

## **Alfredo Jose Morales-Guzmán**

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### **Bio**

My research is about understanding complex social systems by analyzing big data with mathematical, computational and visualization techniques. I work at the intersection of data analytics, computer science, statistics, applied physics and artificial intelligence. I analyze large datasets that result from human activity on social media, internet, mobile phones or purchases, in order to retrieve unstructured patterns of collective behaviors that are linked to large scale societal phenomena. I work closely with world class researchers from academia and industry, including institutions like MIT, Harvard and the UN. I have published my work in multiple scientific journals and international conferences. My areas of interest include: data science, statistics, artificial intelligence, complex systems, socio-economic systems, social dynamics, market dynamics, urban systems, urban segregation, political engagement, political polarization and social influence.

### **Current**

#### Senior Postdoctoral Fellow

New England Complex Systems Institute (Cambridge, since 2015)

#### Visiting Scientist

MIT (Media Lab - Human Dynamics Lab, since 2016)

#### Parallel Appointment

Brandeis University (Department of Chemistry, since 2015)

#### Collaborator at

Harvard Kennedy School (Growth Lab, since 2016)  
United Nations (Global Pulse and UNICEF, 2013-2015)

### **Education**

#### PhD in Physics of Complex Systems

Technical University of Madrid (Spain, 2014)  
Collaboration with Telefonica Research and the UN (Global Pulse and WFP)  
Research stay at the New England Complex Systems Institute  
Grade: Cum Laude. Awarded as excellent thesis.

#### MSc in Physics of Complex Systems

Technical University of Madrid (Spain, 2011)  
Grade: Outstanding

Telecommunication Engineer

Technical University of Catalunya (Spain, 2008)

Position: 18 out of 286 students

Note: I started school in Caracas, Venezuela and was awarded to complete my studies in Spain. In Venezuela my position was 3 out of 50 students.

## Schools

Real World Risk Institute - <http://realworldrisk.com/> (2016)

Lectured by Nassim Taleb. School on real world risk management, anti fragility and extreme events.

NECSI Summer School - <http://necsi.edu/education/school.html> (2014)

School on Complex Systems. Fundamentals and modeling.

## Computational Skills

Advanced software developer: Python (scientific analysis and machine learning libraries like numpy, scipy, matplotlib, scikit, keras, tensorflow), Java, .Net and Matlab.

Artificial intelligence and machine learning: unsupervised (k-means, knn, topic models), classification (bayesian learning, logistic regression, trees, neural networks), regression, spectral analysis (pca, mds, t-SNE), multi scale analysis, social network analysis, deep learning

Data base administrator: SQL, MongoDB, Map Reduce.

Data visualization: processing, d3.js, GIS (shapefiles, maps) and networks (Gephi, Cytoscape).

Modeling: mathematical, statistical, simulations and networks.

## Invited Talks

Collective Response to Emergent Epidemics

University of Guadalajara

Guadalajara, Mexico, 2017

The Science of Human Behavior from Twitter Activity

NECSI

Cambridge, MA, March, 2017

Complex Systems, Data and Societies

Harvard Kennedy School

Cambridge, MA, January, 2017

Complex Systems and Societies

MIT Media Lab

Cambridge, MA, November, 2016

Complex Social Systems

Universidad Nacional de Colombia

Bogota, Colombia, 2016

## Teaching

Data Analytics at NECSI Winter and Summer School, and Executive Meetings

New England Complex Systems Institute.

Cambridge, MA, 2016-2017

Numerical computation in Python  
Technical University of Madrid  
Madrid, Spain, 2012-2014

Software development in Java  
AEDE Technology School  
Madrid, Spain, 2012

Teacher Assistant of Calculus and Physics  
Universidad Católica Andrés Bello  
Caracas, Venezuela, 2003/2006

## **Publications**

AJ Morales, V. Vailala, RM Benito, Y Bar-Yam, Global Patterns of Synchronization in Human Communications, *Journal of Royal Society Interface*, 14 (128), 20161048.

AJ Morales, JC Losada, RM Benito. Users structure and behavior on an online social network during a political protest. *Physica A: Statistical Mechanics and its Applications* 391 (21), 5244-5253. 2012

AJ Morales, J Borondo, JC Losada, RM Benito. Efficiency of human activity on information spreading on Twitter. *Social Networks* 39, 1-11. 2014

AJ Morales, J Borondo, JC Losada, RM Benito. Measuring political polarization: Twitter shows the two sides of Venezuela. *Chaos: An Interdisciplinary Journal of Nonlinear Science* 25, 033114. 2015

AJ Morales, W Creixell, J Borondo, JC Losada, RM Benito. Understanding ethnical interactions on Ivory Coast. *Proceedings of the Third Conference on the Analysis of Mobile Phone Datasets*. 2013

AJ Morales, W Creixell, J Borondo, JC Losada, RM Benito. Characterizing ethnic interactions from human communication patterns in Ivory Coast. *Networks and Heterogeneous Media* 10 (1), 87–99. 2015

AJ Morales, JC Losada, RM Benito. Structure and dynamics of emerging social networks from twitter's conversation. *Int J Complex Systems in Science* 1 (2), 216-220. 2011

AJ Morales, V Vailala, RM Benito, Y Bar-Yam. Global Patterns of Human Synchronization. *arXiv preprint arXiv:1602.06219*. 2016

AJ Morales, J Borondo, JC Losada, RM Benito. Characterizing and Modeling Collective Behavior in Complex Events on Twitter. *Proceedings of the European Conference on Complex Systems*, 643-649. 2012

D Pastor-Escuredo, A Morales-Guzmán, Y Torres-Fernández, Alex Rutherford, et al.. Flooding through the lens of mobile phone activity. *Global Humanitarian Technology Conference (GHTC), IEEE*, 279-286. 2014

J Borondo, AJ Morales, RM Benito, JC Losada. Mapping the online communication patterns of political conversations. *Physica A: Statistical Mechanics and its Applications* 414, 403-413. 2014

J Borondo, AJ Morales, JC Losada, RM Benito. Characterizing and modeling an electoral campaign in the context of Twitter: 2011 Spanish Presidential election as a case study.. Chaos: an interdisciplinary journal of nonlinear science 22 (2), 023138. 2012

J Borondo, AJ Morales, RM Benito, JC Losada. Multiple leaders on a multilayer social media. Chaos, Solitons & Fractals 72, 90-98. 2015

S Martin-Gutierrez, J Borondo, AJ Morales, JC Losada, AM Tarquis, et al. Agricultural activity shapes the communication and migration patterns in Senegal. Chaos: An Interdisciplinary Journal of Nonlinear Science 26 (6), 065305. 2016

S Martín, J Borondo, AJ Morales, JC Losada, AM Tarquis, RM Benito. Phone traffic as a measurement of agricultural events. EGU General Assembly Conference Abstracts 17, 14947. 2015

D Evans, F Nijhout, R Parens, AJ Morales, Y Bar-Yam. A possible link between pyriproxyfen and microcephaly. Available at SSRN. 2016

### **Professional Experience (Before PhD)**

*Sony* (Barcelona, 2006)  
Position: Software developer and IT support.

*Abertis Telecom* (Barcelona, 2007/2008)  
Position: Statistical analysis. Business Intelligence. Software developer (.NET)

*Pasiona Consulting* (Barcelona, 2009)  
Client: Grupo Catalana Occidente  
Position: Software developer (.NET)

*Advantic Sistemas y Servicios* (Madrid, 2010)  
Area: ICT Consultant  
Position: Software developer (.NET, Sharepoint, PHP). R&D consultant.

### **Languages**

Spanish	Native
English, Portuguese	Advanced - LSC Language Studies Canada (Toronto, 2005)
Italian, French, Catalan	Basic

### **Media Coverage**

MIT Technology review. The Best of the Physics arXiv (week ending March 5, 2016)  
<https://www.technologyreview.com/s/600956/the-best-of-the-physics-arxiv-week-ending-march-5-2016/>

Phys.org  
How social media has synchronized human civilization  
<https://phys.org/news/2017-02-social-media-synchronized-human-civilization.html>

La Vanguardia  
Twitter produce un patrón de sincronización humana en medio planeta  
<http://www.lavanguardia.com/vida/20170301/42420071068/twitter-produce-un-patron-de-sincronizacion-humana-en-medio-planeta.html>

AIP: Using Twitter to Probe Political Polarization  
<https://publishing.aip.org/publishing/journal-highlights/using-twitter-probe-political-polarization>

Science 2.0 : How Understanding The Heterogeneous Topocracy Of Twitter Can Help The Future [http://www.science20.com/news\\_articles/how\\_understanding\\_the\\_heterogeneous\\_topocracy\\_of\\_twitter\\_can\\_help\\_the\\_future\\_of\\_science\\_20-148177](http://www.science20.com/news_articles/how_understanding_the_heterogeneous_topocracy_of_twitter_can_help_the_future_of_science_20-148177)

EurekAlert: Tweet much to gain popularity is an inefficient strategy  
<http://phys.org/news/2014-10-tweet-gain-popularity-inefficient-strategy.html>

International Business Times : Over-Tweeting is an Inefficient Way to Become Popular, According to Scientists. <http://www.ibtimes.co.uk/over-tweeting-inefficient-way-become-popular-according-scientists-1472623>

El Pais: No por mucho tuitear se consiguen más seguidores  
[http://elpais.com/elpais/2014/11/06/icon/1415279604\\_852171.html](http://elpais.com/elpais/2014/11/06/icon/1415279604_852171.html)

ABC: Tuitear mucho para ganar popularidad no da resultado  
<http://www.abc.es/tecnologia/redes/20141030/abci-tuitear-mucho-ineficiente-201410301217.html>

Es Materia: Twitter adelantó la victoria electoral de Rajoy  
<http://esmateria.com/2012/07/24/twitter-adelanto-la-victoria-electoral-de-rajoy/>

## **Scholarships**

Research stay at New England Complex Systems Institute, Cambridge, USA (2014)  
PhD Scholarship UPM-BSCH (2013-2014)  
PhD Scholarship UPM GI110230105 (PI Prof. Rosa Maria Benito Zafrilla, 2011-2012)  
PhD Scholarship UPM P100230362 (PI Prof. Juan Carlos Losada Gonzalez, 2011)

## **International Conferences**

Conference of Complex Systems, Amsterdam, Cancun, 2017  
"Patterns of Global Synchronization"  
"Political Activity on Twitter"  
"Patterns of Virtual and Physical Behavior"

International Conference on Computational Social Science, Germany, 2017  
"Patterns of Virtual and Physical Behavior"

Conference of Complex Systems, Amsterdam, Netherlands, 2016  
"Patterns of Human Synchronization"  
"Agricultural activity shapes the communication and migration patterns in Senegal"

Conference of Complex Systems, Phoenix, USA, 2015  
"Visualizing collective dynamics in New York City through Twitter activity"  
"Political Polarization on Twitter: Venezuela"

Net-Sci, Zaragoza, Spain, 2015  
"Influence of Social Networks on online communication patterns of political conversations"  
"Multiple leaders on a multilayer social media"

Net-Sci, San Francisco, USA, 2014

"Efficiency of human activity in retransmission processes on Twitter"

Net-works. Madrid, Spain, 2013

"Unveiling ethnical and regional interactions from Ivory Coast mobile communication patterns" (Awarded as best poster)

"Efficiency of human activity in retransmission processes on Twitter"

WIN: Workshop on Information in Networks, New York, USA, September 2013

"Efficiency of human activity on information spreading on Twitter"

D4D Challenge, NetMob, Cambridge, MA, USA, 2013

<http://perso.uclouvain.be/vincent.blondel/netmob/2013/>

"Understanding Ethnical Interactions in Ivory Coast"

CompleNet, Berlin, Germany, 2013

"The impact language and nationalist currents have on the Spanish Politics"

"Analyzing an Electoral Campaign in the context of Social Media "

WIN: Workshop on Information in Networks, New York, USA, September, 2012

"User and Politician Behaviors in Twitter During 2011 Spanish Presidential Election Campaign"

European Conference on Complex Systems, Brussels, Belgium, September, 2012

"Characterizing and Modeling Collective Behavior in Complex Events on Twitter."

The 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications.  
Orlando, Florida, USA, 2012

"Analyzing offline events through the mirror of Online Social Networks"

"Users structure and behavior in an online social network during a political protest"

NetSci, Chicago, Illinois, USA, 2012.

"Analyzing human social behavior in the context of online social networks"

"Characterizing Online Political Activism in Twitter: A Complex Network Approach"

3<sup>rd</sup> Workshop on Complex Networks. CompleNet, Melbourne, Florida, USA, 2012

"Emerging Social Structure and Dynamics from Twitter's Conversations"

Net-works, Complex Networks: Structure, applications and related topics. Madrid, Spain, 2011.

"Dynamics on complex networks of conversations on Twitter"