MD-PAEDIGREE NEWSLETTER

Issue 2 - May 2014

Model-Driven Paediatric European Digital Repository

MD-PAEDIGREE

SEVENTH FRAMEWORK PROGRAMME

European Commission

Editorial

Bruno Dallapiccola
on behalf of the MD-Paedigree Governing Board

Contents

MD-Paedigree has made good progress in this first year. In any project of such size, complexity, and encompassing such a diverse range of activities, there will be all manner of hurdles. Nevertheless, we have gathered momentum over year one and we are now truly hitting our stride in time to tackle the middle straight of the project and the great challenges it contains. If we, as a project consortium, maintain the levels of engagement and motivation shown so far we will be well set to meet these challenges.

At the core of the project is the data repository and Infostructure, which is the platform on which the rest of the project stands. The progress made for the first prototype integration was able to show the power and potential of the MD-Paedigree vision, enabling us to win the Best Exhibit Award at ICT 2013. Over the next twelve months we will see more clinical centre nodes, more functionality and more data types come online and so the Infostructure will really begin to take on its role as the backbone of the project.

The specific activities in the clinical applications were started in close collaboration between clinical and technical partners. Although some data collection took some time to begin in earnest, there were subsequent mitigation efforts in finding alternatives, e.g. giving access to legacy data to allow the technical activities to progress according to plan. Nevertheless, the risks are understood and particular focus will be dedicated to data acquisition in the second project year.

Since the clinical involvement implies a number of diagnostic modalities encompassing different clinical specialities, well-specified practical workflows are crucial for patient recruitment and effective data collection. Even though DHZB (Deutsches Herzzentrum Berlin) joined the project at a later point, such workflow preparation was achieved in close alignment with the other centres and patient groups could successfully be identified. Cardiac MRI protocols have been adapted at DHZB and lab infrastructure was agreed upon to optimise the pre-analytics for all clinical sites.

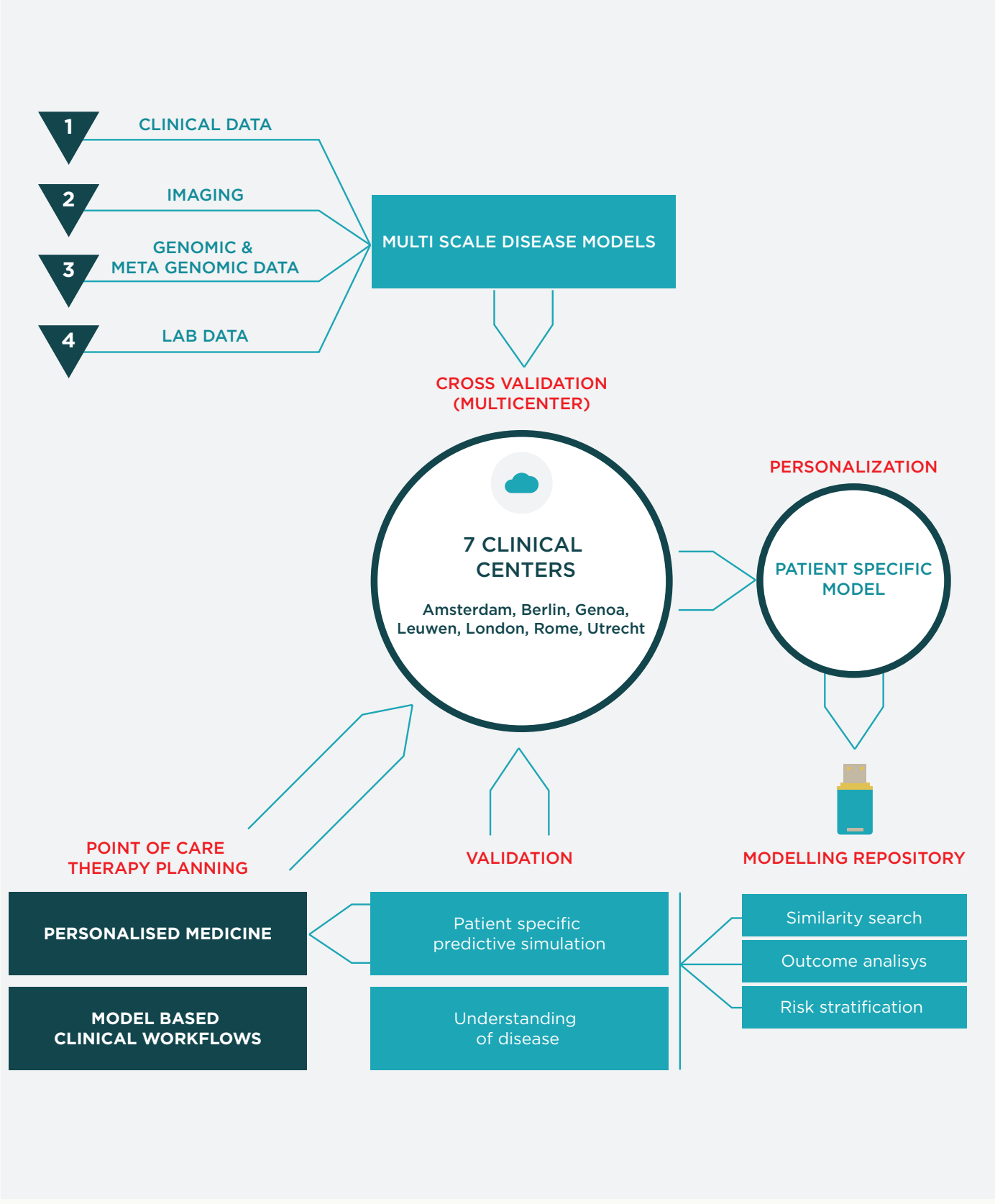
Prof. Bruno Dallapiccola, Project Coordinator and Scientific Director of Ospedale Pediatrico Bambino Gesù (OPBG)

A continued open communication within and between work packages will be a key driver in leveraging the effect of scale of this large project. In addition to the scientific and clinical achievements, the enthusiasm and engagement of the consortium members are the best prerequisite to make this project successful at international level.

As a demonstration of our commitment to transparency between collaborators, we plan to establish a mechanism for publication that will include the MD-Paedigree consortium in the author list of every publication. Furthermore, every publication will be sent to the Co-ordinator for formal approval prior to submission, to ensure appropriateness of authorship and maintain high publication standards.

As a further extension of our focus on clinical leadership as a driver for healthcare innovation we will be conducting a data privacy and risk stratification assessment that is founded upon clinical need and use this to inform our engagement with policy makers. In this way we hope to drive the privacy agenda so that Big Data can be better but securely applied for the benefit of the healthcare of European citizens.

MD-Paedigree Conceptual Overview

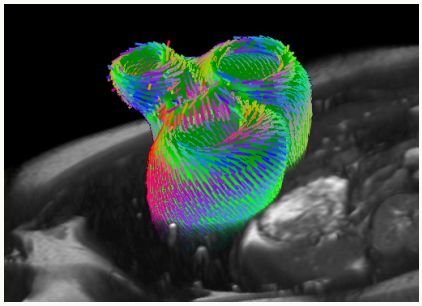


MD-Paedigree: opinions from our internal review

As part of our first annual meeting and in preparation for our first annual review by the EC, we conducted an internal review. The work conducted in each action area was assessed by external and independent reviewers. Here are some excerpts of what the reviewers had to say:

Professor Marco Bonvicini, Paediatric Cardiology and GUCH Unit, University of Bologna
(Reviewer of Cardiomyopathies action area and Cardiovascular risk in juvenile obesity action area)

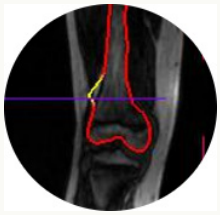
"MD- Pedigree is an exciting project, it's very important to have the possibility to collect a great number of children with different diseases and to allow the researchers to work with these data. More interesting is to create a cardiovascular model of these pathologies.

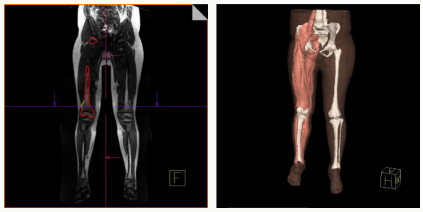


I think it's very important that the clinicians and modelling engineers keep in constant and frequent contact to try to improve their own project areas and avoid losing time."

Adam Shortland PhD, Consultant Clinical Scientist, Guy's & St Thomas' NHS Foundation Trust, London.
(Reviewer of Neuromuscular and Neurological Diseases action area)

"There is a good balance amongst





the institutions represented with academic health centres, world class universities, and innovative and leading commercial interests. The overall aim is to use computational approaches to improve treatment selection. There are two approaches. The first is to use probabilistic models to analyse mixed clinical and clinico-technical datasets to inform decision-making. The second approach is to develop bespoke musculoskeletal simulations underpinned by imaging to better understand the neurobiomechanics of the target populations. There are potential rewards in terms of better prescribed treatments and outcomes for children with neurological or neuromuscular disease. However, there are enormous challenges that shouldn't be underestimated."

Prof. Rolando Cimaz Associate Professor of Pediatrics University of Florence, Head of Pediatric Rheumatology, A. Meyer Children's Hospital, Florence Italy
(Reviewer of Juvenile Idiopathic Arthritis action area)

"First of all, let me congratulate the excellent quality of the project and the work performed so far. I think that the project is excellent

and that the work performed so far has already achieved some goals, especially in preparation of real data acquisition. In fact, the complexity of the different Work Packages and the planning of the integration between them has been complex but only after this preparation the acquisition and analysis of data can be meaningful."

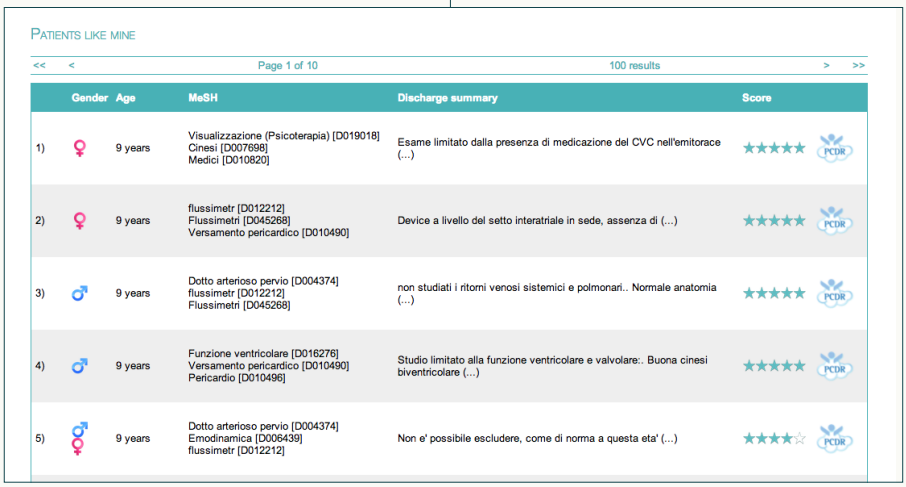
By Alberto Sanna, Director e-Services for Life & Health Research at the Scientific Institute San Raffaele, Milan.
(Reviewer of Infostructure action area)

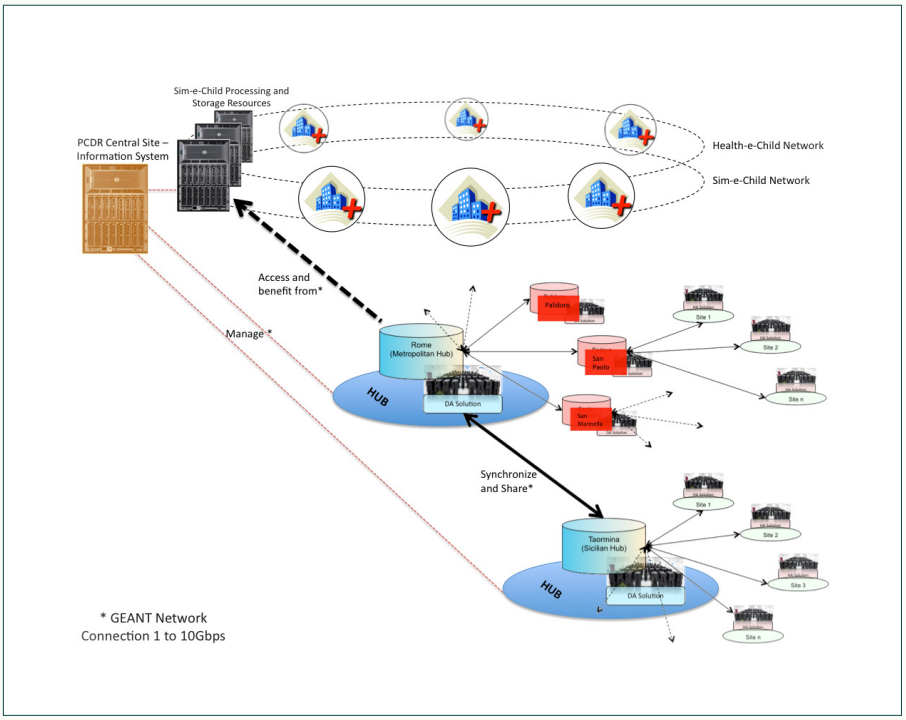
"The main challenge now is to speed up the momentum. MD-Paedigree has already reached a very good state of maturity, but this is the very moment in which the consortium must close the gaps between the clinicians' expectations and the infrastructure services.

In order to have the clinicians and researchers able to master the bigger vision and challenge, the key factor is to leverage on the educational aspect in a systematic and consistent way. Make the clinical technical communication process a formal project methodology by appointing

one technological evangelist, to stay physically one/two days on a regular basis in clinicians/ researchers centres with the specific aim of teach everything from the very trivial and obvious matters to the great potential offered by creating confidence in the interdisciplinary dialogue. With respect to the knowledge service layer of MD-Paedigree, there is a double stream of innovation pathways that emerges from the project objectives. First, services that fulfil clinical needs and opportunities and second to fulfil the clinical research needs and opportunities: this are in the need to be addressed independently and – in a second stage and based on further evidence – identify all the opportunities for interactions and synergies. Those two different approaches reflect also on different way to experiment and offer innovation, because a mainstream clinically-oriented target may need or afford some rigidity in exchange to robustness, while the researching in the long-tail may need more flexibility in exchange of lower performance (e.g., real time), keeping in mind that what is long-tail today may be aggregated and/or become mainstream in the future.

Finally, the privacy aspects must be deeply understood and not taken as an excuse to lower the integrity of the data: proper risk analysis is intended to understand which assets must be protected and which countermeasures must be put in place. The mind-set in confronting with these issues has to be ethical as well as technical, while keeping in mind the need to maintain, and not destroy, the integrity of the data, which identify the source of knowledge: for example, adopting conservative approaches in anonymising clinical records is a good policy in general, but not if the anonymisation takes place with a blind use of blurring time stamps of the events in broader time intervals if this information has – as is in most cases - a clinical meaning. Thus, it is not acceptable to take a generic and non clinically-driven approach to privacy, because it is against the essence of knowledge discovery to just apply flat policies that destroy the integrity of clinically meaningful data. This is a clinically-driven project, thus problem solving approaches must keep this in the best evidence: the risk analysis and the consequent technological and organisational countermeasures must be optimised according to a well understood patient risk (in this case related to privacy) as well as respecting the medical reasoning. Best practices in this domain will be useful for the entire medical domain as well as for the legislator."





Thoughts on year one from our Action Leaders

We asked our Action Leaders for their thoughts following this first year of work. Here is what they said:

Giacomo Pongiglione – Action 1 Leader: Clinical Background Activities, User Requirements, Validation, Outcome Analysis, Workflows

"MD-Paedigree is a Clinically led, model-driven paediatric digital repository", this means that the models must answer to specific clinical questions and problems and therefore that the clinicians must strictly interact and press the technical counterpart in order for the mechanical models to be strictly correspondent to the clinical needs. This is why the MD-Paedigree team place such an emphasis on frequent routine meetings between technical and clinical partners, so that the technical developments are always guided by clinical need.

The relationship between the statistical and the mechanistic model is a key issue that heavily impacts with all the validation work. It is quite clear that any model is just a rough approximation of the reality and no model is intrinsically superior to another. In particular the mechanistic model needs to be validated before it can be incorporated into clinical practice and the best way to do it is through the statistical analysis and therefore through the statistical model. It is evident that eventually the two models will complement each other and will provide a very powerful tool as decision support system."

Olivier Ecabert- Action 2 Leader: Modelling and Simulation Action Leader

"In the early phase, physicians completed the requirements for the tools to be developed taking the clinical constraints into account. Although this step was clearly clinically driven, a feedback loop was naturally established with the technical partners to ensure that the data collected would meet the minimal requirements in order to be able to personalise the multi-scale models, and as such move towards a higher degree of care personalisation.

The integration into prototypes by re-using tools developed in previous and current European projects resulted in demonstrable preliminary results after one year for certain work packages. Even in this early phase notable innovative scientific developments can be identified, some of them already resulted in publications. For instance, a pipeline to automate the personalisation of cardiac models was developed and used to perform the first analysis on clinically relevant parameters. Another example encompasses the fusion of temporal gait data with a bone model of the ankle reconstructed from magnet resonance imaging. The combination of genetic data with imaging and clinical data also has a promising perspective."

David Manset – Action 3 Leader: MD-Paedigree Infostructure

"The first year of activity in MD-Paedigree's Infostructure area has been quite intense. The MD-Paedigree project leverages a core set of 11 legacy ICT assets from involved technical partners. It therefore not only is an ambitious ICT development project, but also represents a significant integration challenge. Six core partners are thus deeply involved in identifying, selecting and implementing appropriate standards and corresponding interfaces between concerned (sub)systems. Beyond the technological core, the MD-Paedigree Infostructure involves 8 partners in total, which represent a total of 372 PM of effort over the 4 years of project activity.

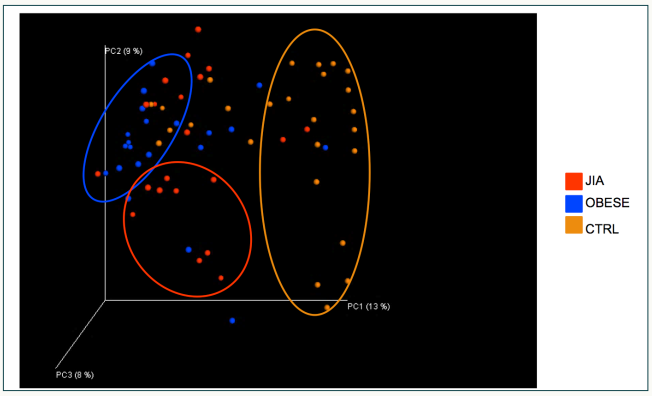
The Infostructure team aimed high and, indeed, the team took on the challenge of participating to the ICT 2013 European Commission and Award competition, coveted by thousands of research projects, institutions and centres from across Europe. MD-Paedigree applied and was eventually selected as one of the privileged 200 exhibitors allowed to enter the competition. After 2 days of live demonstrations, MD-Paedigree won the ICT 2013 Best Exhibit - First Prize Award, last November in Vilnius, in Lithuania.

The Infostructure team is very proud of this major achievement bearing in mind that MD-Paedigree is a project, which had not yet celebrated its first birthday!"

First findings: an early correlation in MD-Paedigree's metagenomics

MD-Paedigree is conducting metagenomic studies in all two disease areas, to see whether metagenomic modelling can also be a useful tool in clinical decision support. By analysing the gut microbiota of Juvenile Idiopathic Arthritis (JIA) patients and obese children at risk of cardiovascular disease. MD-Paedigree aims to explore its potential role in conditioning disease susceptibility as well as immune response in the different stages of disease, thus adding a further important dimension to multiscale analysis.

The first evidence (still based on just an initial sample collection) show some interesting correlations distinguishing these two disease areas from the control samples of unaffected children.



While these correlations await full interpretation, they could lead to new insights into these diseases.

The human body contains over 10 times more microbial cells than human cells, and within each human body, intestinal and other microbiota, along with the 'host' human cells, form a complex ecosystem that, as a whole, interactively performs various biological processes.

The human gut is a dense microbial ecosystem comprised of approximately 100 trillion microorganisms, whose collective genome, the microbiome, is made up from 100-fold more genes than the entire human genome. As a result, some researchers have come to regard the human body as a as 'superorganism' which includes all its indigenous microbes; they think that the composite genome should be referred to as the human 'metagenome', so that sequencing the components of the microbiome can be viewed as a logical albeit ambitious expansion of the human genome project.

Analysis of gut microbiota can provide new insight into the environmental factors which regulate innate and adaptive immune homeostasis and affect the development of systemic autoimmune diseases.

The gastrointestinal tract is the largest human immune organ and home to a complex community of trillions of bacteria that are engaged in a dynamic interaction with the host immune system. Communication between the microbiota and the host establishes and maintains immune homeostasis, enabling protective immune responses against pathogens while preventing adverse inflammatory responses to harmless commensal microbes. Correlations have been found between the composition of gut microbiota and some preferential immune responses.

Next generation 'omics' technologies are now able to describe the gut microbiome at a detailed genetic and functional level. Referred to as synergic meta-omics or systems biology, these approaches provide new insights into the importance of the gut microbiome in human health, and are being used to map microbiome variability between individuals and populations. Research has established the importance of the gut microbiome for numerous systemic disease states, such as obesity and cardiovascular disease, and in intestinal conditions, such as inflammatory bowel disease. Thus, understanding microbiome activity is essential to the development of future personalised strategies of healthcare, as well as potentially providing new targets for drug development.

Why is big data propelling medicine's next quantum leap?

Patrick Ruch

Because big data is prompting technical innovation, and technology is the main driver of social change. Like medical imaging in the 80's, big data is about to reorganise medical practice.

How?

The largest change is driven by biologists with the long tail of disciplines they are creating ex nihilo: genomics, proteomics, metabolomics (the analysis of interactions between biological molecules) and metagenomics (the analysis of microorganisms in the human body), to cite a few. The ability to

associate omics with clinical and behavioural/ environmental features will allow us to build powerful risk assessment models, able to associate genetic profiles, behaviours and risks... provided that the data needed to generate these associations are made available.

Big data solutions for healthcare

MD-Paedigree aims to remove the numerous barriers that threaten the development of big data solutions for healthcare. These barriers include social, technical and epistemological challenges.

The social nature of the challenge is relatively well-known, and not all medical practitioners are digital natives. But let us focus on the technical barriers, expressed by the 5 Vs: volume, velocity, variety, veracity and value. While volume and velocity represent the obvious challenges posed by exponential growth of mainly sequence data, we argue that the main challenges lie in variety, veracity (lack thereof) and value (hard to extract).

Variety

The analysis of genetic sequences requires integration of extremely multimodal data (time-series, images, narratives, sequences ...). The ability to make these heterogeneous data interoperable is today an open scientific problem. The glue required is mainly semantically rich resources, so-called ontologies, able to organise the knowledge of a given field so that machines can analyse it. Today, virtually all serious developers in the biomedical realm make intensive use of ontologies.

From veracity to clinical decision-support.

While traditional evidence-based medicine is constructed using a hypothesis-verification methodology (i.e., all patients with certain symptoms are diagnosed following a stepwise process described in clinical practice guidelines), in the near future, big data clinicians will generate their diagnoses and care plans based on a virtually indefinite set of evidence.

For the first time since Descartes, the status of evidence is thus radically evolving. Evidence was traditionally supported by a crystal-clear discourse: this drug is effective according to this proven mechanism of action. However, big data is changing the conversation: here are the data, from which the following (numerous) associations can be derived.

MD-Paedigree is thus exploring the development of a case based retrieval engine. For a given paediatric case, the idea is to retrieve the files of children having similar anamnesis (e.g., age, gender, diagnosis, abnormalities, bacterial flora, genetic variants, etc.)

to identify the healthcare procedures likely to result in the best outcome. Unlike in evidence-based medicine, where patients are treated with a one-size-fits-all procedure, the treatment will be personalised to optimally suit the patient.

Beyond statistics: clinical decision-making as a social network

MD-Paedigree is also tackling the challenge of federating Europe's clinical repositories.
Alongside this, MD-Paedigree must attempt to balance the isolation of clinicians, whose expertise is questioned in the new paradigm: how can I build a crystal-clear discourse out of tens of thousands of individually weak – yet statistically significant – sets of evidence?

MD-Paedigree's answer is to offer a professional tool for consolidating decision-making, offering clinicians recourse to a second opinion: all information pertaining to a case, as well as all evidence available in the knowledge base, can be shared with a colleague. Other pieces of the puzzle include the future exploitation of social media, with two currently promising threads: social networks for professionals and social networks for patients. The former is represented by private players such the US-based company Sermo, which connects more than 200,000 physicians and allows peers to offer anonymous recommendations.

On the patient side, the trend towards social networks is well illustrated by a recently launched Innovative Medicine Initiative project, which will explore the use of Twitter to identify adverse drug reactions as part of post-market drug surveillance.

This article was first published in
CloudSource Magazine
http://www.sucreproject.eu/content/sucre-cloudsource-magazine

Bottom-up: Towards Supporting Personalised Medicine in the Cloud

Harry Dimitropoulos[1], Anna Gogolou[1], Herald Kllapi[2], Omiros Metaxas[1], Lefteris Stamatogiannakis[2], Eleni Zacharia[1], Yannis Ioannidis[1,2], and MD-Paedigree EU-Project[1] I.M.I.S., Research Centre "Athena", Athens, Greece[2] National & Kapodistrian University of Athens, Greece

A big-data revolution in healthcare is underway. From birth, a person accumulates healthcare data of multiple forms, including clinical records, medical images, genetic data, and data streams produced via mobile applications and wearable devices.

Bottom-up, evidence-oriented analysis

One application of this data deluge is the development of model-guided personalised medicine. In developing personalised medicine, bottom-up (evidence-oriented) analysis is of fundamental interest. Such analysis attempts to identify latent factors (or disease signatures) that can explain and predict similarities and variabilities in drug therapies and disease evolution.

Bottom-up analysis requires ***1) data integration from heterogeneous sources and 2) scalable analytics.***

To this end, our research team is developing a Knowledge Discovery and Data Mining (KDD) platform, called AITION, for biomedical knowledge discovery, feature selection, vertical integration, and semantic modelling under uncertainty. In addition, we utilise Athena Distributed Processing (ADP) middleware providing advanced scaling capabilities, as well as, federated data access that supports a versatile execution of distributed algorithms on ad-hoc clusters and clouds.

The AITION KDD platform

The AITION KDD platform consists of three modules:

(1) Data Curation and Validation (DCV)

(2) Clustering, and

(3) Simulation.

The DCV module provides advanced techniques for data validation and preprocessing; checks for inconsistencies, missing values and outliers; computes medical scores; performs attribute discretisation, and more.

The clustering module is a set of advanced clustering and similarity analysis techniques aiming to identify latent factors (disease signatures) and to group homogeneous patients. Following a mixed membership approach, a patient is characterised by a specific distribution (allocation) on multiple, latent disease signatures. Patient similarity is then computed by comparing such allocations using several metrics.

The simulation module analyses correlations between variables, discovered latent factors and groups to deliver accurate and reusable predictive statistical simulation models based on Graphical Probabilistic Models (GPMs).

It implements state-of-the-art algorithms for Bayesian Network (BN) Structure & Parameter Learning, Markov Blanket induction and feature

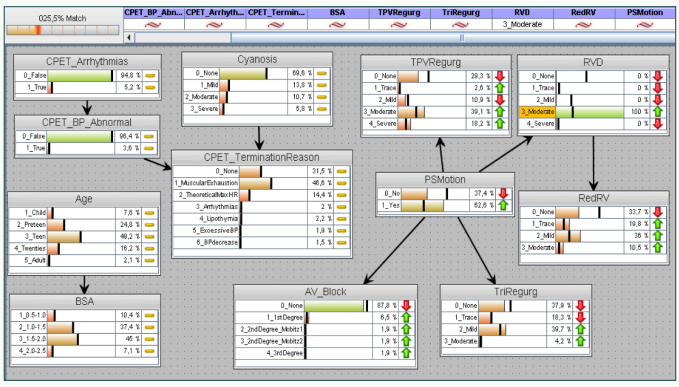


Figure 1 - The real-time inference capabilities of AITION

selection, and real-time inference. The system offers a user-friendly interface to explore the graphical models, as shown in Figure 1.
In addition, ontologies and a-priori knowledge can be incorporated, supporting a top-down (model driven) process that complements bottom-up (evidence oriented) analysis, providing a rich 'natural' framework for semantic modelling under uncertainty, where a domain expert is able to 'seed' the learning algorithm with knowledge about the problem.

Federated data access and scaling utilising ADP
Over the last five years, our group has been building Athena Distributed Processing (ADP), a system for distributed data processing on the cloud.

ADP works to harness the power of cloud computing by defining language abstractions to declaratively express complex computation, and by designing an architecture with clear separation into components with well-defined semantics.

ADP offers a high-level language called ADP Query Language, which is based on SQL enhanced with user-defined functions and a new syntax that makes them easy to use. Thirty years of database technology has shown that declarative languages are important because they offer data and platform independence.

The functionality of the system can be extended with new user-defined functions, which can be as complex as needed. We offer a rich library of user-defined functions to support the AITION platform, including data import (CSV, XML), statistics (Pearson correlation), and more.

This article was first published in
CloudSource Magazine
http://www.sucreproject.eu/content/sucre-cloudsource-magazine

New Partner Presentation: DHZB

Professor Titus Kuehne will lead the work of DHZB on MD-Paedigree. He is formally affiliated with the DHZB and the Charité, Medical University Berlin where he has a Professorship for Non-invasive Cardiovascular Imaging. At the German Center for Cardiovascular Research / German Competence Network - CHD he is heading the imaging infrastructure section. He has expertise in imaging of all age groups (from infants to the elderly) and strong international scientific merits concerning the MR imaging modalities (including 4D blood flow) and post-processing framework (CAIPI).

MD-Paedigree is glad to welcome a new partner to the project. Taking the place of Johns Hopkins University, Deutsches Herzzentrum Berlin formally entered the project in February 2014.

The Deutsches Herzzentrum Berlin (German Heart Institute Berlin, DHZB) is an internationally renowned high-performance hospital for the treatment of cardiovascular and thoracic diseases, for the implantation of mechanical circulatory support systems and for heart and lung transplantation. The research activities of the DHZB cover almost all emerging fields of cardiac diagnostic and therapy, which is reflected by more than 120 peer reviewed publications annually.

DHZB has close international ties and long standing collaborative projects with some of Europe´s leading research institutes. In addition, the DHZB is an important partner of the German Centre for Cardiovascular Research (DZHK; http://dzhk.de/) that is currently Germany's largest joint research initiative in cardiovascular medicine. It is part of the core lab for image processing that was initiated by the German Competence Network more than 8 years ago.

DHZB will contribute to the cardiomyopathy and obesity-modelling aspects of the study by providing integrated clinical data including imaging, genomics, and biochemical markers.

MD-Paedigree and its newly-funded cognate project: Cardioproof

MD-Paedigree has begun a close cooperation with the newly funded Cardioproof project. Cardioproof, which stands for Proof of Concept of Model-based Cardiovascular Prediction, stems from the fact that while previous Virtual Physiological Human (VPH) projects have developed tools for computer-based modelling of various cardiovascular (CV) diseases, the translation of these tools into routine clinical environment has remained challenging. Cardioproof will cope with three key issues bounding the application of VPH models in the everyday clinical practice:

+ Validation: Are the models clinically valid?

+ Comparative effectiveness: Do they result in different treatment decisions? What is the comparative effect on costs?

+ Usability and interoperability: Software application and data management do not comply with clinical requirements (too complex, labour and time consuming).

MD-Paedigree will work closely with Cardioproof, with whom it shares several partners, and will provide them with its advanced platform for data storage and analysis.

Publication Focus:

In this section we present the abstracts of some academic papers produced as a result of MD-Paedigree. Already in this first year we have a number of publications, both published and forthcoming.

- "Health Surveillance. How Knowledge Transfer Changed Biology, Medicine and Health Care". D. Manset In "How Knowledge Transfer Changed Biology, Medicine and Health Care" - WILEY, 2014. In Press. **http://eu.wiley.com/WileyCDA/WileyTitle/productCd-3527332618,subjectCd-PHC0.html**

- "Innovation and Big Data" E. Morley-Fletcher in "From Physics to Daily Life: Applications in Biology, Medicine and Healthcare (Bressan Ed.)" **http://eu.wiley.com/WileyCDA/WileyTitle/productCd-3527332618,subjectCd-PHC0.html**

- LeMonde.fr - "Vers Un Big Data Européen" D. Manset **http://lesclesdedemain.lemonde.fr/sante/vers-un-big-data-europeen-de-la-sante_a-11-3426.html**

- K. Drechsler et al. "Liver Segmentation in Contrast Enhanced MR Datasets using a Probabilistic Active Shape and Appearance Model" (submitted to IEEE CBMS 2014 for publication)

- Tsymbal et al. "Towards Cloud-Based Image-Integrated Similarity Search in Big Data", IEEE BHI 2014. (Forthcoming)

- Neumann et al. "Image-to-Model Framework for Patient-specific Cardiac Electromechanics", ISBI 2014. (Forthcoming)

Upcoming Events

MD-Paedigree will be represented at the following forthcoming events.
Hope to see you there!

eHealth Forum 2014
Athens – Greece - May 12-14, 2014
www.ehealth2014.org

Organised by the Greek Presidency in cooperation with the European Commission, the eHealth Forum 2014 brings together a High-Level eHealth Experts' Conference on European Priorities, the European Innovation Partnership on Active and Healthy Ageing (EIP AHA) – incorporating events and an exhibition, a meeting of the eHealth Network, the 4th EU-US eHealth Marketplace & Cooperation Assembly, and much more.
The event will provide a unique forum for the exchange of experience, good practices innovation and mutual support.

BHI 2014
IEEE-EMBS International Conferences
on Biomedical and Health Informatics
Valencia – Spain - June 1-4, 2014
bhi.embs.org

The second BHI'2014 conference is held in Valencia, Spain during June 1-4, 2014 at the Hotel Balneario Las Arenas. The overall theme of the conference is "Translating key health challenges with advances in biomedical informatics." The conference will cover various topics ranging from cutting edge biomedical and healthcare technology research and development, clinical applications, to biomedical education.

EHFG
17th European Health Forum GasteinGastein - Austria
October 1–3, 2014
www.ehfg.org

The EHFG is the leading health policy event in the EU and takes place annually. It provides a major platform for decision-makers in various fields of public health & health care. With its wide-ranging three-day programme, the EHFG offers an unparalleled opportunity to exchange information about a broad spectrum of contemporary health issues.

ESMAC - SIAMOC 2014
1st Clinical Movement Analysis World Conference
Rome, Italy - September 29 – October 4, 2014
www.esmac-siamoc2014.com

The EHFG is the leading health policy event in the EU and takes place annually. It provides a major platform for decision-makers in various fields of public health & health care. With its wide-ranging three-day programme, the EHFG offers an unparalleled opportunity to exchange information about a broad spectrum of contemporary health issues.

Upcoming Events

Virtual Physiological Human 2014 - VPH 2014
Trondheim, Norway - September 9-12
www.vph-institute.org/events/vph-2014.html
http://www.ntnu.edu/vph2014

Following on from London in 2012 and Brussels in 2010, the Norwegian University of Science and Technology (NTNU) is very pleased to have been awarded to host the 3rd VPH conference by the Virtual Physiological Human Institute. This biannual conference series grew out of the FP7 Virtual Physiological Human Network of Excellence. It has become one of the major instruments for maintaining the coherence and momentum of the highly multidisciplinary VPH community. The members of the VPH community subscribe to the view that a substantially improved healthcare can only be achieved through converged efforts of the life sciences, the mathematical sciences and engineering.

On 14 January 2014 in Strasbourg, Members of the European Parliament specifically endorsed the work of the VPH Institute by recognising the role of the VPH initiative towards improving healthcare in their eHealth Action Plan 2012-2020. VPH2014 participants may thus enjoy the rare claim that they contribute to an initiative that has earned the support of the elected representatives of EU citizens and is directly supported in EU policy.

With a total of up to 60 oral presentations, less than previous conferences, there will be a greater emphasis on the importance of the poster sessions as a means for encouraging dialogue and conveying important results.

Newsletter information

MD-Paedigree Newsletter - Issue 1

Editorial Board

Guest Authors

Subscription

The MD-Paedigree newsletter is published twice a year by the MD-Paedigree consortium and is distributed free of charge.
All issues of the newsletter will be available on our website. For subscription to the newsletter please go to www.md-paedigree.eu

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