

# Orange Data for Development Challenge in Senegal



The Data for Development ('D4D') Senegal Challenge, is a Big Data Open innovation challenge launched under the patronage of the Ministry of Higher Education and Research. It was designed specifically to address societal development and the welfare of Senegal's population.

The project ran from April 2014 to April 2015. Following the 'D4D challenge' in the Ivory Coast in 2012-2013, for this new 2014-2015 edition, Sonatel and Orange, with the participation of the Commission des Données Personnelles of Senegal, have made anonymous data samples extracted from the mobile network in 2013, available to international research laboratories.

The challenge was organized around 5 themes and questions identified in collaboration with the responsible Ministries or partner institutions: health, agriculture, transport/urban planning, energy and national statistics. It aimed also at making progress in data sciences, anonymisation, big data ethics as well as to foster the involvement of local actors and to promote education in this growing field.

It has been made possible thanks to the collaboration of many international institutions which have provided either resources or their own data. The challenge also benefited from the support of our 'D4D Committee' and from the "D4D External Ethic Panel". Both were composed of eminent members of Universities and Institutions leaders in the field of Data for Development and ICT ethics.

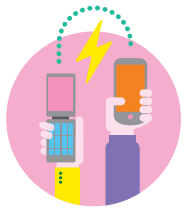
The role of innovation at Orange, is central. It relies on a few steps, healthily unpredictable and creative for some, followed by others that should be more rigorously managed. In all case this requires collaborations and sometimes breaking existing barriers and habits as was the case in D4D Senegal. The best projects have received prizes celebrating their quality and creativity, and thanks to the generosity of our partners, some of them will be selected to explore their capacity to be implemented in the field in a sustainable way, so as to bring their benefits to the populations who need them most.

## Participants from all around the world

The D4D Challenge Senegal gathered the interest of over 260 research labs from all over the world, of which 11 came from Senegal. Out of more than 150 teams who worked on the data, close to 60 high quality projects were submitted on time for the competition on 31 December 2014.

40% of the projects aimed at improving the transportation and urbanism in Senegal. Health was at the heart of the preoccupations of the scientists too with 20% of the projects submitted in this area, while 15% of the projects were dealing with national statistics. The remaining 25% were spread between agriculture, energy, datavisualisation or anonymisation.

# And the winners are...



## **First Prize and Energy Prize: Using mobile phone data for electrification planning**

E.A. Martínez-Ceseña <sup>(1)</sup>, P. Mancarella <sup>(1)</sup>, M. Ndiaye <sup>(2)</sup>, and M. Schlöpfer <sup>(3)</sup>

Knowledge of local energy needs is crucial for the electricity infrastructure planning of a country. We have shown that mobile phone data are an accurate proxy of the energy needs and can be used to develop bottom-up demand models. The new methodology supports and prioritizes the electrification plans in areas with scarce information on local activities and energy consumption.

(1)University of Manchester, UK - (2) Ecole supérieure polytechnique de Dakar UCAD, Senegal - (3) Santa Fe Institute, USA



## **Agriculture Prize: Genesis of millet prices in Senegal: the role of production, markets and their failures**

D.C. Jacques <sup>(1)</sup>, R. d'Andrimont <sup>(1)</sup>, J. Radoux <sup>(1)</sup>, F. Waldner <sup>(1)</sup>, and E. Marinho <sup>(2)</sup>

Information asymmetries are responsible for price differentials in only the few areas where the mobile phone coverage has not yet reached its full potential, which damages both poor producers and food insecure consumers. To address this issue, we have integrated it in a spatially explicit model that simulates the functioning of agricultural markets.

(1) Earth and Life Institute, Université Catholique de Louvain, Belgium - (2) Independent researcher, Rio de Janeiro, Brazil



## **Health Prize: Uncovering the impact of human mobility on schistosomiasis...**

L. Mari <sup>(1)</sup>, R. Casagrandi <sup>(1)</sup>, M. Ciddio <sup>(1)</sup>, S.H. Sokolow <sup>(2)</sup>, G. De Leo <sup>(2)</sup>, and M. Gatto <sup>(1)</sup>

Schistosomiasis is water based parasitic worm infection with debilitating symptoms affecting millions of people. We show that a relatively simple model can reliably reproduce regional patterns of schistosomiasis prevalence across the country. We use the model to study the role of human mobility on disease dynamics and to analyze intervention strategies aimed at reducing disease burden.

(1)Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Italy - (2) Hopkins Marine Station, Stanford University, USA

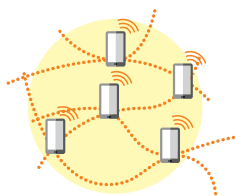


## **National Statistics Prize: Virtual Networks and Poverty Analysis in Senegal**

N. Pokhriyal, W. Dong, and V. Govindaraju

Computer Science and Engineering, State University of New York at Buffalo, USA

Poverty is a complex phenomenon, but can be approximated by observing mobile phone usages and mobility at regional level and extrapolated at more granular level. Poverty maps showcasing multiple perspectives can provide policymakers with better insights for effective responses for poverty eradication.

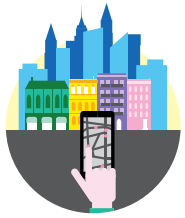


## **Transport Prize: National and Regional Road Network Optimization for Senegal Using Mobile Phone Data**

Y. Wang <sup>(1)</sup>, G. Homem de Almeida Correia <sup>(1)</sup>, and Erik de Romph <sup>(1,2)</sup>

Anonymous mobile phone traces can be filtered with an algorithm to generate a proxy for a trip origin-destination matrix. This is used to develop a gravity model that predicts the future mobility in the country dependent on travel time and number of calls and messages between the departments. This information is then used to improve decision making for road network planning.

(1) Department of Transport and Planning, Delft University of Technology, The Netherlands - (2) DAT.mobility, The Netherlands



### **Data Crossing Prize: Using mobile phone data for Spatial Planning simulation and Optimization Technologies (SPOT)**

S. Gueye <sup>(1)</sup>, B.M. Ndiaye <sup>(3)</sup>, D. Josselin <sup>(3)</sup>, M. Poss <sup>(5)</sup>, R.M. Faye <sup>(2)</sup>, P. Michelon <sup>(1)</sup>, C. Genre-Grandpierre <sup>(3)</sup>, and F. Ciari <sup>(4)</sup>

We propose a methodology of location and relocation of amenities (home, shop, work, leisure places) for urban planning decision. Our methodology exploits mobile phone data and other variables and point of interest on maps to propose optimal amenity locations to reduce the overall travel time or travel distance.

(1) LIA, Université d'Avignon, France - (2) LTI, ESP - Université de Cheikh Anta Diop, Senegal - (3) LMDAN, FASEG-Université de Cheikh Anta Diop, Senegal - (4) Institute for Transport Planning and Systems (IVT), Zurich, Switzerland - (5) UMR ESPACE, CNRS, Avignon, France



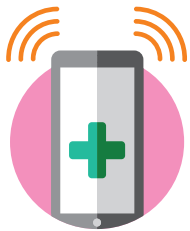
### **Data Visualization Prize: Data for Development Reloaded: Visual Matrix Techniques for the Exploration and Analysis of Massive Mobile Phone Data**

S. van den Elzen, M. van Dortmont, J. Blaas, D. Holten, W. van Hage, J-K. Buenen, J.J. van Wijk, R. Spousta \*, S. Sala \*, S. Chan \*, A. Kuzmickas \* University of Technology SynerScope BV Sensemaking Fellowship

Eindhoven University of Technology & SynerScope BV, The Netherlands

\* Sensemaking Fellowship (MIT, Harvard University)

In our Visual analytics techniques for the exploration and analysis of massive mobile phone data, users are enabled to identify both temporal and structural patterns such as normal behavior, outliers, anomalies, periodicity, trends and counter-trends.



### **Practical Application Prize: Mobile Data as Public-Health Decision Enabler: A Case Study of Cardiac and Neurological Emergencies**

E. Mutafungwa <sup>(1)</sup>, F. Thiessard <sup>(2)</sup>, M. Pathé Diallo <sup>(2)</sup>, R. Gore <sup>(3)</sup>, V. Jouhet <sup>(2)</sup>, C. Karray <sup>(4)</sup>, N. Kheder <sup>(4)</sup>, R. Sadedem <sup>(4)</sup>, J. Hämäläinen <sup>(1)</sup>, G. Diallo <sup>(1)</sup>

The objective of the study is to show the areas in which the absence of a nearest hospital can result in death or serious squeals. The identification of areas at high risk in case of stroke of myocardial infarction, requiring rapid intervention, could help Public Health decision makers to prioritize investments.

(1) Department of Communications and Networks, Aalto University School of Electrical Engineering, Finland - (2) ERIAS INSERM U897, ISPED, Université de Bordeaux, France - (3) Virginia Modeling Analysis and Simulation, Old Dominion University, USA - (4) Faculté des Sciences de Tunis, University of Tunis, Tunisia



### **Scientific Prize and Ethics Mention: Construction of socio-demographic indicators with digital breadcrumbs**

F. Bruckschen <sup>(1)</sup>, T. Schmid <sup>(2)</sup>, T. Zbiranski <sup>(1)</sup>

We show that socio-demographic indicators such as population, age, literacy, poverty, religion, ethnicity, electricity supply and others can be estimated in unprecedented detail and virtually ad-hoc using antenna-to antenna traffic data only. We offer a uniform approach that can be easily extended to other variables. Results are tested for spatio-temporal robustness and visualized as heat maps.

(1) Humboldt Universität Berlin, Germany - (2) Freie Universität Berlin, Germany



**Mr. Alioune N'diaye**  
**CEO Sonatel Group**

We would like to thank very sincerely the community of researchers who got involved in this adventure, the project partners and the Senegal Ministers who have agreed to take part by submitting their questions, as well as all those who from near or afar contributed to making 'D4D Senegal' such a success. It shows how the ICT sector can help the development of our country. It will be a starting point for aiding the development of Senegal and helping our fellow citizens to live a better life.



**Mr. Jake Kendall**  
**Program Officer in the Financial Services for the Poor initiative at the Bill & Melinda Gates Foundation**

Mobile data is the most expansive digital dataset that encompasses the world's poorest citizens. This data is rich, dynamic, and very high resolution allowing it to power a wide array of programs that benefit the poor.



**Mr. Olivier Sagna**  
**Director of Studies and Cooperation at the Ministry for Higher Education and Research of Senegal**

In Africa, where reliable statistics are scarce, data analysis, particularly based on big data generated by mobile networks, represents both new decision aids for those who design public policies and an almost inexhaustible source of inspiration for developers. African institutions of higher education and research need to focus quickly and strongly on this issue.



**Mr. Robert Kirkpatrick**  
**Director of Global Pulse, United Nations**

A High Level Panel appointed by UN Secretary-General Ban Ki-moon has called for a «Data Revolution» to achieve sustainable development. Indeed, there is a tremendous opportunity in unlocking Big Data and utilizing it alongside with traditional data to reveal new insights that can help combat societal challenges such as poverty, disease, and climate resilience. To deliver on the promise of big data for development, we must come together to learn to harness it safely and responsibly. D4D Senegal represents a milestone in mobilizing a data revolution for sustainable development in Africa. All of the partners and participants of D4D Senegal embarked together on an effort that has yielded brilliant innovations which will inspire countless others to build upon.



**Pr. Vincent Blondel**  
**Université catholique de Louvain (Belgium) and Massachusetts Institute of Technology (USA)**  
**Chairman of the Orange 2015 "data for development" committee**

One of the main hurdles still hindering progress in the field of Data for Development is enabling to access and share anonymous data in responsible ways that bring open innovation opportunities to local ecosystems. The approach demonstrated by Orange Sonatel with D4D by involving multiple actors, enabling progress in a number of fields and identifying real potential for society impacts, has been really remarkable.



**Pr Alex (Sandy) Pentland**  
**Director of the Human Dynamics Laboratory and Media Lab Entrepreneurship Program at MIT**

As Chair of the World Economic Forum Council on data driven development, and member of the UN General Secretary Generals Sustainable Development advisory group, I can assure D4D participants that your work will change the world, leading humanity to a more transparent, accountable, and sustainable future. I am happy to host this important event here in my laboratory at MIT.



**Mr William Hoffman**  
**Head of the World Economic Forum's Telecommunications Industry Group**

The use of data to deliver positive social impact holds unique potential for the global development community.

Yet despite this tremendous opportunity, uncertainties and risks remains requiring effective governance in a real world context, to protect the interest of individuals and communities.

The Data for Development initiative provides a world-class platform for uncovering those issues and finding pragmatic and safe ways forward.



[www.d4d.orange.com](http://www.d4d.orange.com) / Twitter: @O4Dev



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