

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



UNIVERSITÉ  
DE GENÈVE



ÉCOLE POLYTECHNIQUE  
FÉDÉRALE DE LAUSANNE



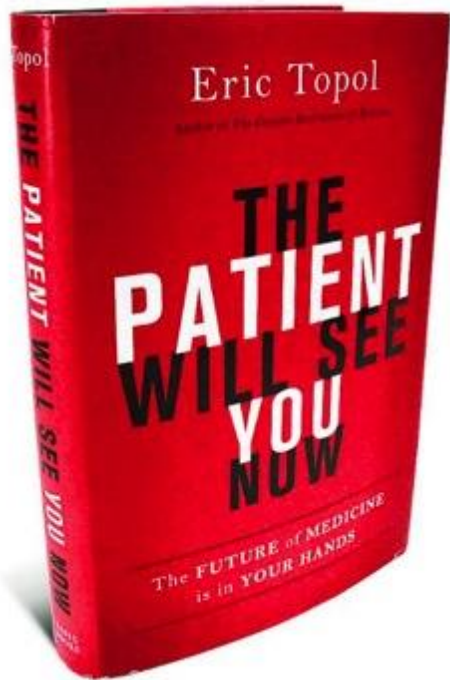
citizen  
cyberlab



# 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





# 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

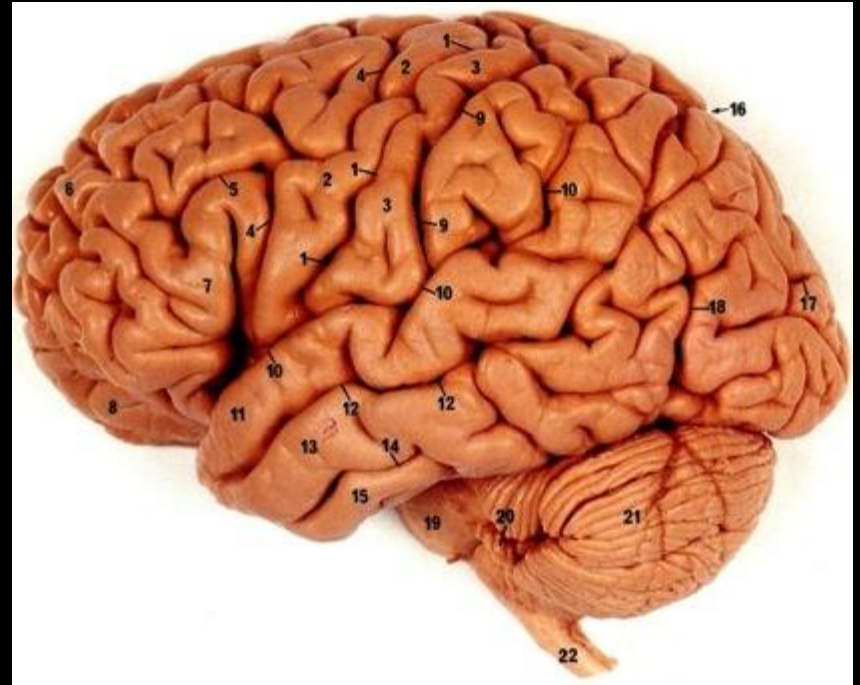
A range of methodologies and technologies



Volunteer  
Computing

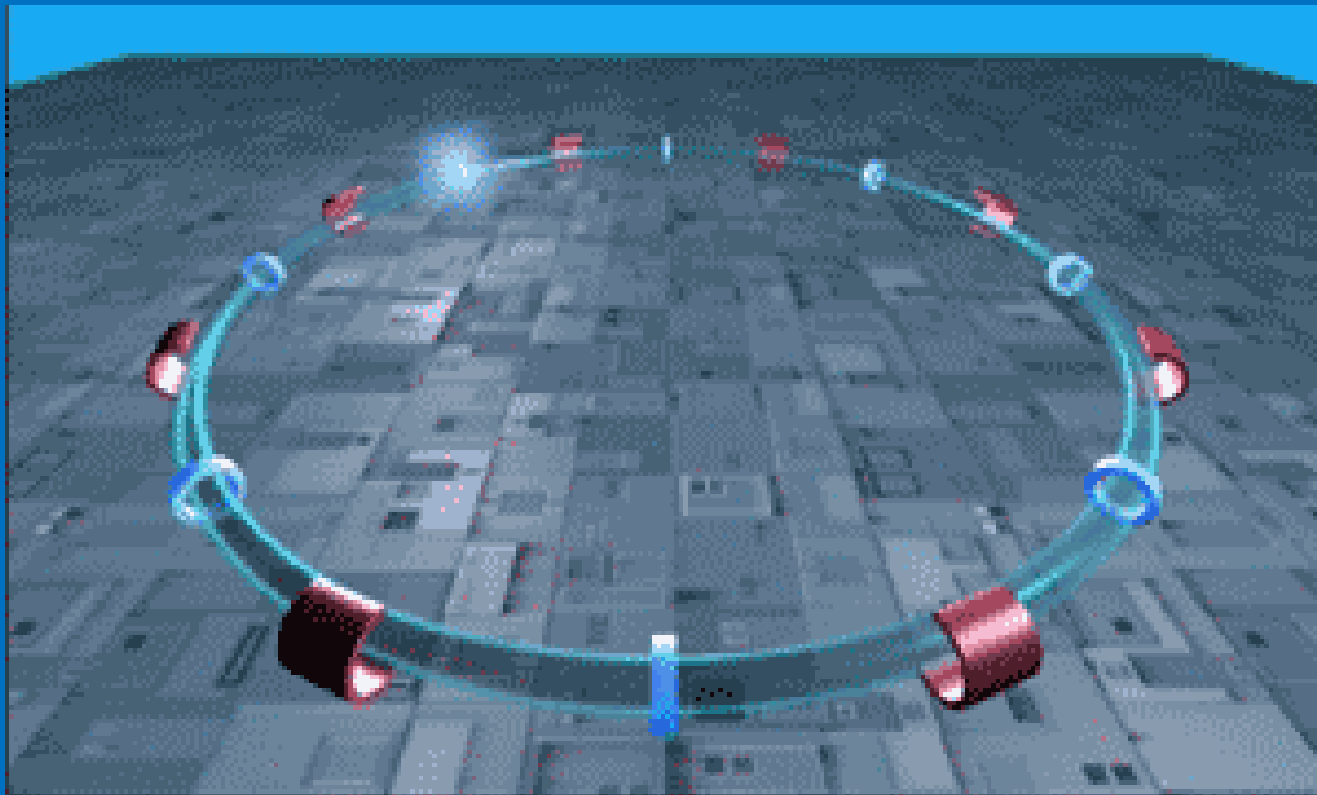


Volunteer  
Sensing



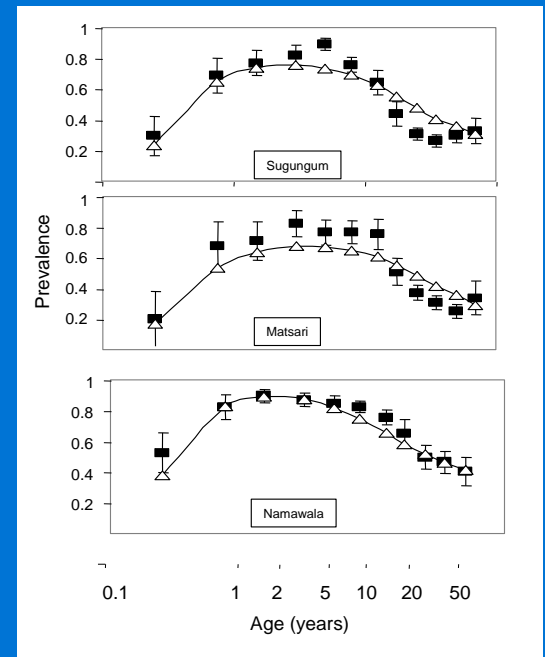
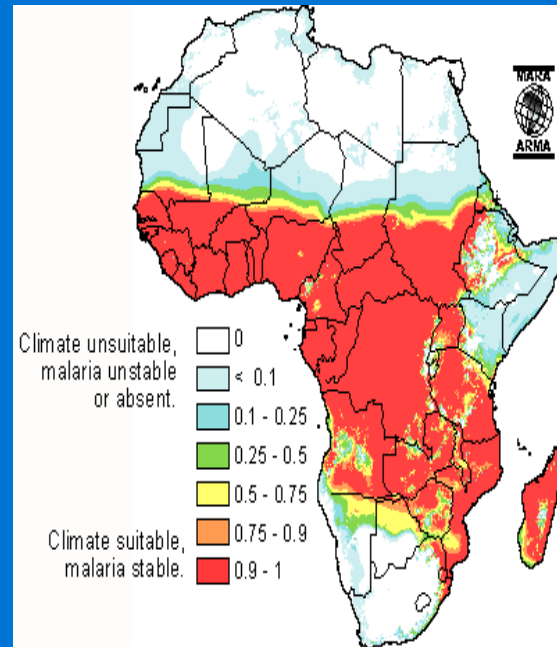
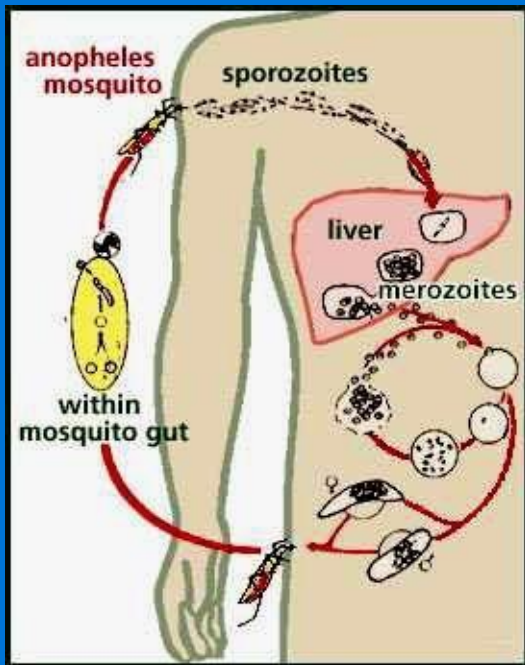
Volunteer  
Thinking

LHC@home (2004)  
accelerator design  
particle physics simulation



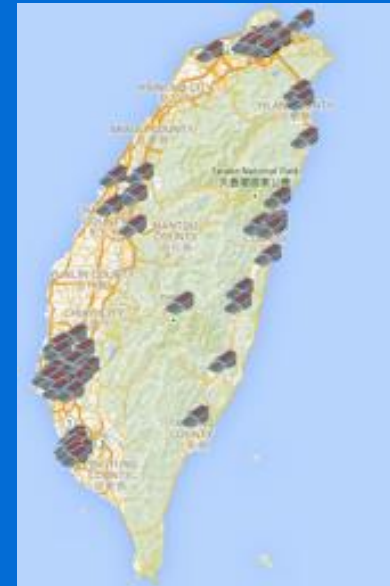
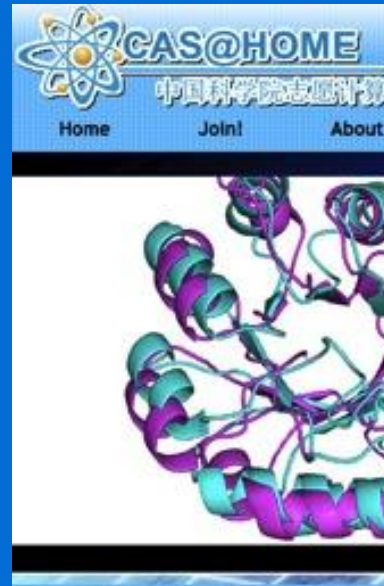
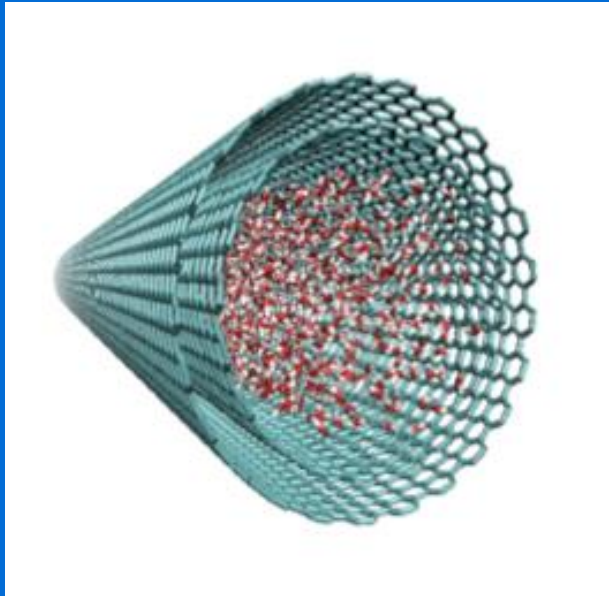
# Africa@home (2006)

## 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<sup>1,2,3</sup>, François Grey<sup>2,4,5,6\*</sup>, Luming Shen<sup>7</sup>, Michael Urbakh<sup>3,8,9</sup>, Shuai Wu<sup>1,4</sup>, Jefferson Zhe Liu<sup>10</sup>, Yilun Liu<sup>11</sup> and Quanshui Zheng<sup>1,4,8,9,12\*</sup>



**CERN**  
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Join CERN's Public Computing Challenge 2015: [cern.ch/go/8dln](http://cern.ch/go/8dln) @CitizenCyberlab #citizenscience



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](http://www.nature.com/naturenanotechnology)

### in the classroom

## 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.

FRANÇOIS GREY is co-director of the Lifelong Learning Lab at Tsinghua University, 100084 Beijing, China, and coordinator of the Citizen Cyberscience Centre at the University of Geneva, CUI, 7 Route de Drize, 1227 Carouge, Switzerland. e-mail: [francois.grey@cern.ch](mailto:francois.grey@cern.ch)

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 (LCL), 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



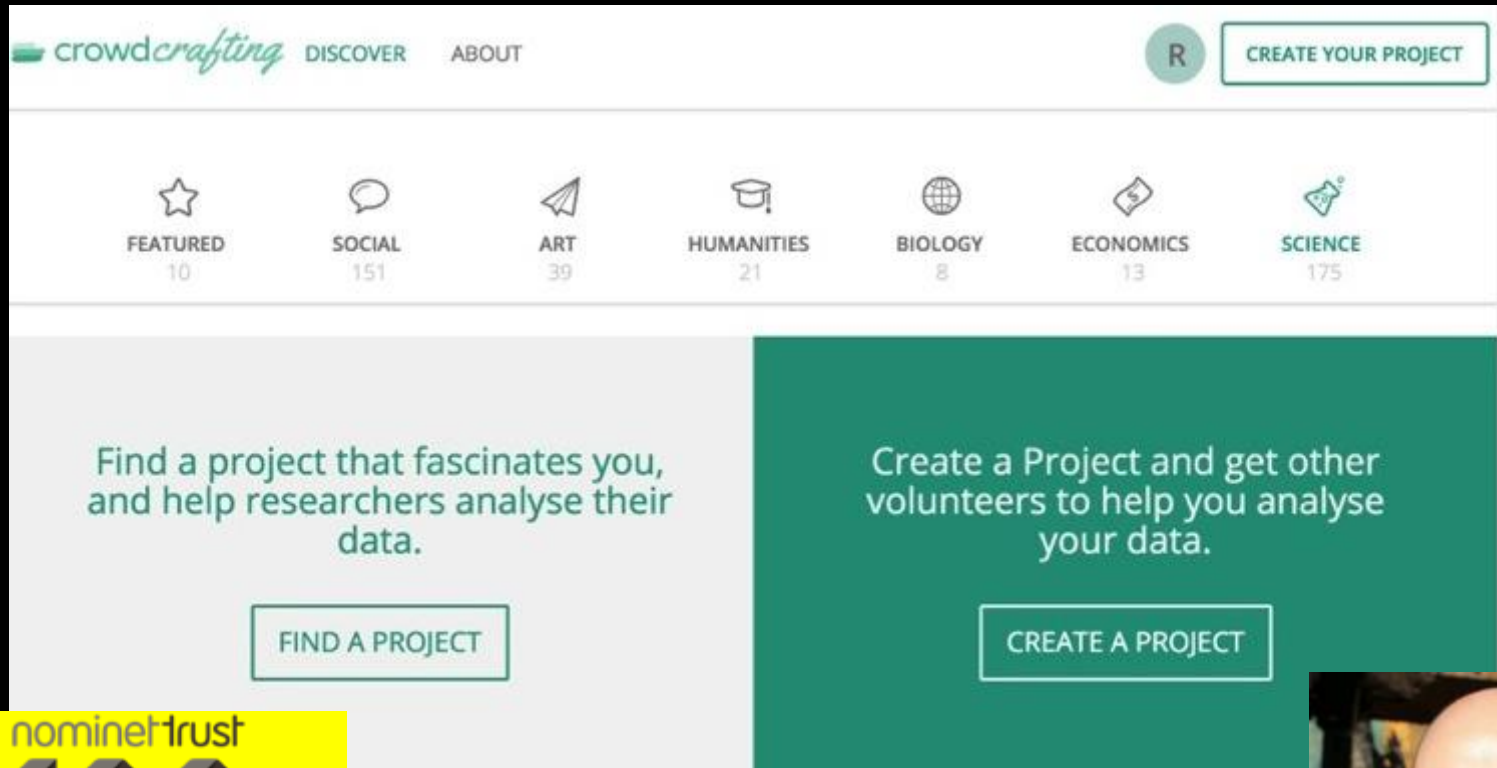
Beijing



CERN Summer Student Webfest

CERN

# Spinoff: Crowdcrafting Platform



Daniel Lombraña González

# CERN: Antimatter Research

[« Back to Antimatter Alpha](#)

## Question

You have found the following tracks

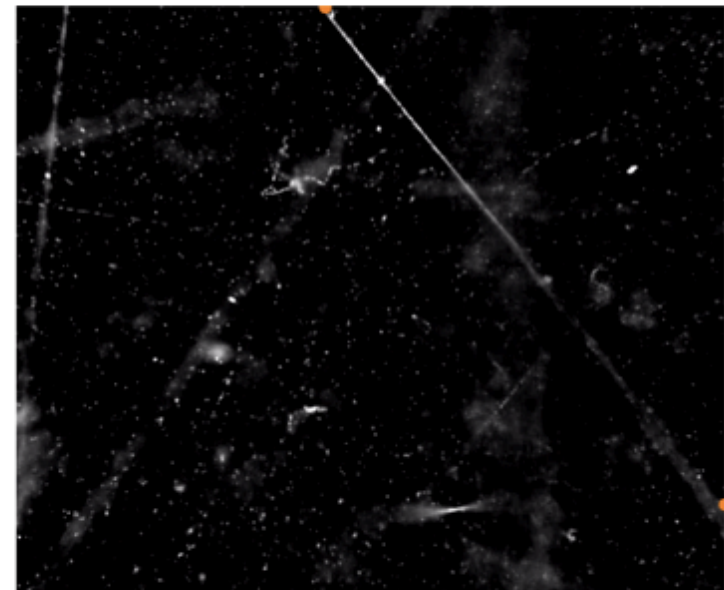
Can you count the number of dots in the track?



You are working now on task: **824161**

You have completed: **0** tasks from **30**

Show comments



« Previous frame

» Next frame


Current frame **19**

# NASA: ISS photo classification

crowdcrafting DISCOVER ABOUT SIGN IN

## Classify this picture

Black City Stars Aurora Astronaut None of these No photo I don't know



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

The image shows a screenshot of the 'crowdcrafting' website interface. At the top, there is a navigation bar with the 'crowdcrafting' logo, 'DISCOVER', 'ABOUT', and 'SIGN IN' links. Below this is a section titled 'Classify this picture'. A row of eight classification options is displayed, each with a label and a representative icon: 'Black' (black square), 'City' (city skyline), 'Stars' (stars), 'Aurora' (aurora), 'Astronaut' (astronaut), 'None of these' (white X on black square), 'No photo' (camera with X), and 'I don't know' (question mark). The 'None of these' option is highlighted with a blue border. Below the options is a large photograph of the aurora borealis, which is a vibrant display of orange and yellow light patterns in a dark sky. At the bottom of the page, there is a caption: 'Earth Science and Remote Sensing Unit, NASA-Johnson Space Center. "The Gateway to Astronaut Photography of Earth."'

# UNITAR: Ebola Response



## EBOLA RESPONSE



Is protective equipment being used in Ebola disaster responses?

-  104 Tasks
-  122 Volunteers
-  104 Tasks Completed
-  0 Pending Tasks

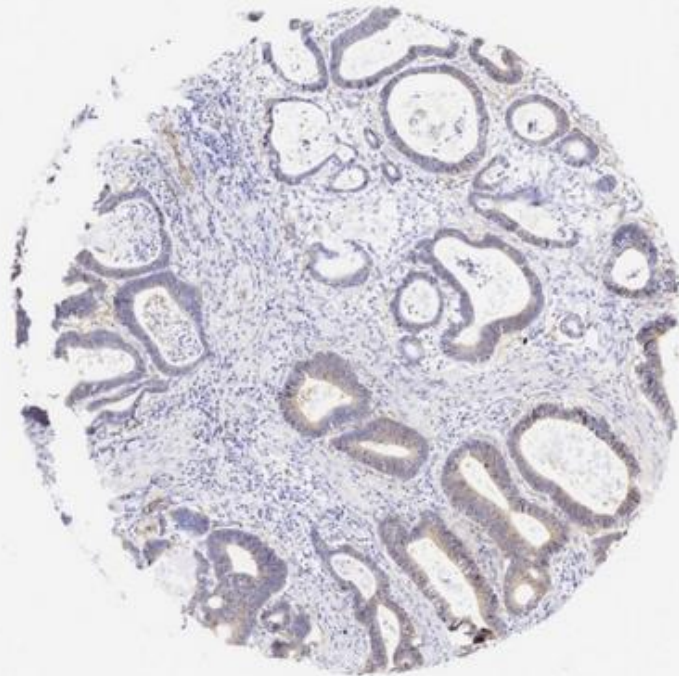


START CONTRIBUTING



100%  
complete

# Cancer Research UK: Cancer Detection



## Sample image 1

Move your mouse over the image on the left to zoom in and see more detail.

To identify **cancer cells**, look for **blotchy cells** grouped together in **uneven clumps, rings or broken chains**.

Can you identify the areas of cancer?  
Click on 2 to see the answer.

1

2

3

Previous

Next

# Health Hackathons: *la Genève Internationale* in action



**HEALTH Hackathon at Campus Biotech**  
2-4 OCT. 2015

SCIENCE FOR HEALTH

IMPACT HUB Geneva

HUG Hôpitaux Universitaires Genève

citizen cyberscience centre

APPLICATIONS 1 MAY - 1 JUN. 2015

WWW.THEPORT.CH

THE Port unite innovators · impact future · act today

campus biotech

Detailed description: This poster features a central illustration of a green double-decker bus with its rear door open, set in a modern, industrial-style interior. The text is arranged around the bus, with the event title at the top and dates to the right. Logos for Impact Hub Geneva, HUG, and the Citizen Cyberscience Centre are positioned below the bus. At the bottom, there is a call for applications from May to June 2015, the website URL, and logos for THE Port and Campus Biotech.



**OPEN GENEVA HACKATHON**  
16-18th April @Campus Biotech

Applications open from 25th January to 7th February

Innovating global health with open data  
Innover dans le domaine de la santé avec des données ouvertes

www.theport.ch OGH2016@theport.ch

organized by / organisé par

THE Port GGC HUG SITG tpg </open data>

in collaboration with / en collaboration avec

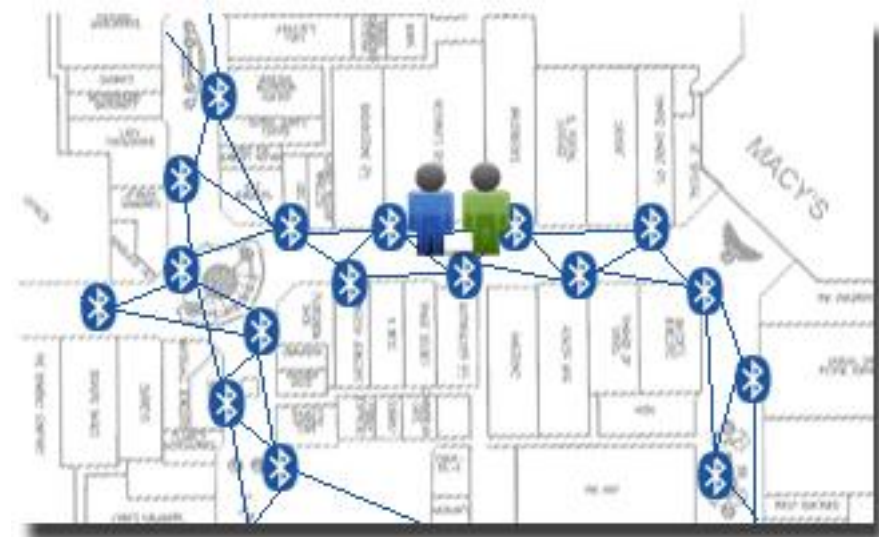
campus biotech citizen cyberlab HUG HES UNIVERSITÉ DE GENÈVE

Detailed description: The poster has a blue background with a white graphic of a lighthouse beam on the right side. The main title 'OPEN GENEVA HACKATHON' is in large, bold, white letters. Below it, the dates and location are listed. A diagonal orange banner in the top right corner contains the application period. The bottom section features logos for the organizing institutions and their partners.



# 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

