Overview of Medical Data:
Current Status from Medical Perspective

Crowdsourcing Health Data

Divonne Brainstorming / CERN
February 2016

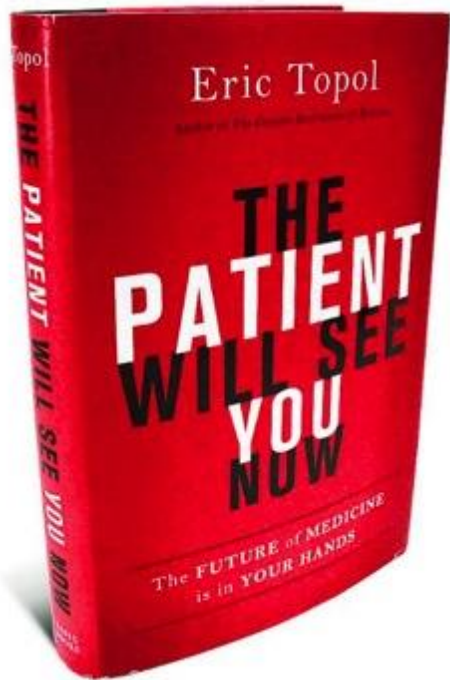Francois Grey, Citizen Cyberlab
University of Geneva, UNITAR & CERN

Campus Biotech

Antoine Geissbuhler
Head of Innovation, HUG

- Largest hospital in Switzerland
- Biggest employer in Western Switzerland
- 8 hospital sites
- 40 healthcare facilities
- 1'800 beds
- 10'500 collaborators (1'700 doctors, 4'750 nursing staff)
- 970'000 out-patient visits
- 650'000 in-patient days
- 90'000 emergency visits

Eric Topol

THE PATIENT WILL SEE YOU NOW

The FUTURE of MEDICINE is in YOUR HANDS

VISION
20/20

Marcel Salathé
Professor Digital Epidemiology, EPFL

A map of health-related Tweets from the US
(Salathé et al., "Digital Epidemiology", PLOS Comp. Biol. 8(7): e1002616)

Examples

- Detecting disease outbreaks early
- Real-time measurements of epidemics
- Assessing health behaviors (e.g. vaccination, smoking cessation)
- Pharmacovigilance: detection adverse drug reactions
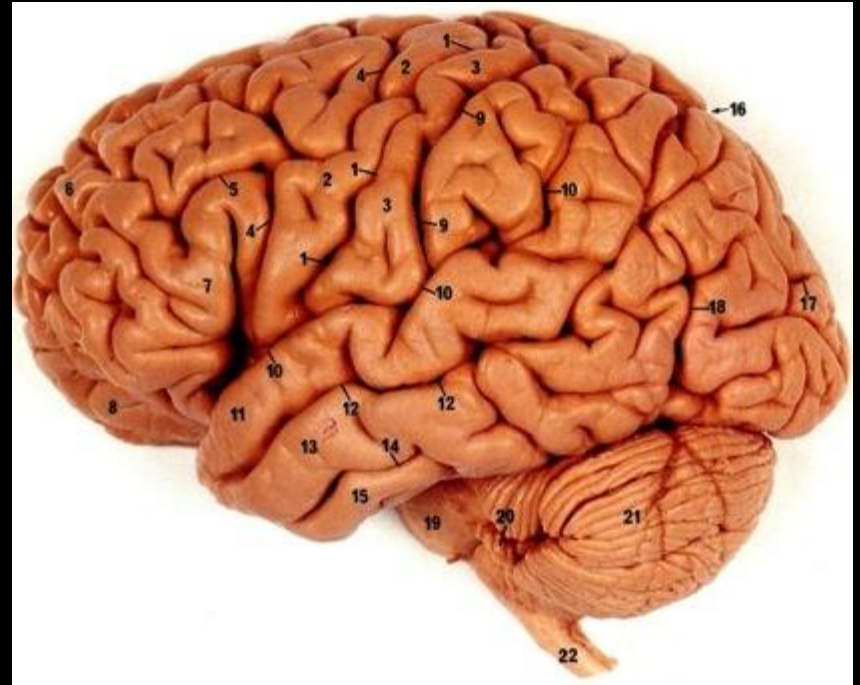- etc.

Crowdsourcing
A range of methodologies and technologies
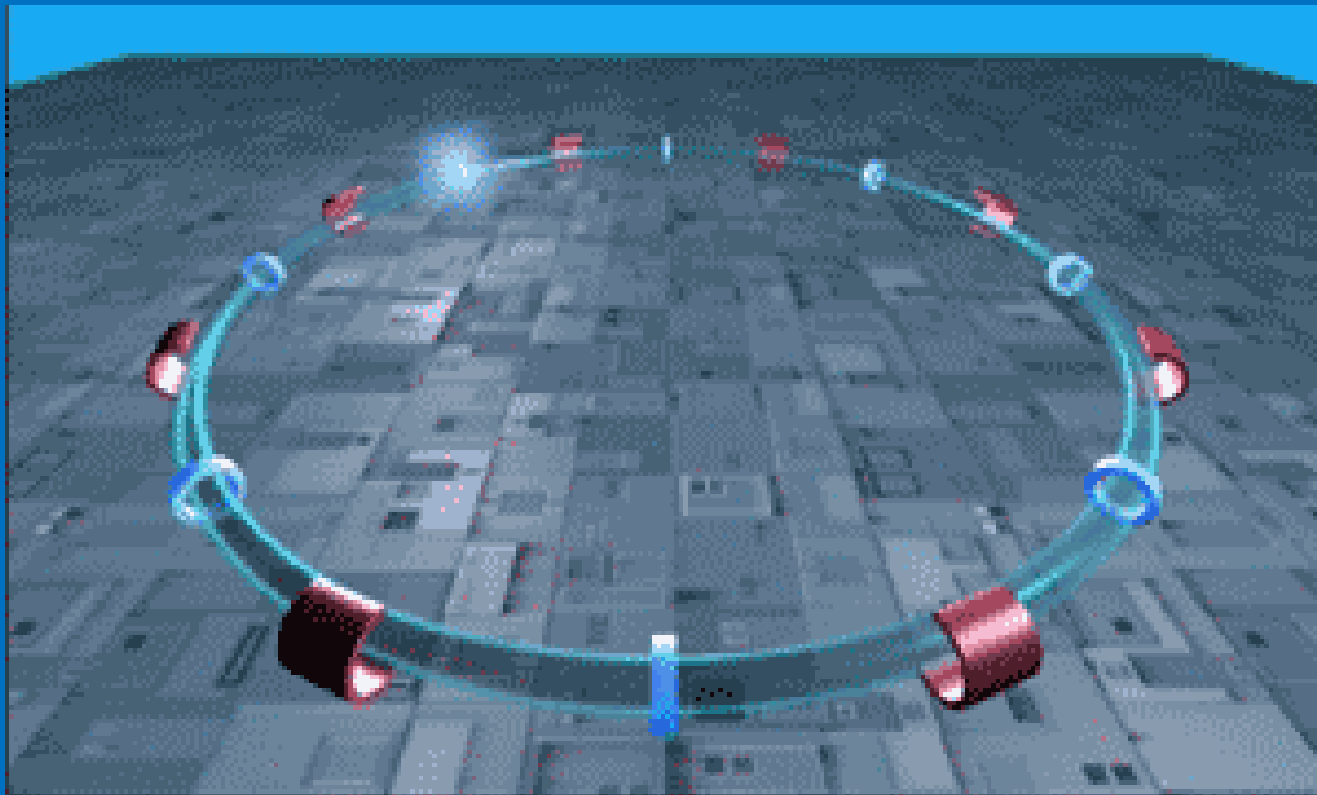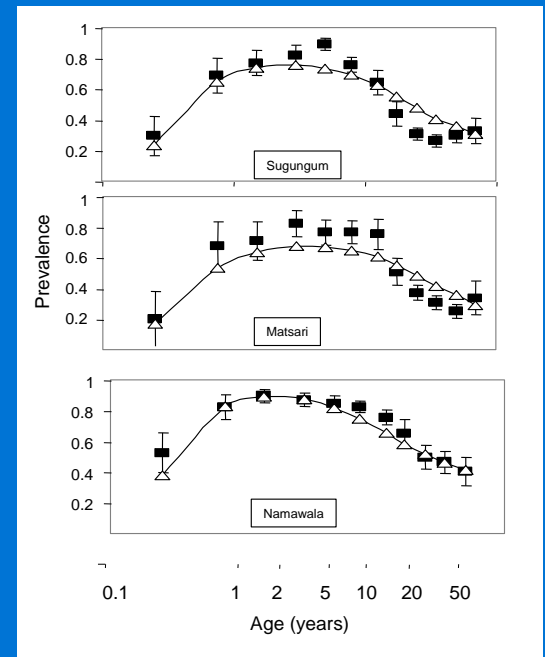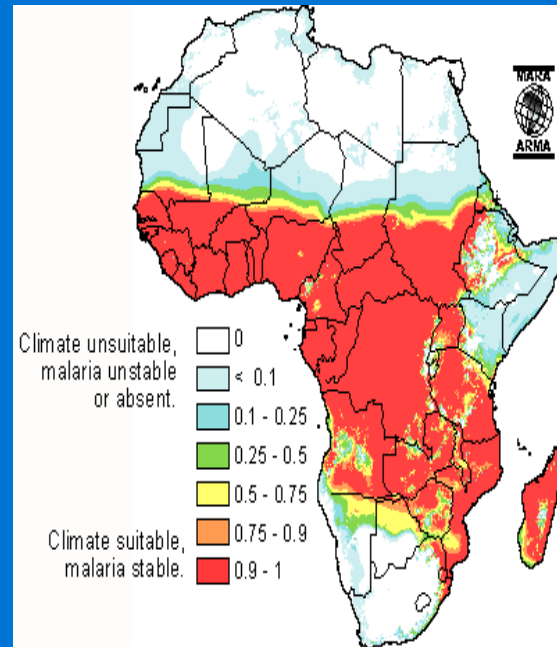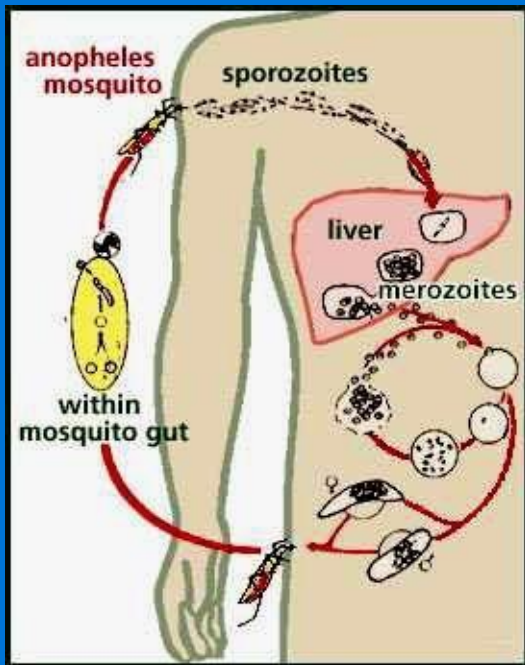

Volunteer
Computing

Volunteer
Sensing

Volunteer
Thinking

LHC@home (2004)
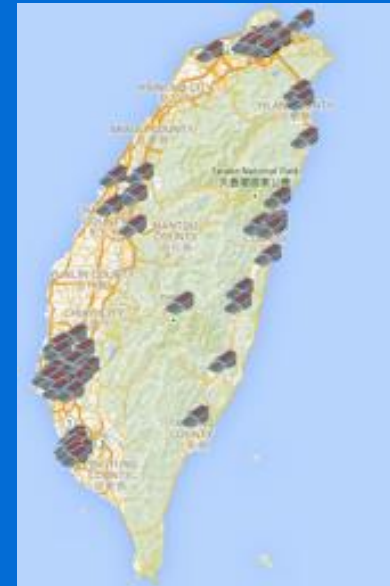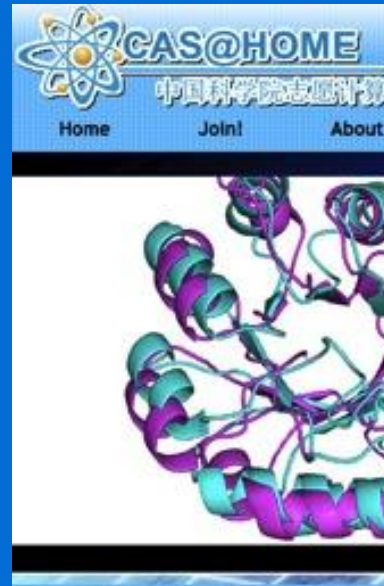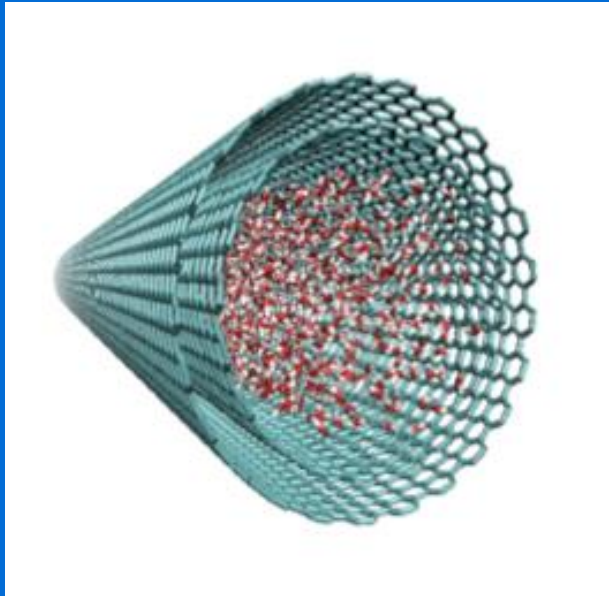## accelerator design
particle physics simulation

Africa@home (2006)
modelling the epidemiology of malaria in Africa with Swiss TPH

Asia@home (2008)
Simulation of water filters, protein folding
Networks of school-based earthquake sensors

Computing for Clean Water with Tsinghua, IBM
CAS@home with IHEP, ICT (Chinese Academy of Sciences)
Quake Catcher Network Taiwan with Academia Sinica

Impact

LETTERS
PUBLISHED ONLINE: 6 JULY 2015 | DOI: 10.1038/NNANO.2015.134

nature nanotechnology

Water transport inside carbon nanotubes mediated by phonon-induced oscillating friction

Ming Ma[1,2,3], François Grey[2,4,5,6]*, Luming Shen[7], Michael Urbakh[3,8,9], Shuai Wu[1,4], Jefferson Zhe Liu[10], Yilun Liu[11] and Quanshui Zheng[1,4,8,9,12]*

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CERN Public Computing Challenge 2015

RETWEETS 247   LIKES 184

Wanted: computers for a humanitarian cause

nature

Spare computing power tackles thorny questions in malaria.

Helen Pearson

Researchers want the help of your home computer for an urgent new mission: fighting malaria.

Malaria kills more than 1 million people every year, mostly young children in Africa. Many researchers build computer models to mimic the spread of the

NATURE NANOTECHNOLOGY | VOL 10 | MAY 2015 | www.nature.com/naturenanotechnology

in the classroom

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Creativity unleashed

Hands-on challenges such as building a low-cost atomic force microscope for schools can teach more than standard lessons, says François Grey.

When I arrived as a visiting professor at Tsinghua University in 2008, one of my first tasks was to set up an international summer school that would expose foreign students to the many exciting advances being made in China in the field of nanotechnology, and to encourage them to collaborate with their Chinese counterparts on practical projects. This summer school became an annual fixture, thanks to an ongoing collaboration between the London Centre for Nanotechnology at University College London (UCL), the Centre for Nano

prompted discussions about the relative health risks of different size particles, and their possible origins.

At the second LEGO2NANO summer school, held in September last year, new student teams went beyond the hardware design to look at how to bring down the cost of the associated electronics and software for operating the AFM. They even explored possibilities of crowdfunding the production of such devices, and crowdsourcing the analysis of the data that schoolchildren could gather with them.

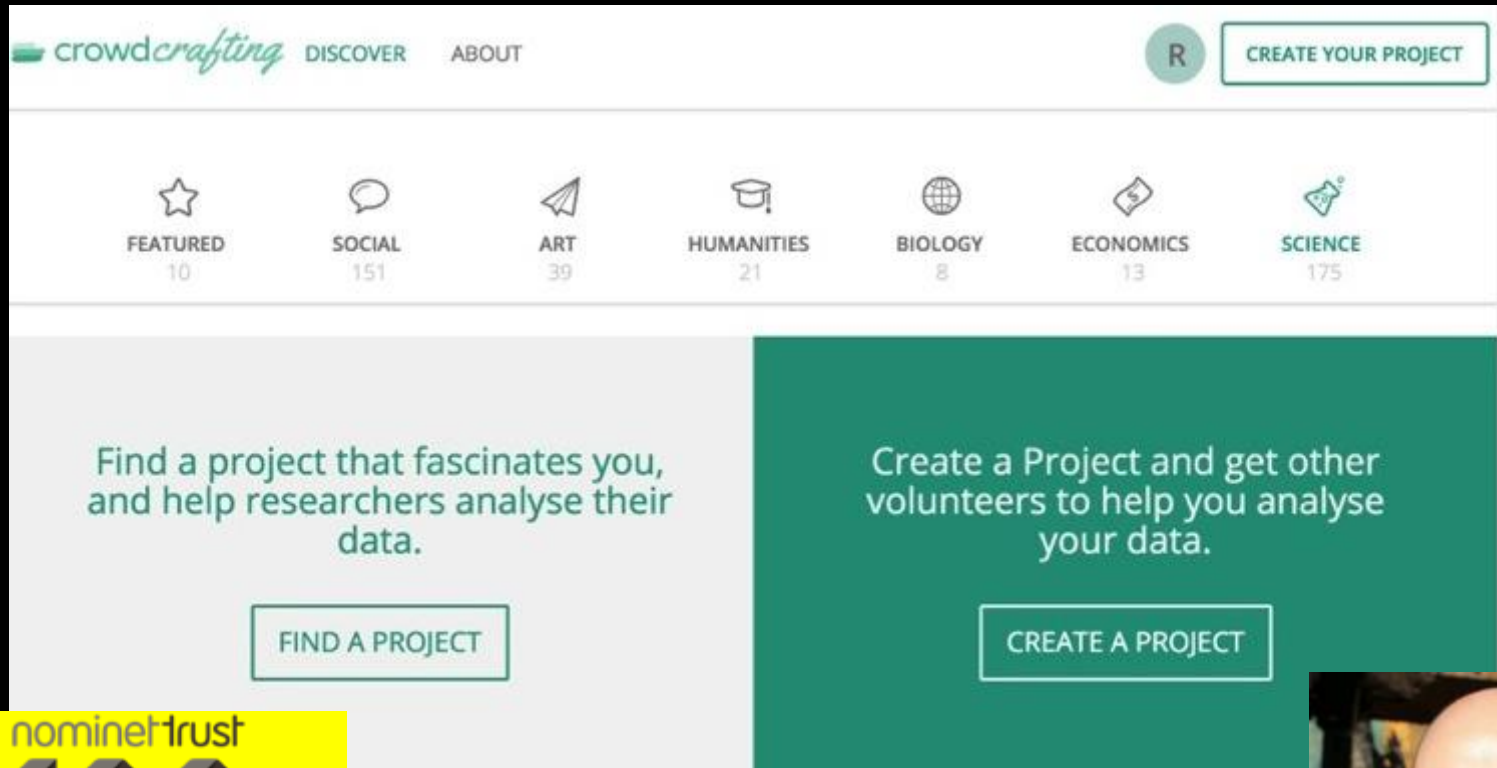# Citizen Cyberlab hackathons

Rio de Janeiro

Beijing

CERN Summer Student Webfest
CERN

Spinoff: Crowdcrafting Platform

Daniel Lombraña Gonzàlez

CERN: Antimatter Research
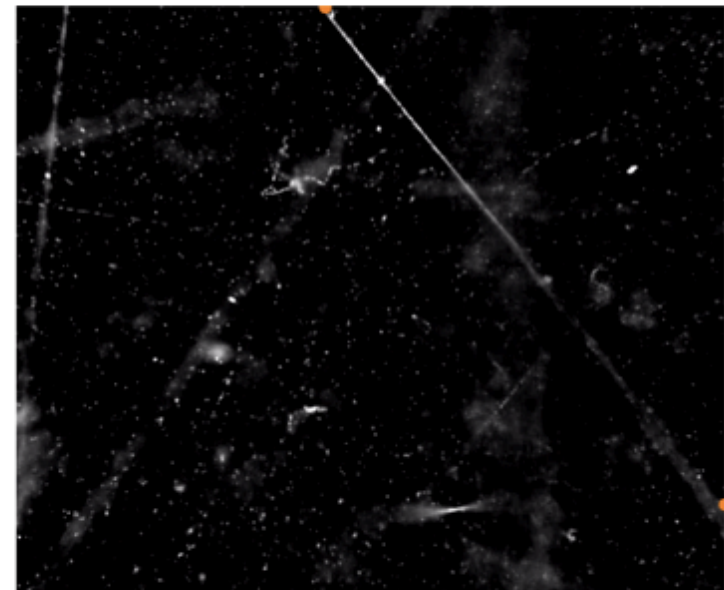
NASA: ISS photo classification

Earth Science and Remote Sensing Unit, NASA-Johnson Space Center. "The Gateway to Astronaut Photography of Earth."

UNITAR: Ebola Response

Cancer Research UK: Cancer Detection
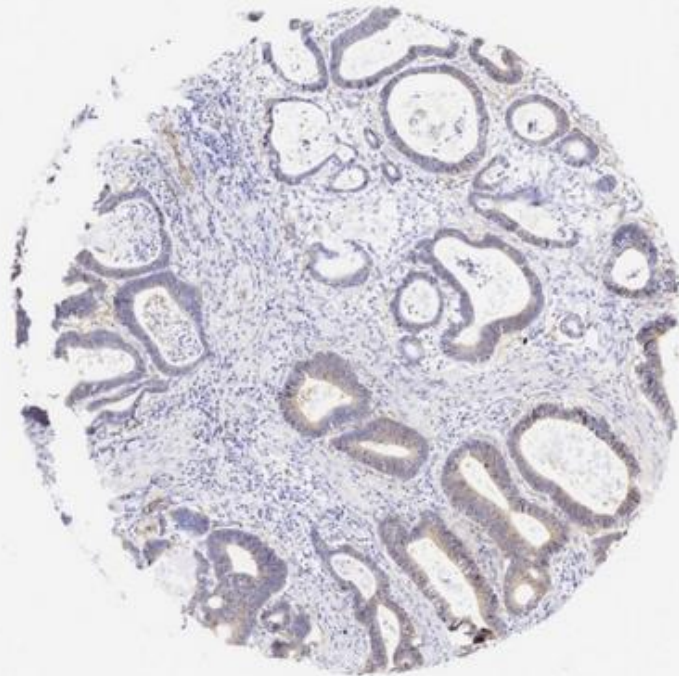
Health Hackathons:
la *Genève Internationale* in action

Challenge: Rethink Hospital Navigation

- Existing indoor navigation systems rely on fixed infrastructure such as wifi or bluetooth:
  - High implementation cost
  - High maintenance cost
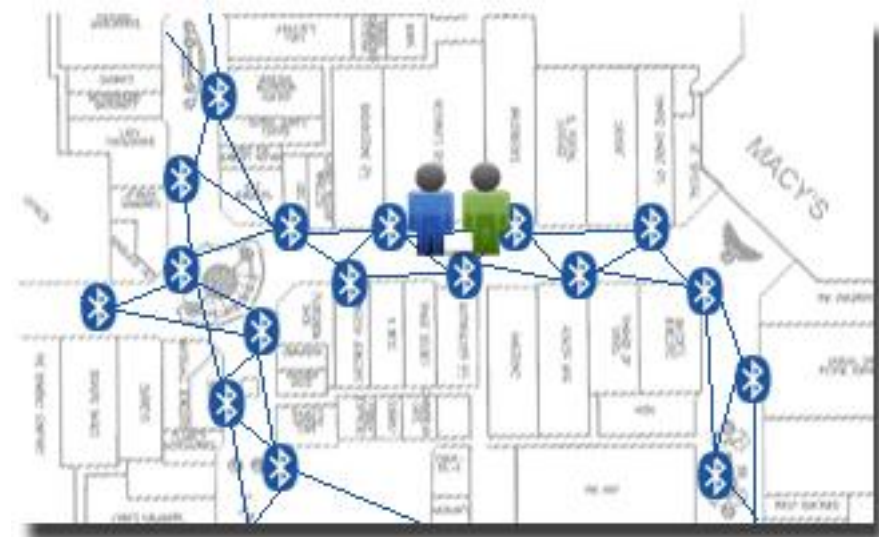
Alberto   Cesar   Anna   Leif Terje   Jose

HEALTH HACKATON H-COMPASS TEAM

Christian

Nefeli   Mirana   Gabriele   Gareth   Jonathan

Solution: Augmented Reality

- Infrastructure-less approach
- No fixed hardware
- Low implementation cost
- Low maintenance cost
- Compatible with mobile devices.

Crowdsourcing and Citizen Science in the EC Horizon 2020 Open Science agenda