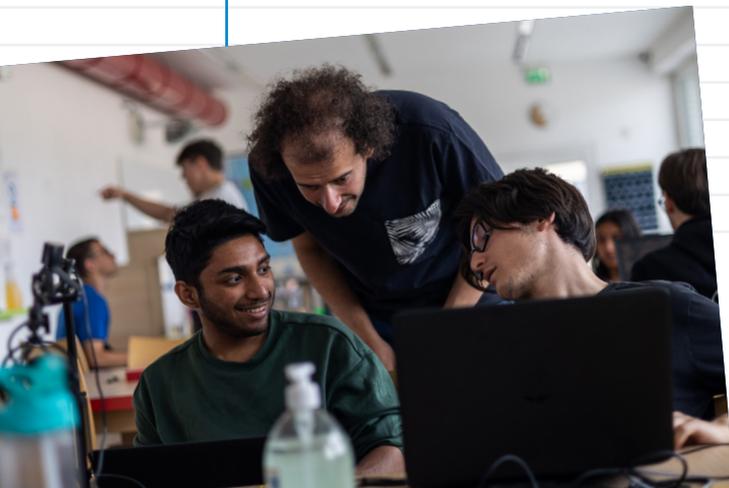
Artigianelli Team
Innovation and communication consultants, Designers and Psychologists

The Artigianelli team for the WebValley program uniquely combines psychologists and designers, offering a rich blend of psychological insight and design expertise.

This diverse team is poised to deliver innovative solutions

where understanding human behavior and user experience is as crucial as aesthetic and functional design, ensuring the program resonates deeply with its audience and stays at the forefront of user-centered innovation.

Partecipants demographics & Alumnus community

02

① Selection process

Since 2001, WebValley has involved a total of 449 students, 325 boys and 124 girls, with 21% international students

Each year, the team of young researchers is carefully selected, conducting a selection process in order to identify emerging young talents to take on the challenge. The selection process aims to find highly motivated students with strong English language skills and an excellent academic record.

Students are generally recommended by their high school science teachers and must submit a comprehensive resume including grades, letters of support, a personal statement of interest, and a virtual video interview to better highlight their profile, which may not always be fully captured in the documentation. Many of the candidates have a keen interest in research and are deeply curious about technology and computer science. These qualities are part of some candidates' formal education, but often they are the result of self-directed learning, which sometimes leads to very high levels of performance.

Participants typically include national finalists of STEM Olympics & international finalists from the Intel ISEF competition.

⚠ Good to exceptional marks, especially in STEM.

⚠ Experience in several scientific projects, with team project experience.

⚠ Participation in STEM competition (Maths/CS Olympics)

⚠ Involvement in different extracurricular activities (reading groups, team sports, music, art, etc.)

⚠ Expertise in self taught topics, especially related to Computer Science, such as programming languages, website development or robotics, and participation in state-of-the-art Community Scientist programs.

⚠ [Italian students] Good to fluent English, w/ periods spent abroad

⚠ Out-of-the-box motivation letter & strong recommendation letter

A team of psychologists from the Artigianelli team, along with directors Claudia Dolci and Giuseppe Jurman, conduct a screening of all the material received by every student using an evaluation grid that makes a ranking of all the profiles.

Each year, a call for participants is issued and about 20 seats are made available. Female participation is encouraged, which has averaged 20% over the first 11 editions, reaching almost 35% from 2011 to 2023.

Requirements:

- ▷ High School student (for Italy: 4th year completed), 17-18-year-old (i.e. grade 12)

- ▷ Good knowledge of English

- ▷ Enthusiasm in science and new technologies

- ▷ Above-average school records

- ▷ 2 letters: 1 Student Motivation letter and 1 Teacher's Recommendation letter

- ▷ 1 recorded video

Applications are subdivided into different tracks, i.e.:

- ★ General, for all candidates

- ★ Regeneron ISEF, for ISEF* finalists

- ★ International students (no ISEF)

* 1 Regeneron ISEF, or the Regeneron International Science and Engineering Fair, is a prestigious global science competition for high school students. It is often considered one of the most significant science fairs for pre-college students worldwide.

WebValley
Identifying profiles

CRITERIA	CV Evaluation	Recommendation Letter	Motivational Letter		Potential Contribution to the Project	ICT Skills
			Effort	Content		
SCORE	⭐ 0 - 5	⭐ 0 - 5	⭐ 0 - 5	⭐ 0 - 5	⭐ 0 - 3	⭐ 0 - 2
WEIGHT	1	1	1	1	2	2
DOCUMENTS	CV / Documents provided by the candidate	Recommendation letter / *written by a teacher/professor	Motivation letter	Motivation letter	CV / Interview / Recommendation letter / Motivation letter	CV / Interview / Recommendation letter / Motivation letter
NOTES	E.g. certificates of participation to scientific Games and Olympics, ICT certificates, certificates of extra-school activities		Scored according to the effort in writing the motivation to participate	Scored according to the contents presented by the candidate	Scored according to the candidate background as described in the own CV and in the motivation and/or recommendation letter	Scored according to the ICT skills declared by the candidate and the recommending teacher/professor

School results				Interview	WebValley point	English language/ Experience abroad
Average of the ongoing school year	**Average of the past school year**	**Average Maths/ICT of the ongoing school year**	**Average Maths/ICT of the past school year**	**Interview**	**WebValley point**	**English language/ Experience abroad**
⭐ 0 - 10	⭐ 0 - 10	⭐ 0 - 10	⭐ 0 - 10	⭐ 0 - 12	⭐ 0 - 3	⭐ 0 - 3
0.5	0.5	0.5	0.5	2	2	1
Original school report *presented by the candidate	Original school report *presented by the candidate	Original school report *presented by the candidate	Original school report *presented by the candidate		Overview of the provided documents, certificates, letters and video	Motivation letter *in english Interview
cored according o the average of he school marks	Scored according to the average of the school marks	Scored according to the average of the school marks in maths and ICT	Scored according to the average of the school marks in maths and ICT	Scored according to the answers given by the candidate	Scored according to a general evaluation of the candidate and the video presentation	Scored according to the English language proficiency

Admission criteria and selection

There are two main tracks for applicants: a General Track for Italian and international students attending the fourth year of high school (17/18 y.o.), an ISEF Track for International finalists at the International Science and Engineering Fair.
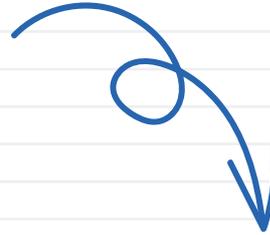
Admission to WebValley is based on a selection process. In order to make this opportunity accessible to all students, regardless of their economic status, FBK funds up to 20 scholarships to participate, covering all costs (lab, tutoring, accommodation, travel, meals).

Participant Demographics

Over the years, there has been a varying number of participants from Italian and International backgrounds. In 2023, the program included 13 Italian participants, and 5 International participants; the total number of International participants from 2001 to 2023 is 80, while the total number of Italian participants is 369.

The gender distribution also shows variation over the years, with male participants generally outnumbering female participants.

In 2023, there were 6 female and 12 male participants, confirming a steady female presence compared to past editions. These graphs indicate that WebValley has experienced diverse participation over the years, with both genders and a mix of Italian and International attendees.

WebValley Students

From all over around the world

USA(56)

MEXICO(1)
PUERTO RICO(1)

BRASIL(3)

ITALY(367)

WeBVaLLey

CZECH REP.(1)

SERBIA(1)   UKRAINE(1)

NORWAY(1)   RUSSIA(1)

PORTUGAL(1)   ISRAEL(1)

TUNISIA(1)   IRELAND(1)

GERMANY(2)

JAPAN(1)

INDIA(3)

CHINA(3)

AUSTRALIA(1)

WebValley

Year	Lower	Upper
2001	21	3
2002	19	3
2003	16	4
2004	17	3
2005	19	5
2006	14	8
2007	15	4
2008	11	3
2009	14	2
2010	16	2
2011	1	8
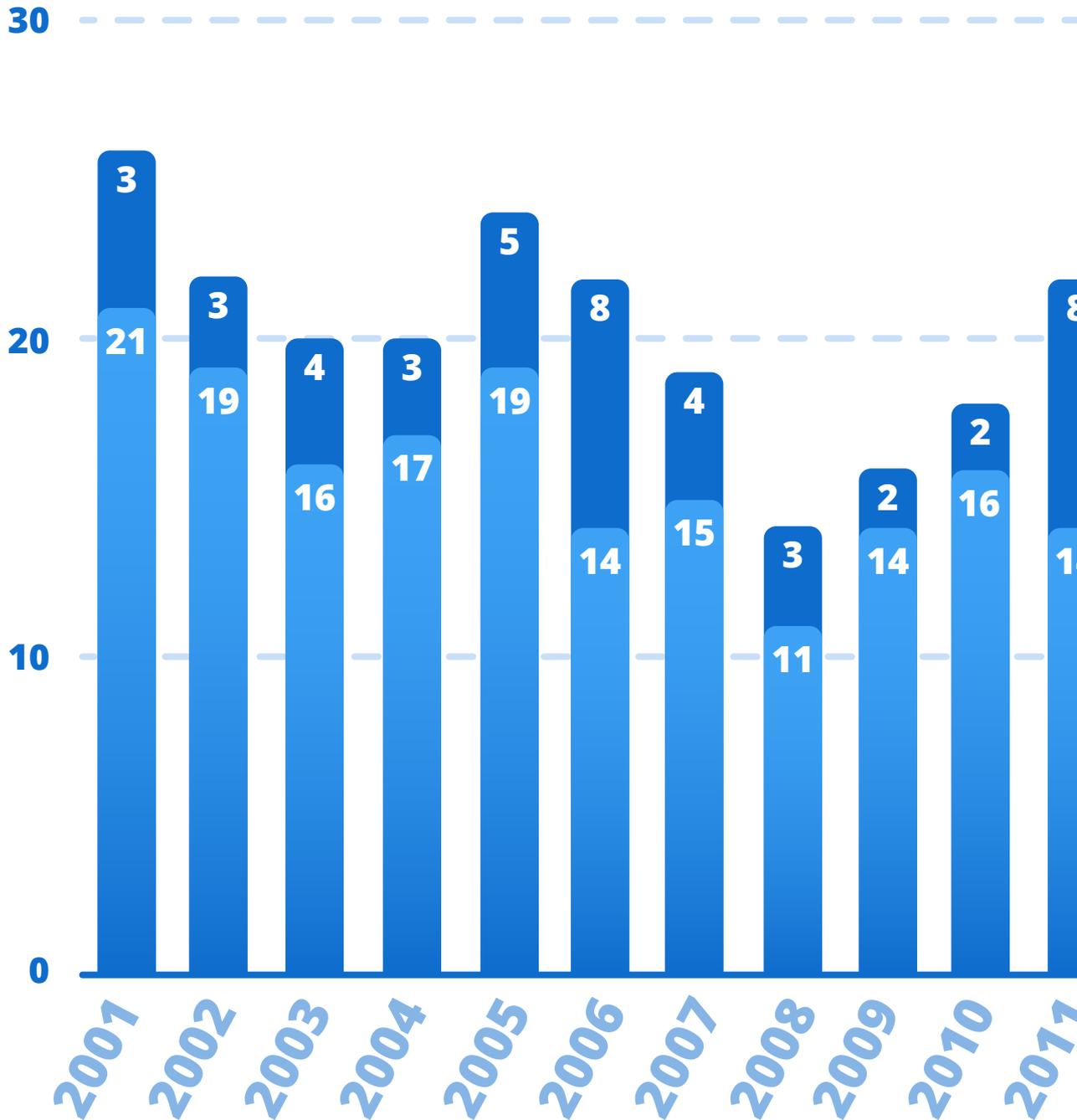
MALE
325
TOT

FEMALE
124
TOT

Year	Female	Male
2012	10	10
2013	15	4
2014	13	6
2015	9	8
2016	8	7
2017	14	4
2018	10	8
2019	15	5
2020	14	7
2021	13	6
2022	14	6
2023	12	6

WebValley

Year	Value
2001	26
2002	22
2003	20
2004	20
2005	24
2006	22
2007	16
2008	14
2009	16
2010	18
2011	

ITALIAN — 369 TOT

INTERNATIONAL — 80 TOT

Year		
2012	8	12
2013	7	12
2014	9	10
2015	7	10
2016	4	11
2017	6	12
2018	4	14
2019	6	14
2020	4	17
2021	7	12
2022	6	14
2023	5	13

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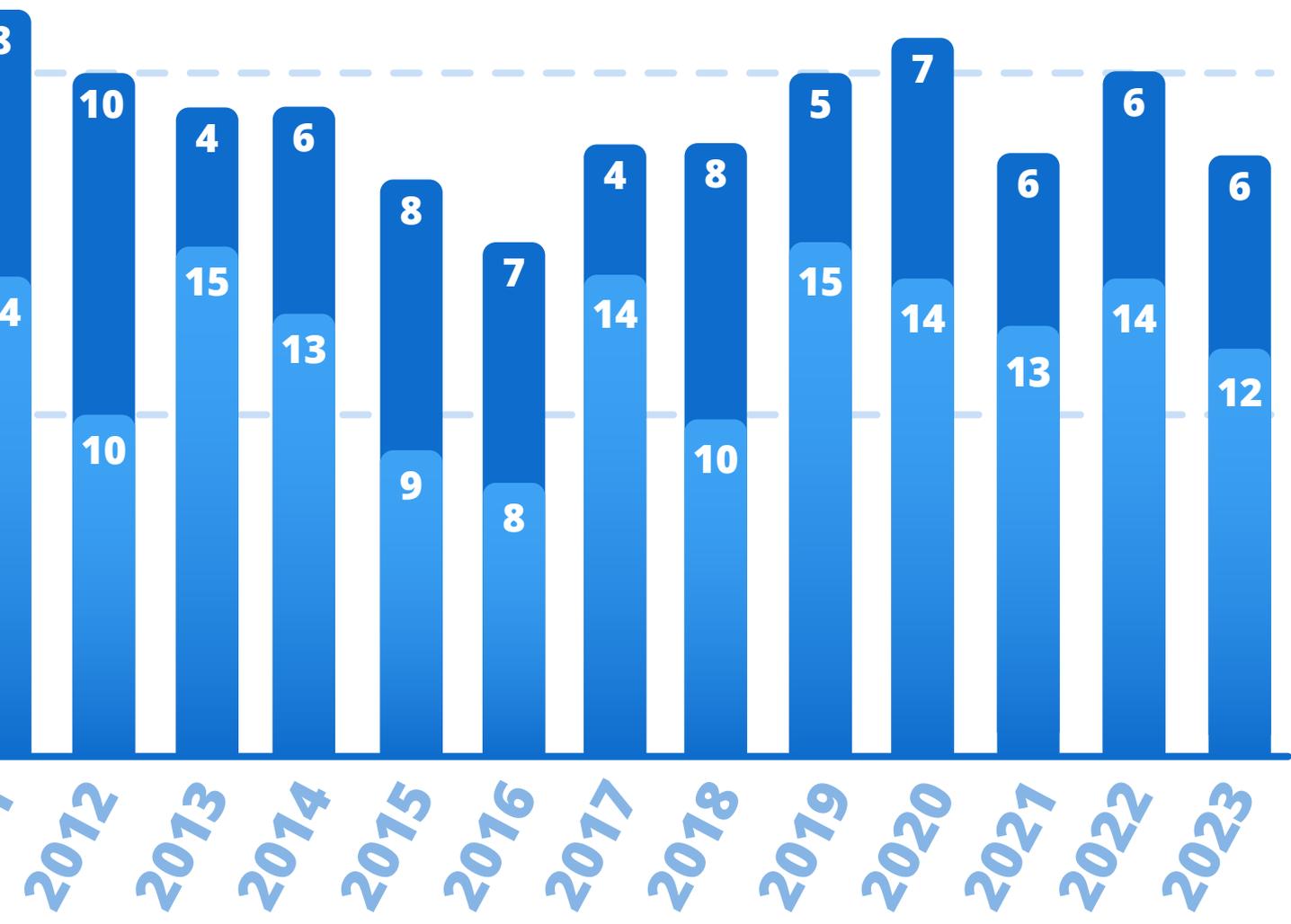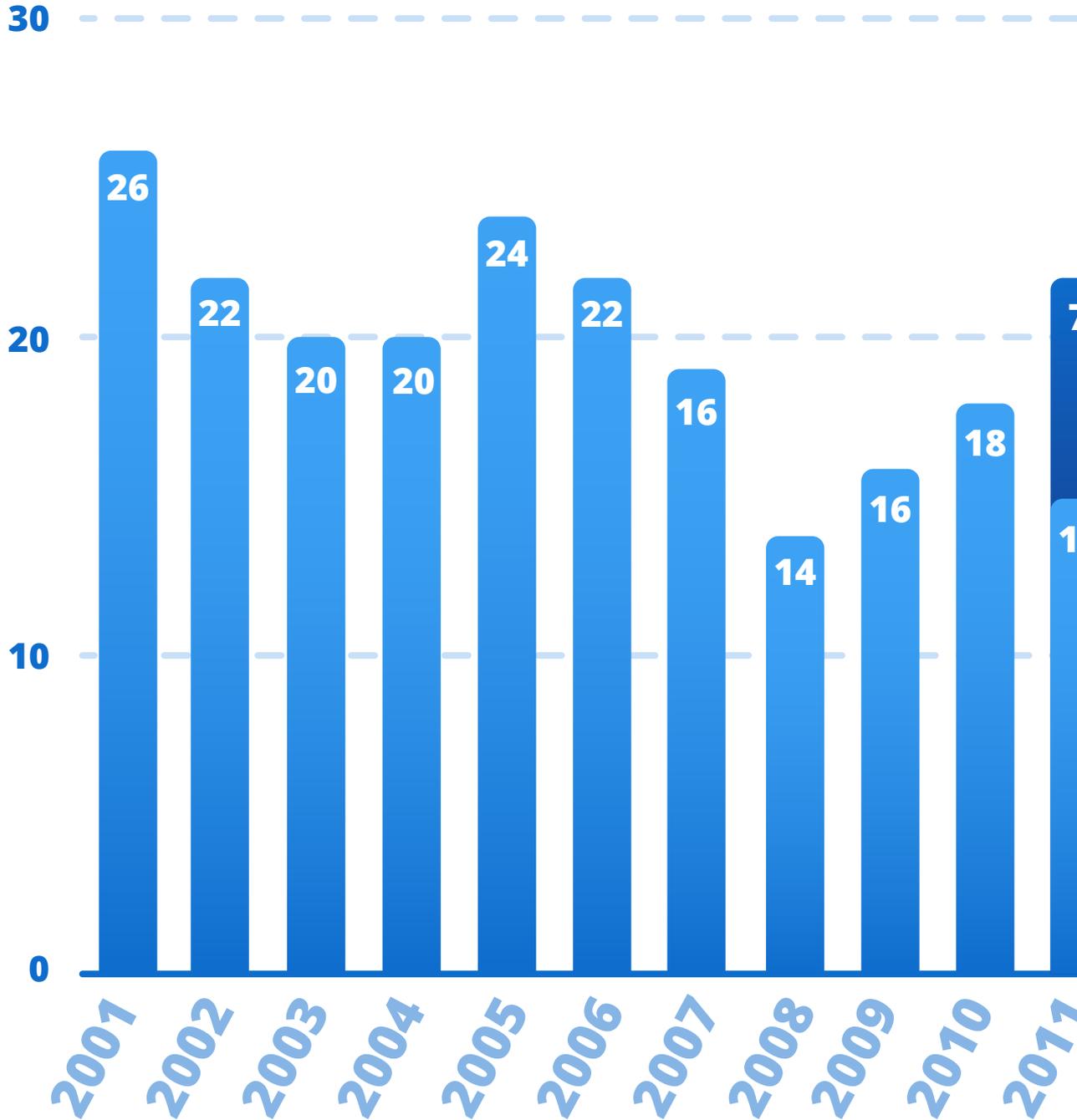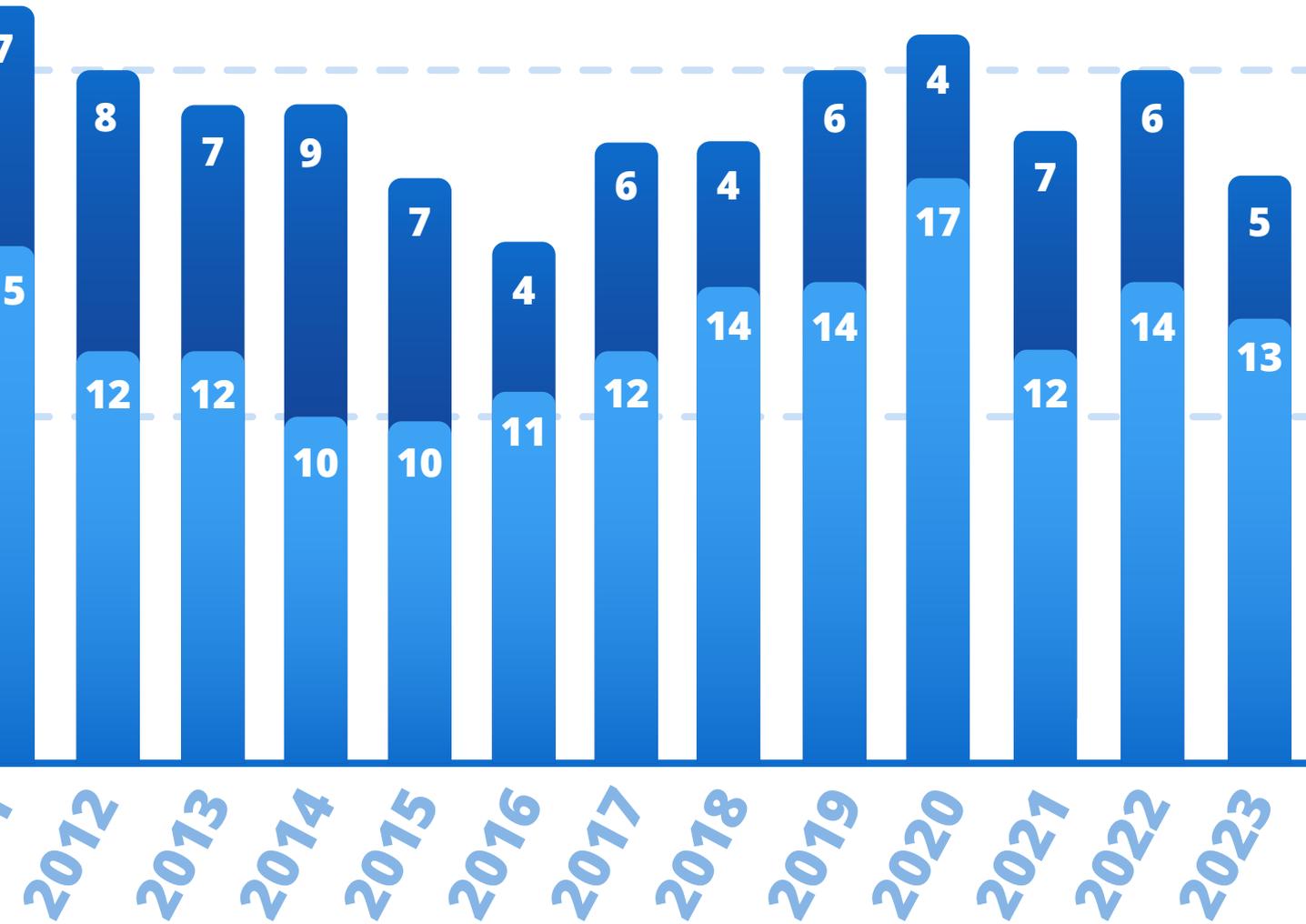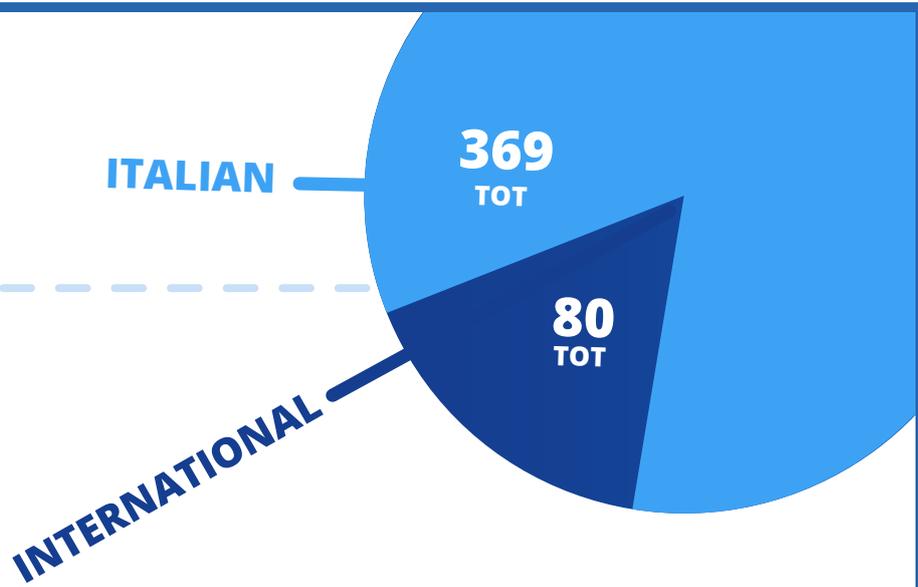
③ Alumni Community

Many WebValley alumni pursued careers in Science or within the science and technology domain. Generally they have kept in touch with each other and with their tutors, forming today a great WebValley community. In some cases, participants themselves have become tutors at later WebValley editions. Many have earned international MScs and/or PhDs in scientific fields.

In the professional domain, WebValley alumni have an impressive track record, with many securing positions at leading companies within the Science and Technology sector.. Household names like Google and Spotify are among the top-tier organizations that recognize the caliber of WebValley alumni, underscoring the program's role as a launchpad to influential careers.

65% of WebValley alumni have carved out future trajectories that are shaping the landscape of science and technology. Whether in academia, industry, or research, the footprints of WebValley alumni are unmistakable and far-reaching.

Further embedding its impact, about 10% of participants have engaged in research collaborations with the Fondazione Bruno Kessler (FBK), contributing to groundbreaking projects and advancing the frontiers of technology and science.

WebValley

Alumni

Keeping in touch with other WebValley participants and with their tutors

Some participants have then **become tutors at WebValley**

International masters MScs and/or PhDs

Hired by leading companies in the sector (Google, Spotify, ...)

Career within the science and/or technology domain

FUTURE TRAJECTORIES

65%

10%

@FBK AND RESEARCH COLLABORATION
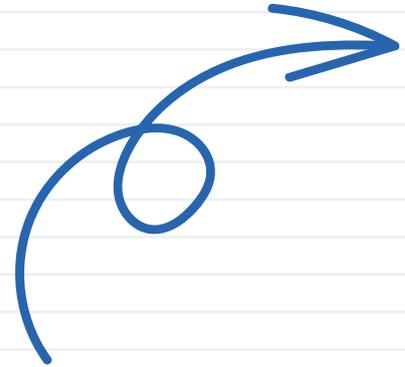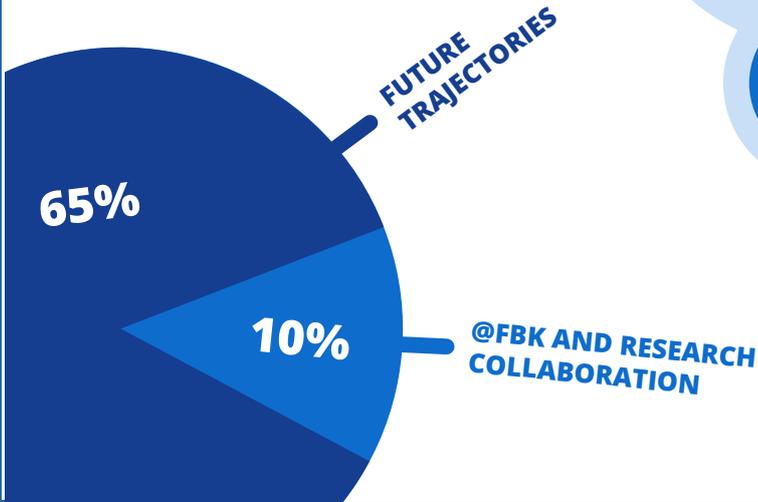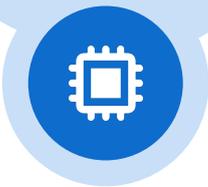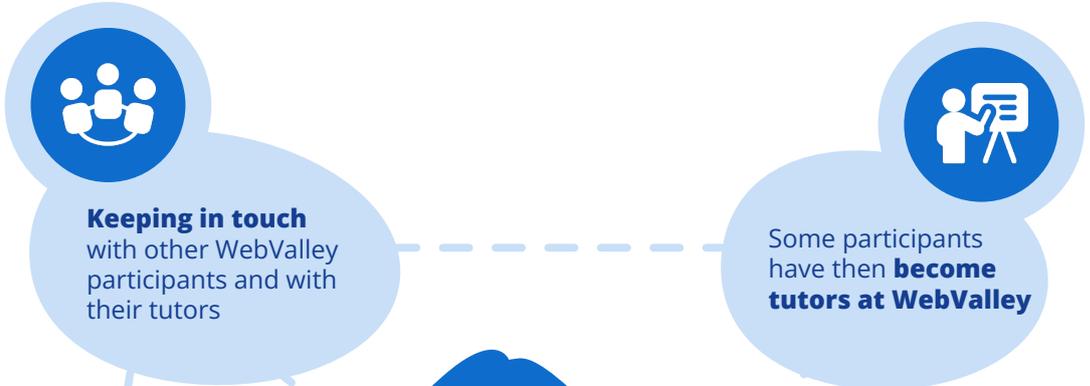
Nicola Mosca

I'm an enterpreuner in the IT field, in the last 20 years i've co-founded and managed companies focused on full stack web technologies, IOT, web applications, NLP and machine learning self-service services. Recently i'm focused on management and consultancy about intangible assets managent and sustainable energy production/consumption.

① **Has WV contributed to your path?**

Definitely:yes, thanks to WebValley i've decided to change my path and follow my interest in the IT & tech field

② **Would you recommend it? And why?**

Sure, i recommend it, it is a challenging experience with opportunities to work on team and access to deep knowledge, resources and know how.

Marco Moschin

I am a physician at San Raffaele Hospital in Milan and I became the coordinator of an important prostate cancer study that was presented at the European Urology Conference.

Gabriele Franch

My name is Gabriele Franch and I was born and live in Trentino, Italy. I took part to the second edition of webvalley in 2001 that was held in the beautiful village of Luserna in an area of Trentino that is part of the Magnificent Community of the Cimbrian Highlands.
I am a full time researcher at FBK in Trento, where I research Artificial Intelligence methods for weather and climate

① Has WV contributed to your path?

What can I say... Webvalley kickstarted and shaped my path in the research community and showed me what research means.

② Would you recommend it? And why?

I recommend webvalley wholeheartedly to ANYONE, not only to the students. It gives something new to everyone because it is a place of encounter between different realities and different people that take 3 weeks of their time to work on a common scientific challenge: students, teachers, people from industries, public servants.

Verena Passerini

I work in the field of Bioinformatics and after spending 10 years abroad I am back to Italy, to Trento.

① Has WV contributed to your path?

Yes, definitely! WV was the first opportunity I had to really experience hands-on scientific exploration alongside "real" researchers from different fields. Before taking part in WV I had no clue what "scientific research" could look like in practice, in everyday's life. It was during VW that I started to consider taking a scientific/research-oriented university path.

② Would you recommend it? And why?

Yes, I would recommend it because I think it's an unique chance for high-school students to foster to only skill development, but also (and most importantly) personal growth in an highly dynamic and international environment.

Mauro Fontanari

WebValley was such an amazing experience. It was the catalyst for the person I am today. It inspired me to dive deep into the tech environment. A few years later, it led me to found a startup in TechHealth. It fuelled my adventures living in Venice, Florence, and now in Amsterdam. Today, I am the founder of a consultancy dedicated to empowering organisations in cultivating startup ecosystems.

① Has WV contributed to your path?

In high school, I wasn't exactly a model student. WebValley offered me the opportunity to discover my strengths and passions, and to learn how technology can enhance everyone's life. It ignited a passion for innovation and laid the foundation for my entrepreneurial journey.

② Would you recommend it? And why?

I would definitely recommend WebValley! It offers a unique opportunity to discover your personal strengths and passions, especially in the realm of technology. The program provides a hands-on learning experience where you can "handle" real technology applications. WebValley's collaborative environment encourages the formation of new friendships, and for those uncertain about pursuing a career in tech, it's an ideal place to gain clarity.

Shamar Droghetti

I'm Shamar Droghetti from Merano. I took part in WebValley in 2007 @ Castello Tseine (TN). In this edition we worked to build WebGIS Tools for Humanitarian Response (InterSOS data and partnership)

① What are you doing now and where?

In recent years I have been on the Board of Directors of Motorialab where I took care of the financial plan and the development of the technological infrastructure. Motorialab was born in FBK and I am the co-founder and CEO from the beginning. Our first product launched on the market is SAFE, an integrated risk management system for ski area managers..

② Has WV contributed to your path?

Participating in WebValley was certainly a fundamental stage in my journey. A moment that left me with the awareness that IT could become the starting point for my career. Participating in WebValley was certainly a fundamental stage in my journey. Working closely with so many researchers that gave me the chance to grow and see that a passion could become something more... a job first, a start-up later :)

③ Would you recommend it? And why?

All people should be able to have an opportunity like WebValley. Three weeks away from home working closely with highly competent people and researchers allows you to open your mind. They make you challenge yourself and go out of your comfort zones.

Andrea Nardelli

WebValley 2013

I have a degree in Computer Science from the University of Trento, and a joint Master's Degree in Data Science with a focus on Big Data from the Royal Institute of Technology Stockholm (KTH) and Eindhoven University of Technology. Currently I work as a Data Engineer for Spotify, where I started working right after my studies.

1 Has WV contributed to your path?

Yes! I always knew I wanted to pursue Computer Science in my life but WV definitely made me fall in love with (big) data and the problems that arise in that space.

2 Would you recommend it? And why?

Definitely! Other than being a great opportunity for your technical skills, it's a great chance to meet a lot of like-minded people and make friends that you normally would not get the chance to meet.

3 You became a tutor. How is it to be on the other side?

WebValley was such an amazing experience as a student. It motivated me to give back and try to make it as special for others as it was for me. Being a tutor was definitely a tiring experience but I am happy I was able to contribute to the WebValley magic even if a bit.

Luca Coviello

PhD student in Industrial Innovation at University of Trento - Artificial Intelligence for Sustainable Agriculture

① Has WV contributed to your path?

Yes! It showed me the meaning of collaboration and multidisciplinarity, and instilled in me the passion for research

② Would you recommend it? And why?

Absolutely, it's a great growing opportunity, by meeting with other passionate teenagers from all around the world, coached by great scientists. It definitely teaches you way more than "just" science.

③ You became a tutor. How is it to be on the other side?

It's very interesting for two main reasons: first it gives you the perspective of how much you changed since then, and seconds it reminds you of what it means to be full of energy and passionate about your work

Francesco Ballerin

II just completed a Master's Degree in Mathematical Analysis in Bergen, Norway. Currently in the process of applying for a PhD in Differential Geometry

① Has WV contributed to your path?

Yes. WebValley was a fundamental step in my education, offering a dynamic and international environment where I learned the value of teamwork, time management and research. As of now it still is one of the most valuable experiences I had in this regard.

② Would you recommend it? And why?

Most definitely yes. WebValley is an incredible opportunity to learn and grow among some of the most passionate and talented people that the field can offer. It gives a completely different perspective on research.

③ You became a tutor. How is it to be on the other side?

Being a tutor might be even more fun and entertaining than being a student. It comes of course with many responsibilities, little time to sleep and long duties, but at the same time gives the opportunity to be an amazing mentor and be once again in the middle of an amazing and incredible project.

Chiara Masci

" *I am both studying and working.*
As regards my studies, I am currently studying Biomedical Engineering (master studies). As regards work, I currently manage the business operations of CatchSolve, a startup incubated at the NOI Technology Park in Bolzano. CatchSolve is focused on making software testing accessible for people who do not have a technical background. "

① Has WV contributed to your path?

WV was the spark that has ignited my passion for the technical field. Engineering is a tool to make your ideas become reality

② Would you recommend it? And why?

Absolutely yes! It has been one of the best educational experiences in my entire life!

Anna Piccoli

WebValley 2018

I'm Anna Piccoli, and I come from Italy—specifically, from a small village in Trentino. I participated in WV2018. Currently, I'm pursuing a Master's in Cellular and Molecular Biotechnology at the University of Trento. I've recently completed a semester in Denmark as an exchange student, where I will also undertake my master's thesis project.

① **Has WV contributed to your path?**

WebValley played a crucial role in my journey; the field I've chosen, Cancer Biology, was first introduced to me during this summer school.

② **Would you recommend it? And why?**

WV was one of the best experiences I've ever had. It provided me with insights into research and helped me understand the importance of a strong team. I'm still in contact with many of the friends I made during that time.

Samuele Facenda

WebValley 2022

" *Now I'm attending the first year of computer science at the University of Trento.* "

① Has WV contributed to your path?

↳ Yes, it was an awesome deep dive in the research world that made me consider that path for my future.

② Would you recommend it? And why?

↳ it was a fantastic opportunity to meet other brilliant students with my same passions and also to learn a lot of different skills.

Arianna Prada

At the moment I am studying Medicine at Milano Bicocca University.

① Has WV contributed to your path?

As you can deduce, there is a strong connection between the aim of WV2021 and the topic I am following up right now. Indeed WV gave me a different point of view on many health determinants. Moreover I could understand how Artificial Intelligence plays a fundamental role in health, in terms of prevention, diagnosis and treatment.

② Would you recommend it? And why?

I would definitely recommend this experience, particularly to those people who, like me, come from a total different background. I attended a classical highschool and at the beginning it was really difficult to fit in and keep up with the lessons. At the end, I found a way to contribute to the project using my previous knowledge. In addiction I could widen my horizons and learn more about the technologies that will underpin prevention and diagnosis in the future.

WebValley International and Its Challenges: An Overview

03

President Ferruccio Resta
visiting WebValley 2023

An overview

The core idea of WebValley summer program is to enable participants to experience full immersion in team-based scientific research by completing in three weeks a challenge to develop novel approaches to answer real-world questions using real-world data.

Throughout its 23 editions, the data science projects have explored several fields, ranging from predictive models of risk associated to climate change to AI for healthcare, e.g. deep learning for medical imaging in pediatric neuro-oncology, or analytics of wearable sensors to monitor atypical movements in autism, Digital Agriculture and air monitoring.

WebValley

Simba

2002

A Web platform for mapping & sharing info on accessibility

📍 **Luserna**

SGA

2004

Analysis of gene-environment interactions in roe deer populations

📍 **Pozza di Fassa**

SUN

2006

W
s
a

📍

Super sentieri

2001

Locating images and videos on a WebGIS interface

📍 **Palù del Fersina**

Geopark

2003

Deers roaming monitoring

📍 **San Bernardo di Rabbi**

Lugort

2005

Magnetic field monitoring system

📍 **Pieve di Bono**

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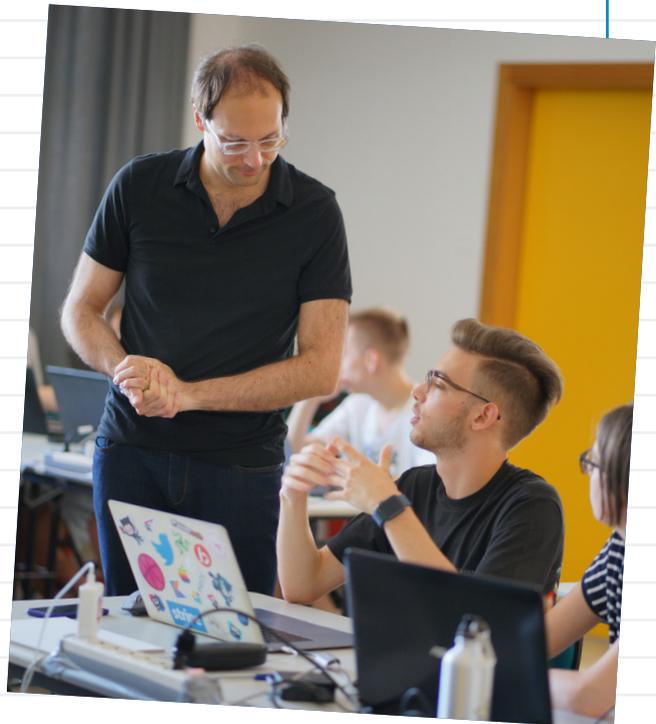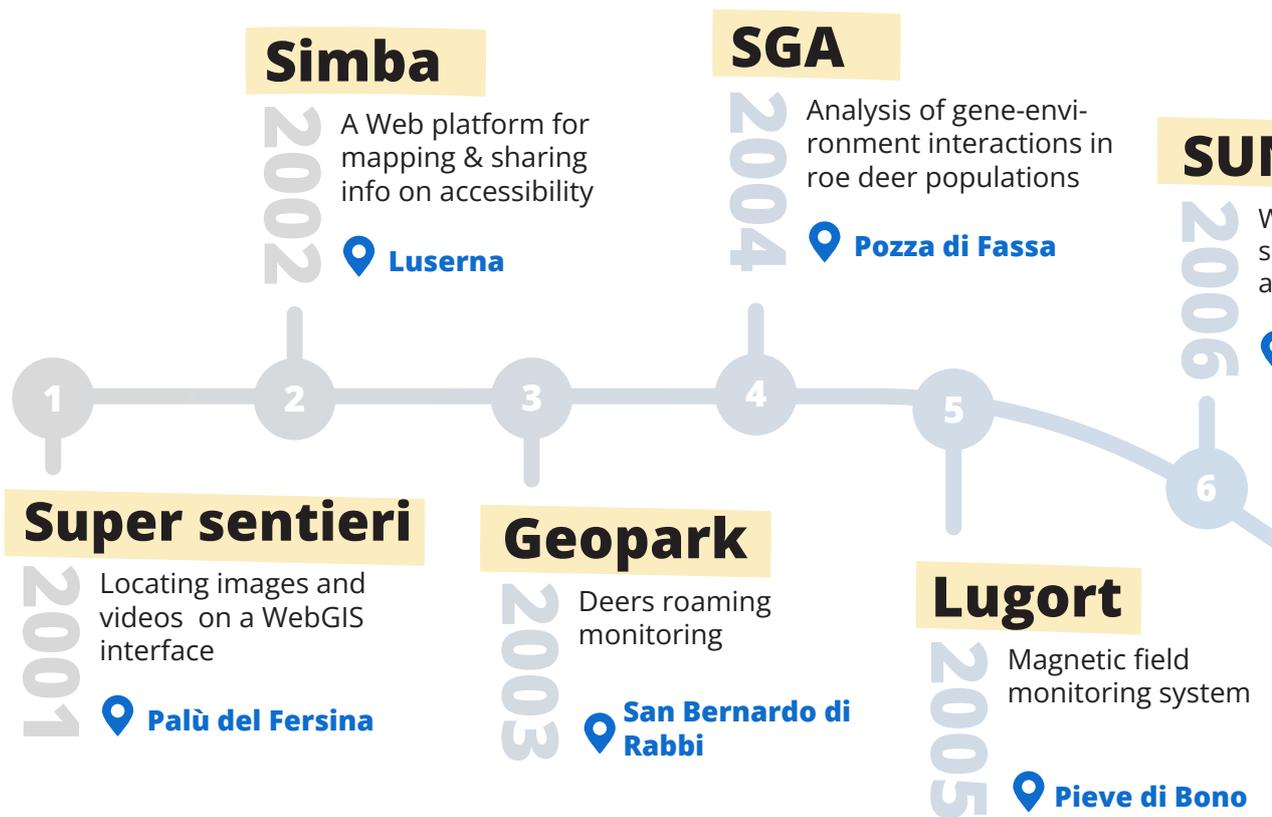
NR

Web services for analysing
solar energy exploitation
t single building level

Riva di Vallarsa

Moograph

2008

Dynamic graphs for scientific and
public awareness of socio-eco-
nomic progress indicators

Pozza di Fassa

Geoscalerhub

2010

WebGIS interface for the
exploration of climate
change phenomena

Transacqua

**Italian
applications**

InterSoS HR

2007

WebGIS for humanitarian
aid monitoring in
Tchad/Darfur

Castel Tesino

Yeps

2009

Software for data
sonification

Luserna

ISEF

Virtual Editions
2020 2021

Pittsburgh
Pennsylvania
2012 2015 2018

Los Angeles
California
2011 2014 2017

Atlanta
Georgia
2022

Dallas
Texas
2023

Phoenix
Arizona
2013 2016 2019

19
17 18
14
15 16 22

NanoWebGIS

2012

Multi-scale science: the NanoWebGis interface for molecular medicine data

Transacqua

DysbioTrack

2014

An interactive platform for the monitoring of paediatric dysbiosis

San Lorenzo in Banale

Fruitipy

2016

Machine learning solutions for port Spectroscopy

San Lorenzo Dorsino

11 12 13 14 15 16 17

MUSE Exhibit

2011

Adapting to the future: a Web-Kinect-GIS interface for the analysis of climate change scenarios and complex environmental data

Transacqua

Omero

2013

3D NanoWebGS designing a novel web tool for studying change in cells

Molina di Fiemme

PhysioWAT

2015

A web-based platform for predictive analysis of data collected through physiological wearable sensors

San Lorenzo Dorsino

Fr

201

WebValley

11

13

12

Airwatching

2022

Data Science and AI tools for Air Quality Monitoring

📍 **Artigianelli Trento**

Shift

2020

Online training the AI generation in computational biology

🌐 **Online**

Melba

2018

Predictive models and privacy-by-design in Healthcare

📍 **Casez di Sanzeno**

table

23

22

20

21

19

18

Airwatching 2

2023

Quality Monitoring: Sensor Network & Data Science

📍 **Artigianelli Trento**

Hocus

2019

High-throughput Omics Combined with Ultra-Sound (A.I. for Health)

📍 **Casez di Sanzeno**

T2D

2021

AI model to predict diabetes comorbidities

🌐 **Online**

ruit.AI

Smart digital Agricolture

📍 **Casez di Sanzeno**

The challenges

Each year, a unique theme captures the imagination and ingenuity of participants, who collaboratively develop prototypes that address pressing global challenges. Here's a glimpse into some remarkable editions:

WebValley 2001 - "SUPER SENTIERI":

Set in Palù del Fersina, the inaugural year embarked on creating an innovative internet service that fostered a virtual community of developers and users. They developed a WebGIS interface for managing and sharing videos and photos linked to mountain trails, enhancing the outdoor experience through collaborative digital mapping.

WebValley 2010 - "GEOSCALERHUB":

In the picturesque town of Transacqua, participants integrated the novel Kinect controller with GeoScaler Hub, an Open Source WebGIS for climate change indicators. The project delved into interactive geospatial patterns, scaling global indicators to local needs, and conceptualizing an exhibit display for the Trento Science Museum designed by the renowned Renzo Piano.
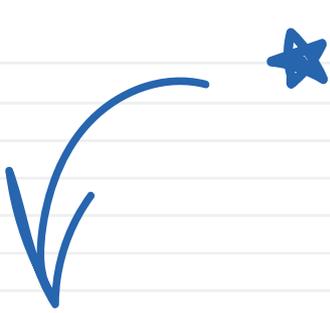
WebValley 2011 - Internationalization and "MUSE EXHIBIT":

Marking its debut as an international program, the 2011 edition continued in Transacqua, evolving the previous year's project into a Web-Kinect-GIS interface.
This interface was geared towards analyzing climate change scenarios and complex environmental data, reinforcing the program's global relevance.
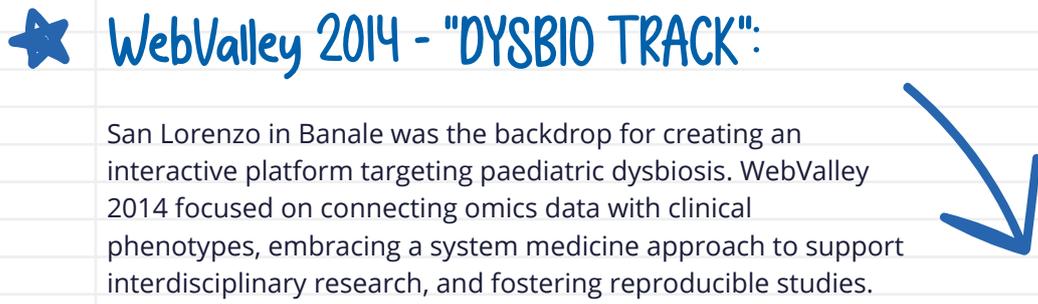
WebValley 2014 - "DYSBIO TRACK":

San Lorenzo in Banale was the backdrop for creating an interactive platform targeting paediatric dysbiosis. WebValley 2014 focused on connecting omics data with clinical phenotypes, embracing a system medicine approach to support interdisciplinary research, and fostering reproducible studies.

WebValley 2016 - "Fruitipy":

The project explored Machine Learning solutions for Portable Spectroscopy, demonstrating the program's commitment to leveraging technology for practical and accessible scientific applications.

## WebValley 2017 - "Fruit.AI":

In Casez di Sanzeno, the spotlight was on Smart Digital Agriculture.
This edition combined smart technologies and biological research, using drones for innovative applications in agriculture, underscoring the program's dynamic and adaptive nature.

Melba Project

WebValley 2018

The 2018 Team developed, together with clinical experts from the Bambino Gesù Hospital, a privacy-by-design platform combining blockchain technologies and Artificial Intelligence methods for pediatric oncology.

The 2018 team working on their project!
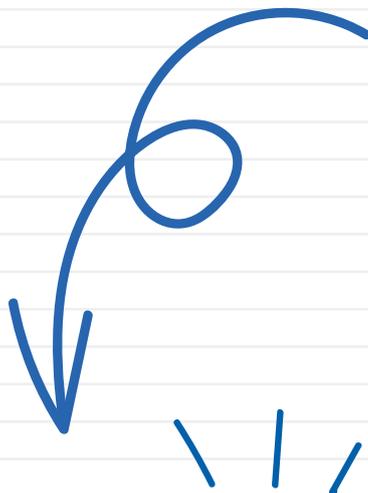
HOCUS
Project
WebValley 2019

The 2019 challenge consisted in the development of a learning model for the prediction of health trajectories for cardiac events starting from longitudinal clinical data.

Reimagined: Training the AI future generation

WebValley 2020

Adapting to the pandemic, WebValley operated a 'Scattered Lab' across Trento, Italy, and the USA. This year's focus was on single-cell sequencing (SCS), an advanced omics technology. Participants utilized unsupervised learning models and

dimensionality reduction algorithms to uncover new cellular patterns, driving forward the field of computational biology.

From its humble beginnings to becoming a global forum, WebValley has continuously evolved, creating a legacy of innovation and a network of alumni that carry its vision forward. Each project reflects a snapshot of technological advancement, with participants at the forefront of pioneering solutions for a better world

T2D

WebValley 2021

The purpose was analyzing complex health datasets for enhancing the research in these kind of chronic ilnesses.

The second online edition focusing on AI models to predict diabetes comorbidities.

In Person again at Artigianelli

WebValley 2022

After the COVID experience, WebValley has set a Data Science and AI tools for Air Quality Monitoring. In 2022, an innovative Data Science project was undertaken for air quality monitoring, marking a significant step forward in the field. This project, held at the Artigianelli Institute, Piazza Fiera in Trento, gathered students from around the globe for an intensive two-week course. It was a momentous occasion, as it signified a return to in-person collaboration after the challenges posed by the pandemic. Participants engaged in cutting-edge research, analyzing data from air quality monitoring.

Notably, the project featured real-time air quality monitoring within the classroom itself, using advanced air quality detectors. This initiative not only fostered a hands-on learning environment but also underscored the practical applications of Data Science in addressing environmental concerns.

Data Science and AI tools for Air Quality Monitoring

WebValley 2023

2023 has been the year of the Airwatching2 challenge:
Air Quality Monitoring: Sensor Network & Data Science.

WebValley students working on the project

Break time!

WebValley today

04

① WebValley today

In recent years, we have introduced innovations within the team, the methodology, and the physical spaces where students can work during the summer program.

Designers within the team contribute by enhancing the visual communication skills of the participants, aiding them in creating impactful and effective presentations.
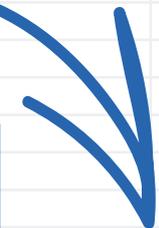
Soft Skills Team

Designers and Psychologists

This aspect of training ensures that the technical content is not just accurate but is also aesthetically appealing and better understood by various a variety of audiences.

Additionally, psychologists play a crucial role in the development of interpersonal skills, such as public speaking and presentation competencies. They offer guidance on how to convey ideas confidently and clearly in a public setting, which is essential for effectively sharing project outcomes and insights.

Artigianelli's approach is to provide a well-rounded and "contaminated" development program for the Web Valley team, ensuring the students are equipped with the necessary skills to excel both behind the scenes in project development and in the spotlight during presentations and public engagements.

② Methodology

Design Thinking and Project Building

Web Valley uses a special way of thinking called design thinking to solve problems. This approach helps students understand others' feelings, identify problems, evolve solutions, make models, and test their ideas again and again.

They work on real projects that deal with modern issues, using both technology and creativity to come up with new solutions, in effect "humanizing technology". During these projects, students get help and advice from experts and teachers.

This interweaving of theory and real-time practice ensures that our young scientists receive a unique educational experience.

Dedicated Spaces for Students

The Artigianelli Institute provides state-of-the-art classrooms and labs designed specifically for Web Valley. These spaces are equipped with the latest technology, fostering an environment

in which students can engage in hands-on learning and experimentation. The program emphasizes collaborative work, and the institute has designed spaces that encourage teamwork and creative brainstorming.

Activities in the Valleys of Trento: In a beautiful valley, students get to experience exciting recreational activities.
They visit adventure parks where they climb and move through courses high up in the trees. This not only gives them a good workout but also helps them learn to work together and solve problems.

They go rafting on the rivers, which is thrilling and fun. This activity teaches them how to work as a team and understand nature's flow and movement. To balance all this excitement, they also even enjoy peaceful walks in the forests. This is a quiet time for thinking and coming up with new ideas, all while feeling close to nature and its calming presence.

WebValley: As seen from a distance

Recognizing the immense value and potential of such a model, the University of South Florida (USF) and the Science and Technology Society (STS) headed by Nicholas Barbi and Sandra Justice, are now embarking on an ambitious journey to collaborate with the creators of WebValley.

The goal is to emulate the Web Valley success and adapt this exceptional program for a new audience in the United States. In what follows, we detail the WebValley program's achievements, its distinctive approach to STEM education, and our vision for a collaborative venture that seeks to bring this innovative educational model to a broader global stage.

Students work side-by-side with each other under the continual guidance of researchers and educators, to apply Artificial Intelligence algorithms and coding techniques to discover predictive trends in massive data sets. The culmination of the STEM team's discoveries and data analyses are then communicated in a formal presentation of results that can be understood by a wide variety of audiences.

At its core, WebValley is an intense three-week experiential learning deep dive into the world of scientific research.

In short, the "junior scientists" emulate a team of researchers at a renowned research Institute, examining real-world problems, extracting and analyzing information from Big Data sets to contribute to actual on-going research efforts. The learning outcomes for students are realized in advanced understanding of STEM and data analytics, and the human skills critical to collaborative teams and the promotion of scientific knowledge to intelligent, non-expert audiences.

Generally, formal public education must accommodate students of all aptitudes, to provide the best education for the greatest number of students. To challenge advanced students, college-level courses may be offered, which, in the United States, are called "Advanced Placement" courses. There are also summer programs and competitions to inspire participating students to continue their pursuit of careers in science.
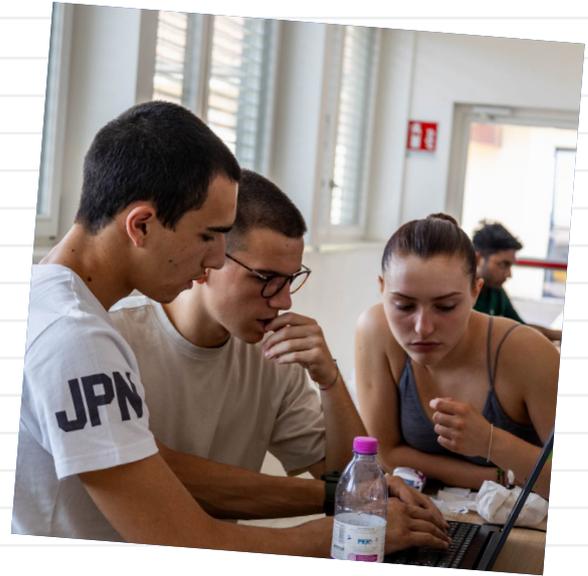
Among all these contributions to the advancement of informal STEM leaning, WebValley is a program of international distinction. FBK and the Artigianelli Institute have elevated STEM education for the best and brightest science students from around the world to a higher level by creating an immersive experience set in a 'think tank' environment, in which students become a real research team.

Over the past year, we have begun to map the pathway to bring a version of this imaginative program to the United States, in which the University of South Florida (USF) and Science and Technology Society (STS) collaborate with WebValley, to allow students and researchers from USF and FBK to interact, asking the big questions and positing diverse ideas on their respective projects and/or approaches.

Key partners descriptions

Nicholas Barbi, PhD, founder of three scientific instrumentation companies, led product development and product marketing teams throughout his career. Some years ago, Nick brought together an international team involving FBK, an organization unknown to him prior to that collaboration, other Italian and German scientists, and a multibillion-dollar Japanese company to bring to fruition a significant sensor development that continues to evolve many commercial and research advances. In 2022, Nick led a grassroots movement in Sarasota, Florida which matured into the Science and Technology Society (STS) a private, non-profit and charitable organization.

Sandra Justice has been engaged in the research enterprise at the University of South Florida (USF) since 1995. Currently serving as the USF Director for Research and Innovation, she works to foster and support the robust research culture and environment, and to inspire talented student researchers to continue their path as meaningful contributors to the knowledge economy as the next generation of innovators and thought leaders. Sandra leads the USF Summer Grant Writing Workshops, an eight-week certificate program for early career grant writers. Sandra is also an active member of the Society for Research Administrators International, National Organization for Research Development Professionals, and the National Council for University Research Administrators.

WebValley 2023!

Road to 2024

TRENTINO

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YouTube WebValley Playlist on FBK channel

Graphic layout by Artigianelli