WebValley 2020
Training the AI Future Generation
August 16 - August 28, 2020
webvalley.fbk.eu
WebValley 2020

WebValley is the international FBK summer school for data science and AI-based interdisciplinary research. This year the school is run on-line, adopting a distance learning approach as experienced during Covid-19 lockdown: participants will attend streaming courses and workshops held by experts and researchers, and they will be provided with multimedia learning material. Meanwhile, a head office will be set up at the Artigianelli high school in downtown Trento, in order to allow the team tutors to manage the scientific and educational activities of the students, who will be guided throughout the experience with effective work methodologies and cooperative tools.

The WebValley Lab provides computing resources to test new ways of exploring the principles of applied data science and predictive models. Students joining the school work in a lively, interactive and, this year, virtual environment together with a group of selected experts, also interacting with other labs.

More than 350 students (17-19y old) have attended the WebValley camps since its first edition in 2001, as true protagonists of a challenging research project. The school is sponsored by FBK, the FBK Trustees Board, and the partner organizations, providing human as well as computing and scientific resources, and venue for the head office. Each year, the team includes students from Trentino, nationals and internationals.

The requirements to participate are:
- High School student (for Italy: 4th year completed)
- Good knowledge of English
- Enthusiasm in science and new technologies
- Above-average school records
- 1 Student Motivation letter
- 1 Teacher’s Recommendation letter

Applicants need to demonstrate their inquisitiveness, their programming skills and their interest in STEM domains or in the topic of the year. In addition, aptitude to teamwork and English knowledge are crucial requirements to participate. Candidates are scored both for background knowledge and for motivation to contribute to the project.

The 2020 Challenge

In 2020 the team of about 20 students, supported by FBK researchers and other tutors of international level will delve into a project of AI for Computational Biology and Precision Medicine.

What are the essential tools of a high-quality, basic kit for top-notch data and bioinformatics scientists of the next generation? What blending of skills constitutes an essential portfolio? WebValley 2020 tries to answer these questions, providing essential domain knowledge and effective operative, communicative, and organisational tools. In details, the WebValley Team will delve both into omics technologies (i.e., emerging biotechnologies for understanding the behavior of cells, tissues, organs, and the whole organism at the molecular level), and into the computational tools needed to analyze and make sense of the data (i.e. data science and machine/deep learning solutions and high-quality software collaboratively produced by the students). Starting from the state-of-the-art case study of unsupervised machine learning on single-cell sequencing, we aim at providing the participants with a high-quality, basic toolkit to become an attractive resource to excellence biotech lab worldwide, thus providing a valuable training package.

Throughout the project evolution the students will develop technical skills in data science, acquiring working experience on machine learning and bioinformatics methodologies, including reproducibility, interpretability and privacy for AI solutions in health, and the basics of deploying models on the cloud.
In the first week, introductory courses in data science, visualization and AI (e.g. Python and machine learning) software are provided to the whole team, with an emphasis on the specific domain of the project (e.g. biomedicine, digital agriculture, etc.). Such initial concentration efforts provide a large spectrum of tools among which the participants can choose the most proper ones for developing the research project, including programming languages and AI frameworks such as Keras/TensorFlow and PyTorch for deep learning.

This second stage of the experience outlines a learning environment which is intentionally shaped, where the participants have the chance to work independently on the research project, typically divided in smaller groups that are formed on the basis of the students’ personal interests and the specific tasks required to tackle the challenge. The teamwork sessions will be marked by interactive experiences designed with a specific methodology that aims to develop fundamental problem solving skills while setting the goals of the challenge, and to increase the quality of the cooperation among the teams.

As far as leisure time and weekend are concerned, the WebValley Team will organise leisure time activities such as e-sports and videogames sessions, as well as other informal on-line gatherings to let participants and tutors get to know each other, get inspired, and build a real team despite social distancing issues / measures.

The Goals

1. Encourage smart students to be entrepreneurs in science
2. Interdisciplinarity
3. Transform internet into an innovation building environment
4. Develop teamwork, collaboration, fast-prototyping attitudes
5. Use sophisticated open source methods in an informal teaching environment
6. Expose to challenging research themes of strong ethical interest
7. Using high quality data from scientific or statistical institutions
8. Promote the adoption of standard formats and share data policies
9. Deduce innovative, efficient, and effective education and communication models to be reproduced within the Italian and, potentially, the European school system

The Program

- Data Science & Tools
- Unix + GitHub
- Python intro + clinic
- Numpy & Scipy
- Data Visualization
- Machine learning for the life sciences
- Data science & privacy
- Data integration for Health
- DL theory, apps & implementations
- PyTorch
- Single-cell data preprocessing, simulation and analysis
- DL implementations and solutions
- Project Data

SPECIAL EVENTS
- Meeting and brainstorming sessions with high school teachers
- Friday, Aug 28th – Final presentation of the results / of the project
- Sept 2020 – Dissemination live session