



<http://cointoolbox.github.io/>

# COIN

## *Methodology and Software for Cosmology*

Emille Ishida  
MPA – Germany

*Python in Astronomy – Leiden, April 2015*



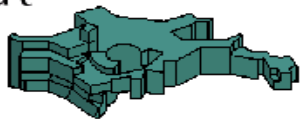
# COIN

*Methodology and Software for Computational*

*High-end education*

*Astronomy*

Emille Ishida  
MPA - Germany



## *Mission:*

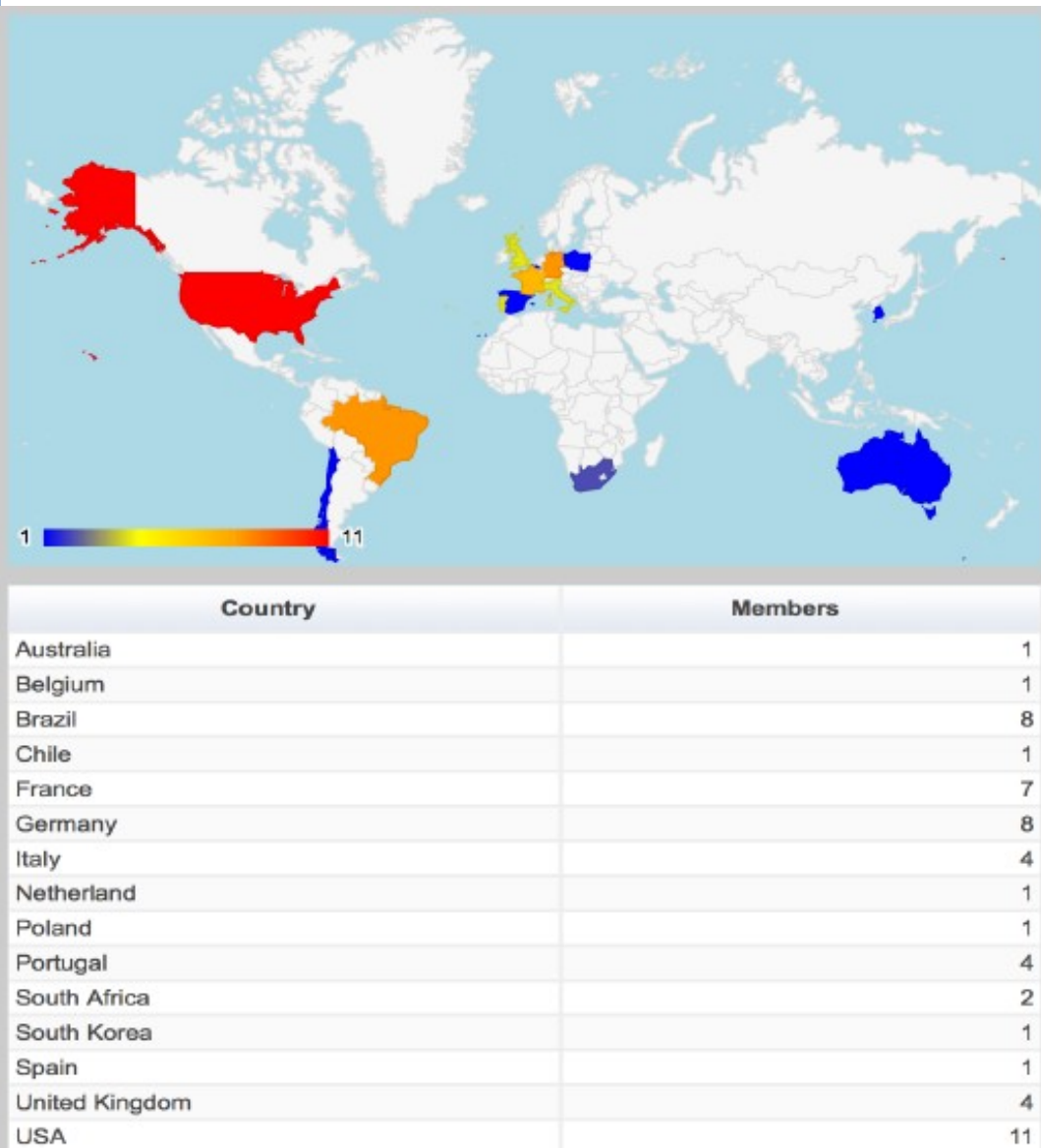
The Cosmostatistics Initiative (COIN), an international working group built under the umbrella of the International Astrostatistics Association (IAA), aims to create an interdisciplinary environment where collaborations between astronomers, statisticians and machine learning experts can flourish.

# Meet COIN

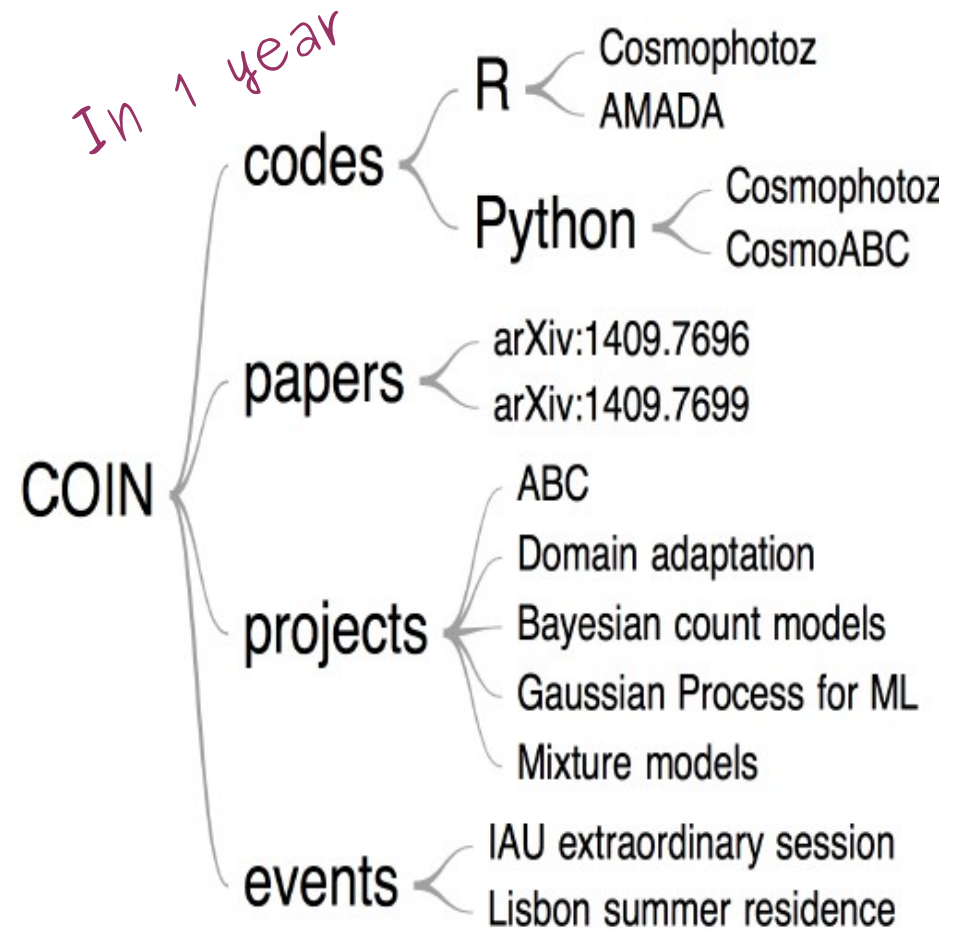
Lead by Rafael de Souza (ELTE, Hungary)

**50** researchers from **15** countries

Nearly half actively involved in an ongoing project



## Scientific outcomes



Cosmostatistics Initiative



*Long term goal:*

Establish Astrostatistics as a discipline on its own.

*Short term goal:*

Make astronomers, statisticians, computer scientists and machine learning experts understand each other ...  
WHILE doing science.....



**Cosmostatistics Initiative**



Statisticians  
love R...



... as we love Python



COIN tries to be bilingual  
as much as possible

**Cosmostatistics Initiative**



# How we work



We recognize people with skills which might be used to solve a scientific problem, and propose it.



A COIN member come to us, describe the problem and we look at the pool of people which might be interested in the project.

## All COIN products are open



“This is basically a matter of representativeness, since the redshift (distance) covered by the SDSS (telescope 1) training (spectroscopic) sample is close to complete when compared to the test (photometric) sample, which is not the case in DES (telescope 2)”.



# The first COIN Summer Residence Program

August/2014, Lisbon



**Cosmostatistics Initiative**



# The first COIN Summer Residence Program

August/2014, Lisbon

## The Overlooked Potential of Generalized Linear Models in Astronomy - I: Binomial Regression and Numerical Simulations

R S. de Souza<sup>a</sup>, E. Cameron<sup>b</sup>, M. Killedar<sup>c</sup>, J. Hilbe<sup>d,e</sup>, R. Vilalta<sup>f</sup>, U. Maio<sup>g,h</sup>, V. Biffi<sup>i</sup>, B. Ciardi<sup>j</sup>, J. D.  
Riggs<sup>k</sup>, for the COIN collaboration

arXiv:1409.7696v1

## The Overlooked Potential of Generalized Linear Models in Astronomy-II: Gamma regression and photometric redshifts

J. Elliott<sup>a</sup>, R. S. de Souza<sup>b</sup>, A. Krone-Martins<sup>c</sup>, E. Cameron<sup>d</sup>, E. E. O. Ishida<sup>e</sup>, J. Hilbe<sup>f,g</sup>, for the COIN  
collaboration

arXiv:1409.7699v1

## cosmoabc: Likelihood-free inference via Population Monte Carlo Approximate Bayesian Computation

<http://arxiv.org/abs/1504.06129>

E. E. O. Ishida<sup>1</sup>, S. D. P. Vitenti<sup>2</sup>, M. Penna-Lima<sup>3,4</sup>, J. Cisewski<sup>5</sup>, R. S. de Souza<sup>6</sup>, A. M. M. Trindade<sup>7,8</sup>  
E. Cameron<sup>9</sup> and V. C. Busti<sup>10</sup> for the COIN collaboration

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# The second COIN Summer Residence Program

Sometime in the second semester of 2015, somewhere in the UK



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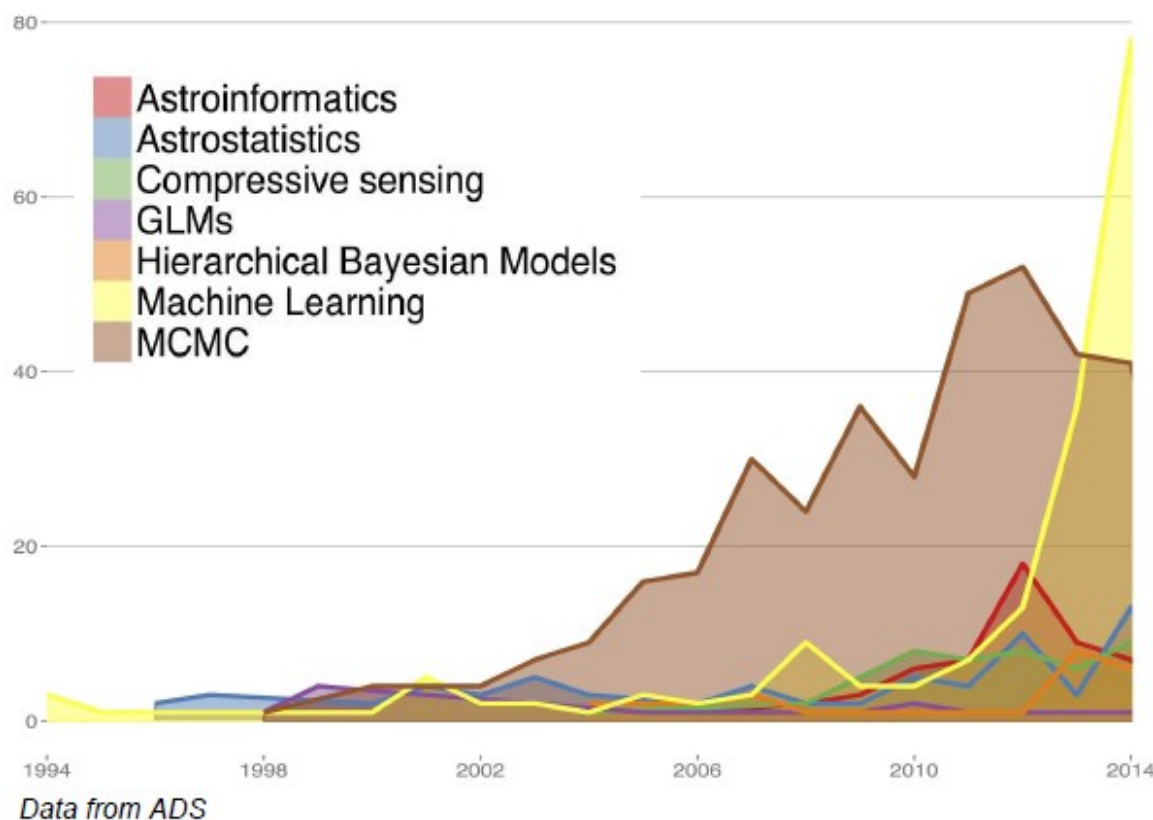
# What's next?

November 04, 2014

## The rise of astrostatistics

Astrophysicists and cosmologists are turning to statisticians to help them analyze an ever-increasing deluge of data.

By Lori Ann White



Significance, Dec/2014

astrostatistics

## Making sense of massive unknowns

Astronomy data sets are astronomically big – that is why statistical approaches are needed to analyse, organise and unravel the mysteries of the universe. By Rafael de Souza and Emille Ishida

Cosmostatistics Initiative



Astronomy is still inspiring!





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