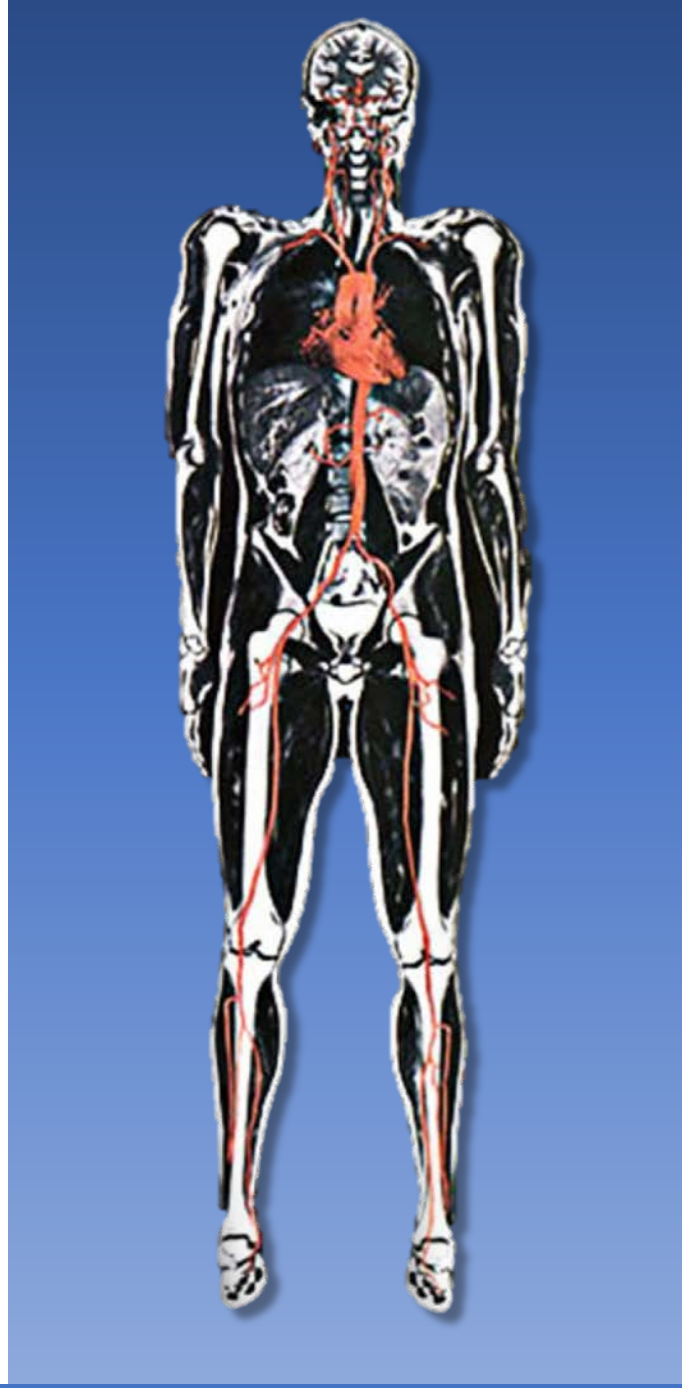
Medical Data

Summary of discussion

Philippe Lambin
Eric Grancher
Hans Hoffman
Francois Grey
Rolf Lewenshon
Renaud Jolivet
Sparsh Navin
Raj Jena



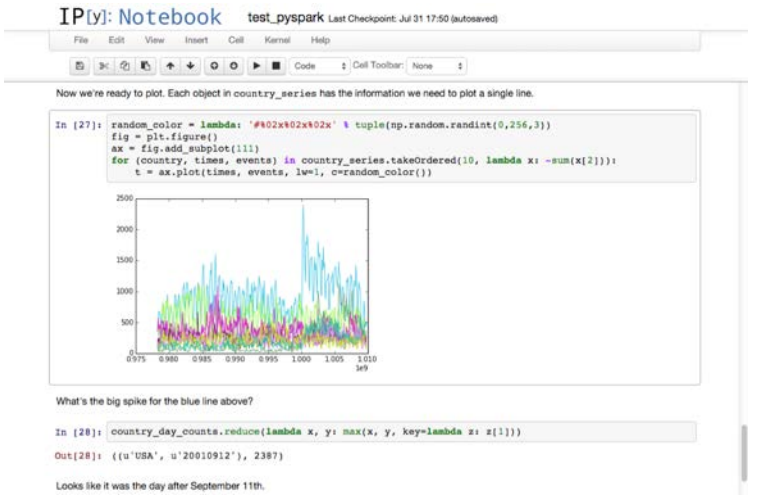
Emerging themes

- Facilitating open data
- Crowdsourcing of annotated data
- Develop distributed learning platforms in private and hybrid clouds
- Using Root as a platform for medical computing
- Simulation - something old and something new
- A challenge : Global integration of patient generated (IoT) and clinically derived data

TL;DR

Facilitating Open Data - 1

- Radiobiology
  - Use interactive notebooks to encode radiobiology experimental data
  - Encapsulate beam data, methods, raw data and analysis
  - Facilitate cross comparison of data for building RBE libraries
  - Include analysis goals (esp for incomplete experiments)
  - Leverage crowdsourcing for analysis - create community challenges



Facilitating Open Data - 2

- Showcase storage of annotated clinical & research data
  - Annotated data & Models from cancerdata.org
  - Try to bind to notebook format
  - Crowdsource – ask community to build better models
  - Set global challenges from this platform (like computer vision / ML community)

Facilitating Open Data - 3

- Store preclinical data (esp genomics)
  - Fulfill data repositary criteria of publishers
  - Link to cancerdata.org, expose DOIs
  - Use Zenodo as the umbrella platform for integrating with other data

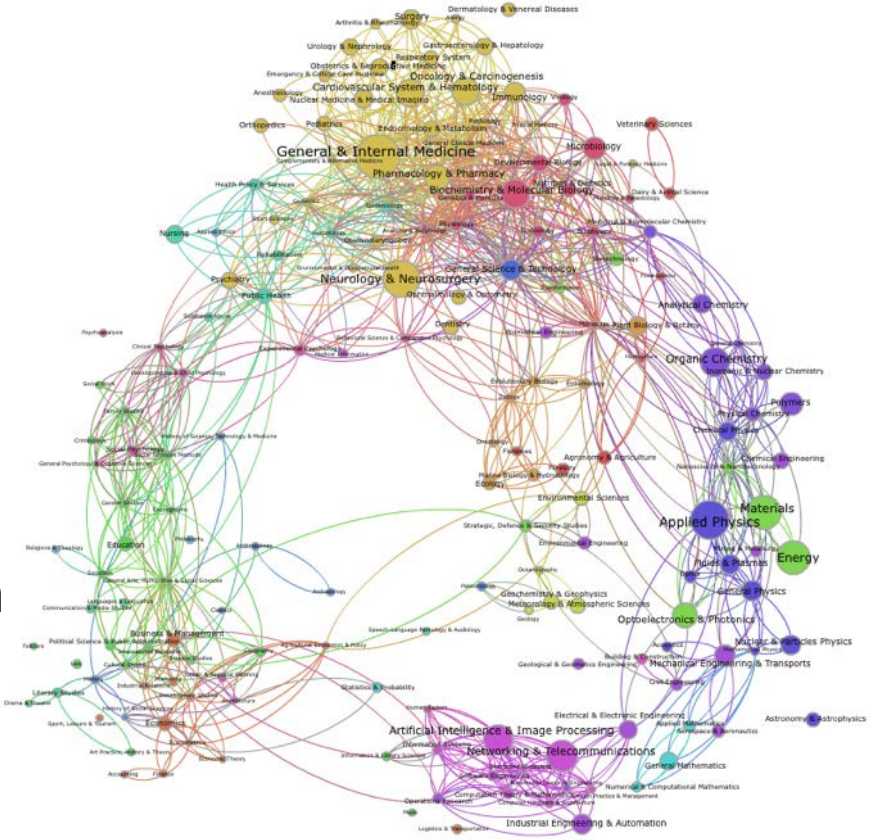
Distributed learning in the cloud

- WLCG/Openstack (LHC computing cloud) – distributed sites in 40 countries
- Hybrid cloud solutions – private cloud server inside DMZ of a hospital IT network
- Re-factor existing tutorials for hospital use
- Opportunity for community goals

Distributed learning in the cloud -2

- Precedent : Human brain project (Anastasia Ailamaki - EPFL)
- https://www.humanbrainproject.eu/fr/-/cern-open-lab-in-conjunction-with-hbp-publishes-a-whitepaper-on-future-it-challenges-in-scientific-research

- Spin-outs
  - Work with ESTRO/ASTRO on an Open Oncology Ontology



ROOT for medical computing

- ROOT is the compute platform used throughout CERN
- Open source
- Nice toybox – tools for SVM and ML
- Build workflows for computational tasks

Multi-scale Simulation

- Upgrade FLAIR / Fluka to allow integration into decision support workflows
- Use Geant4DNA to model DNA damage from cytotoxics and radiation together
- Or build physiological models to complement FLUKA in ROOT

http://www.fluka.org/flair/

Need to import medical expertise into CERN to build these tools

See one, simulate one, teach one

- Lot of tidy medical data and know-how encoded in these data & models
- Strong opportunities for teaching resources
  - Interactive
  - Distance learning

IoT challenge – Fetch this!

- Can CERN help to integrate a global medical dataset?
- Bring together
  - Clinically derived medical data
  - Patient generated data from IoT
  - Patient data access authorisation via TPM
  - In situ processing of patient data via TCM
  - Lessons (self-) learned from Microsoft Fetch?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Thank you!