

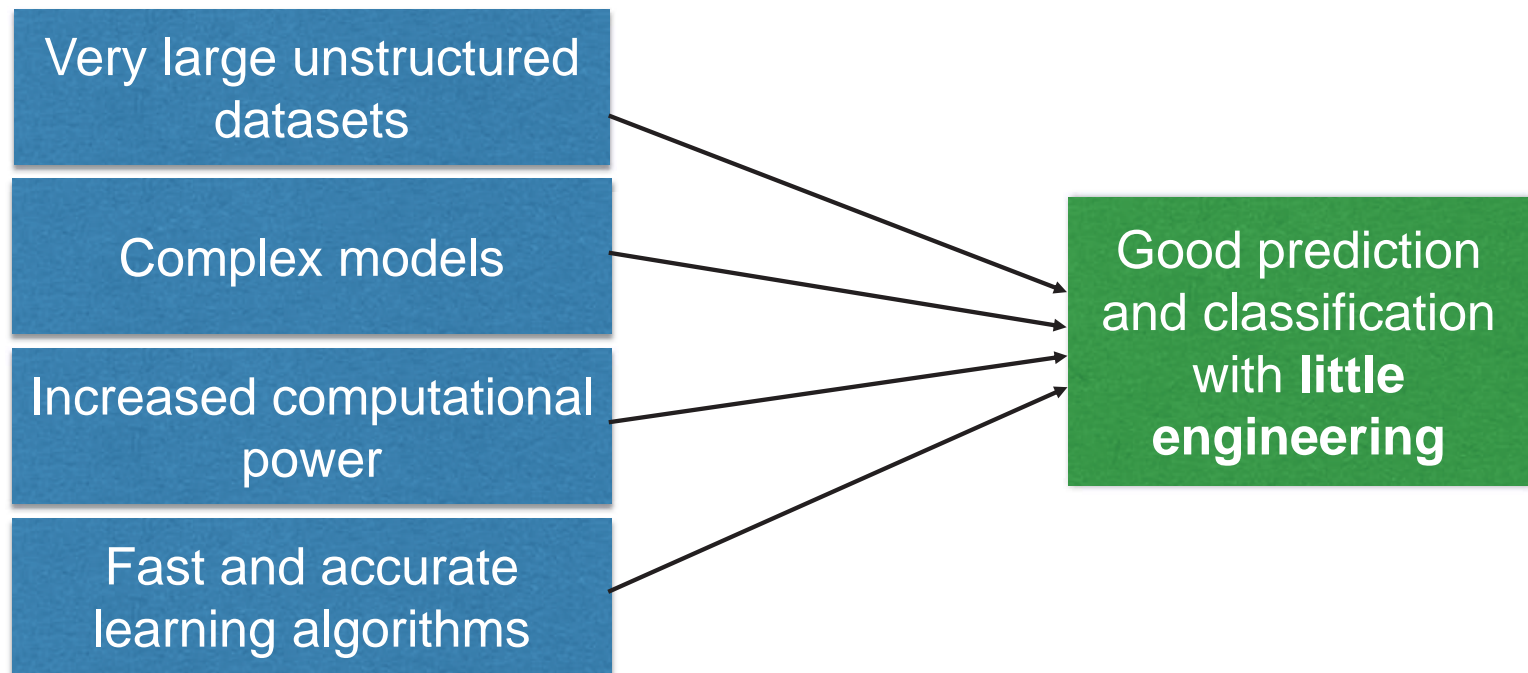
# “Big data” machine learning for prediction and classification

Daniel Acuna, Ph.D.

Rehabilitation Institute of Chicago &  
Northwestern University

# “Elevator speech”

- Perfect storm for breakthroughs in machine learning



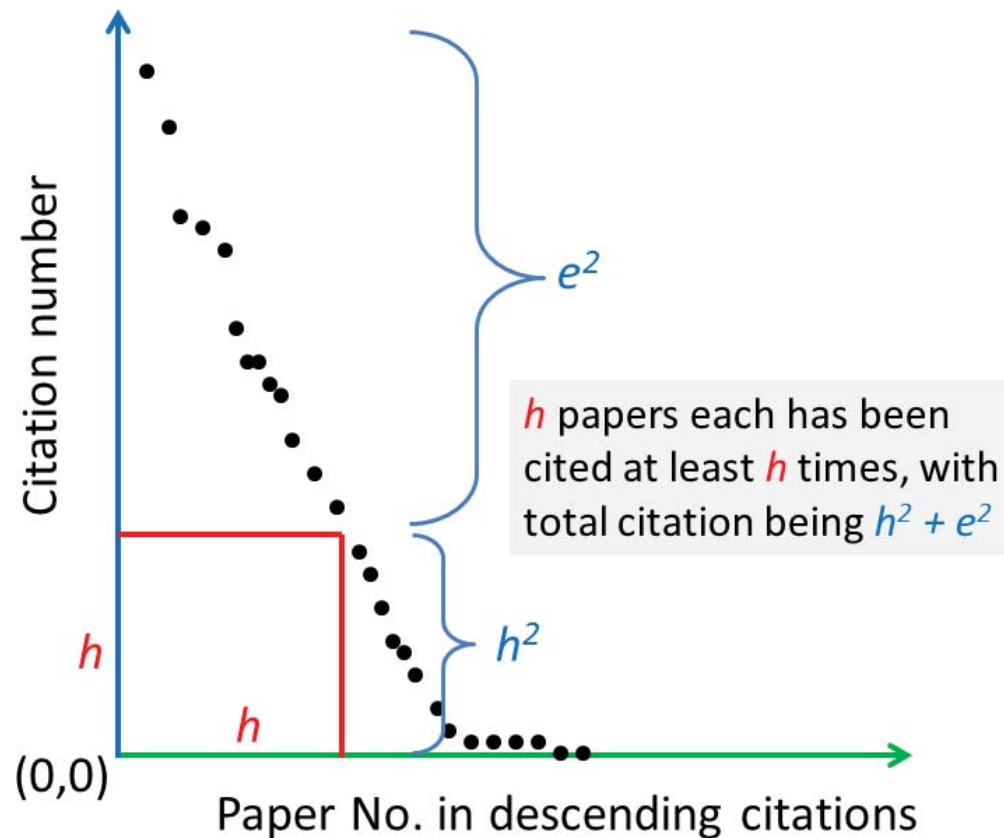
# Predicting scientific success

- Typically done by a committee of experts based on education, awards, experience, publications, and funding.



# Quantitative measure of scientific “success”

- h-index: Measure of scientific “success”



# Index of success using “big data”?

- Combining large datasets from heterogenous sources

## Publications



**Daniel E. Acuna**  
 Rehabilitation Institute of Chicago and Northwestern University  
 Cognitive Sciences - Computational Neuroscience - Adaptive Optimal Control  
 Verified email at umn.edu  
[Homepage](#)

Citation indices	
	Since 2009
Citations	78
h-index	3
i10-index	3

Title / Author	Cited by	Year
Future Impact: Predicting scientific success DE Acuna, S Allesina, KP Kording Nature 489 (7415), 201-202	38	2012
Structure Learning In Human Sequential Decision-Making DE Acuna, PR Schrater Neural Information Processing Systems	18	2009
Bayesian modeling of human sequential decision-making on the multi-armed bandit problem D Acuna, P Schrater Proceedings of the 30th Annual Conference of the Cognitive Science Society ...	12	2008
Toward Perceiving Robots as Humans: Three Handshake Models Face the Turing-Like Handshake Test G Avraham, I Nisky, HL Fernandes, DE Acuna, KP Kording, GE Loeb, ... Haptics, IEEE Transactions on S (3), 196-207	3	2012
People efficiently explore the solution space of the computationally intractable traveling salesman problem to find near-optimal tours DE Acuña, V Parada	2	2010

## Funding

**NIH RePORTER**  
 Version: 6.3.0

About RePORTER DATA

QUERY | BROWSE NIH | MATCHMAKER BETA

SUBMIT QUERY | CLEAR QUERY

### RESEARCHER AND ORGANIZATION

Principal Investigator (PI) / Project Leader:  
 (Last Name, First Name)

Organization:  **LOOKUP**

Department:  **SELECT**

Organization Type:  **SELECT**

### TEXT SEARCH

Text Search (Logic):

And  
 Or  
 Advanced

Projects  
 Publications  
 News

## Collaboration



**Konrad P Kording** (Tree - Distance to... - Progeny - Nearest Nobel - Oldest ancestor)

Institution: Northwestern University  
 Area: Motor Control, Bayesian statistics, Normative models  
 Mean distance: 5.38 (cluster 15)  
 Home page: <http://www.koerding.com/>  
 Pub med: Kording+KP  
 Cross-listed: MathTree  
 Report error

**Parents**

Peter König	grad student	University of Zurich
Rodney J Douglas	grad student 1999-2003	University of Zurich
Daniel M Wolpert	post-doc 2002-2004	University College London
Josh Tenenbaum	post-doc 2004-pres	Massachusetts Institute of Technology

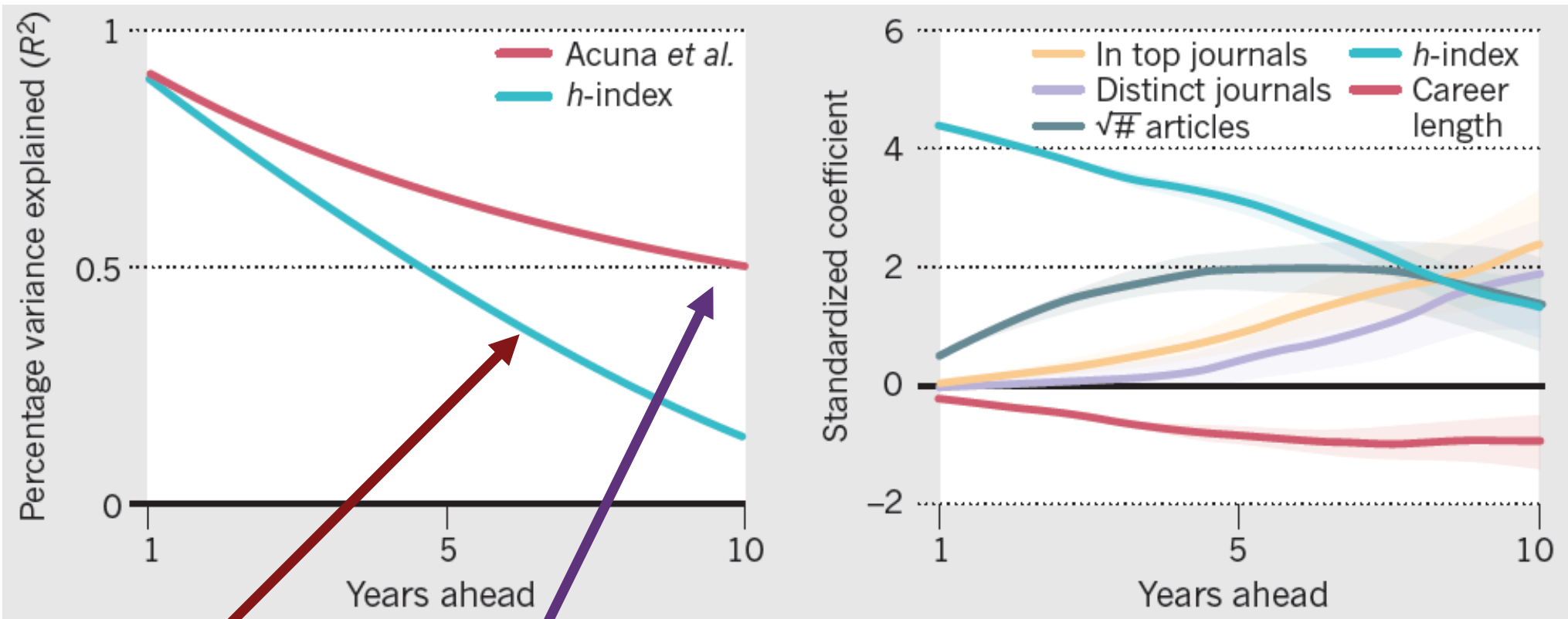
**Children**

Kunlin Wei	grad student	Northwestern University
Gregory Dam	grad student 2006-pres	Northwestern University
Ian Stevenson	grad student 2006-2011	Northwestern University
Hugo Fernandes	grad student 2009-2013	Northwestern University
Iris Vilares	grad student 2009-2013	Northwestern University
Patrick N Lawlor	grad student 2012-pres	Northwestern University
Daniel K Wood	post-doc	Northwestern University/Rehabilitat
Mark V. Albert	post-doc	Northwestern University
Max Bemiker	post-doc	Northwestern University
Daniel E Acuña	post-doc 2011-pres	Rehabilitation Institute of Chicago
Bernard Marius 't Hart	post-doc 2014-pres	Feinberg School of Medicine North

**Collaborators**

Ulrik Beierholm	collaborator	
Christoph Kayser	collaborator	Max Planck Institute Tuebingen

# Predicting scientific “success”

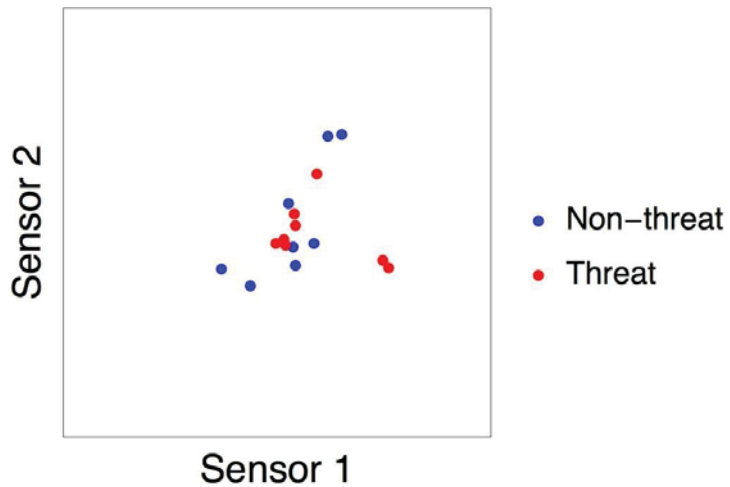


“small data”

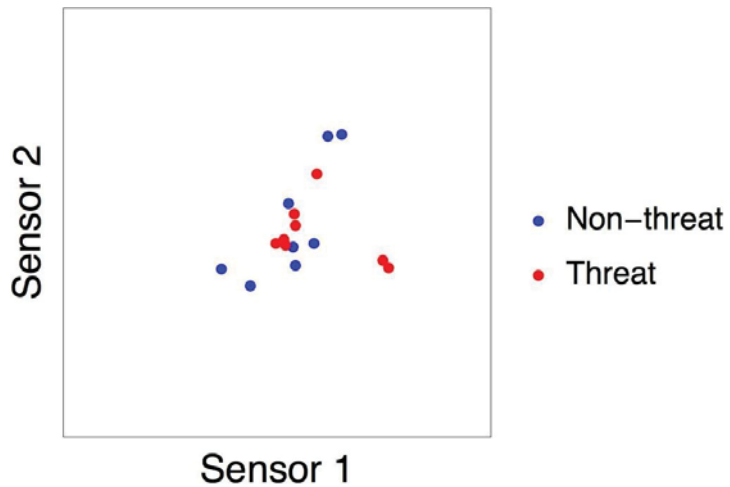
“big data”

Acuna et al., Nature, 2012

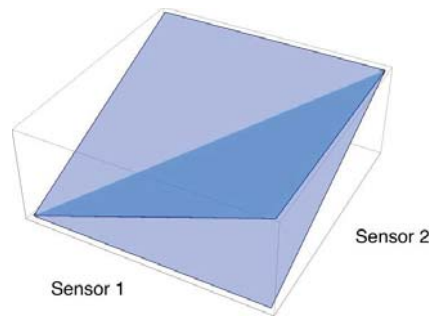
# Why “big data” works?



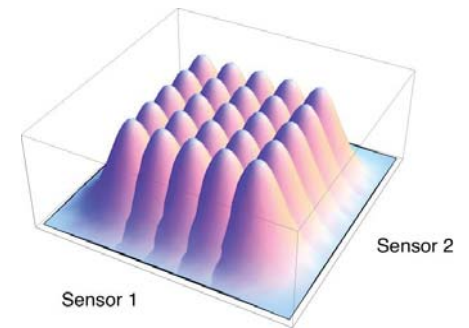
# Why “big data” works?



Simple model

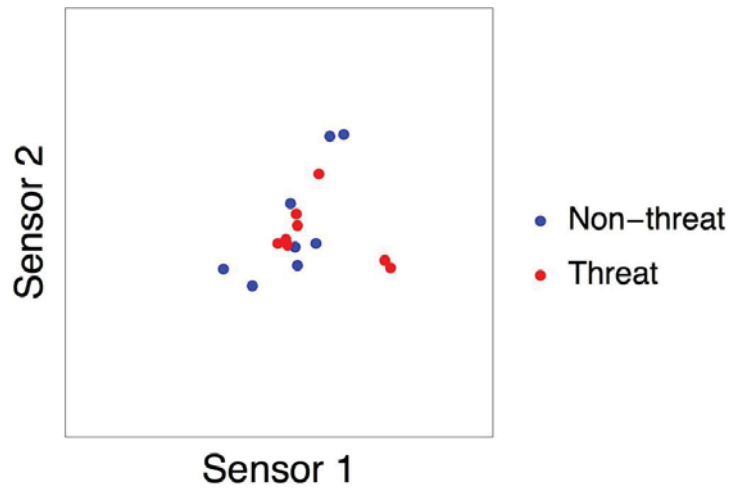


Complex model

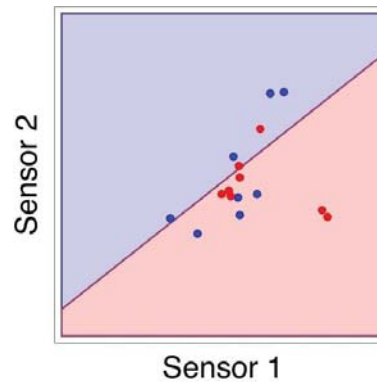
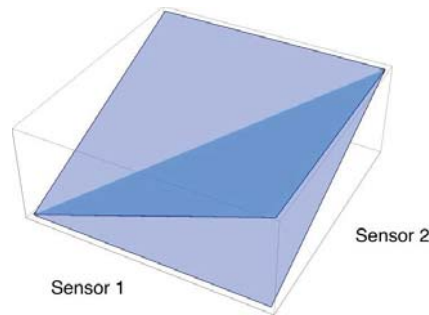




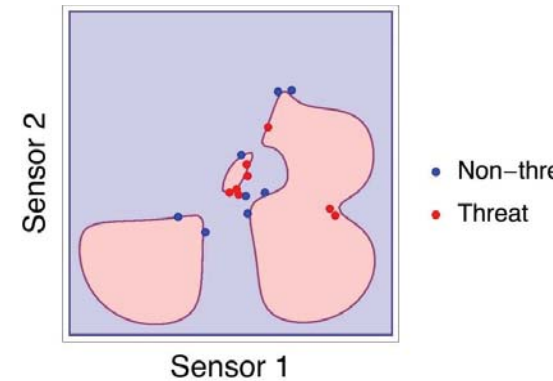
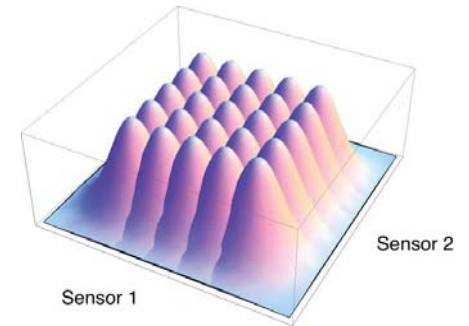
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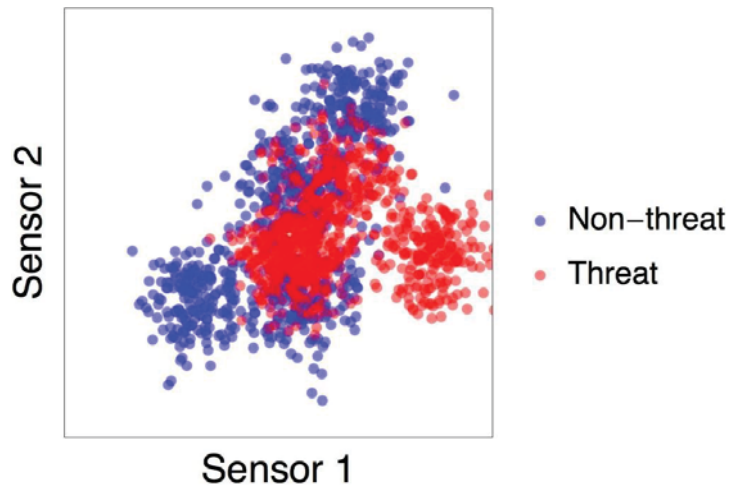
## Simple model



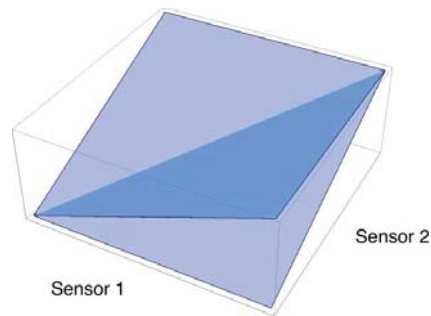
## Complex model



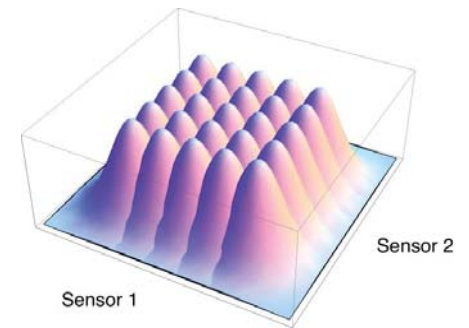
# Why “big data” works?



Simple model

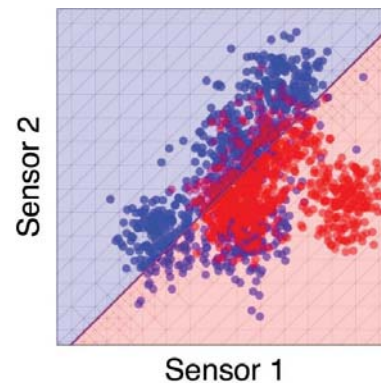
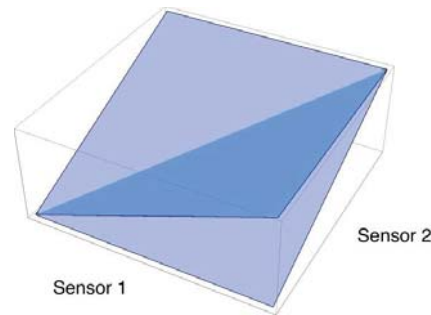
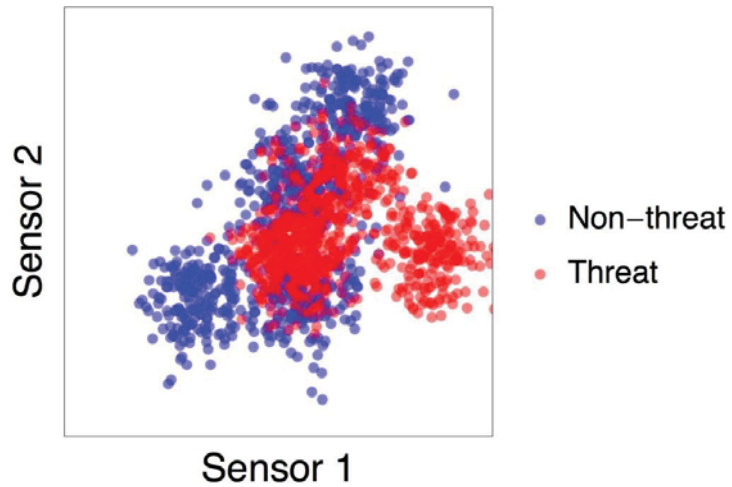


Complex model

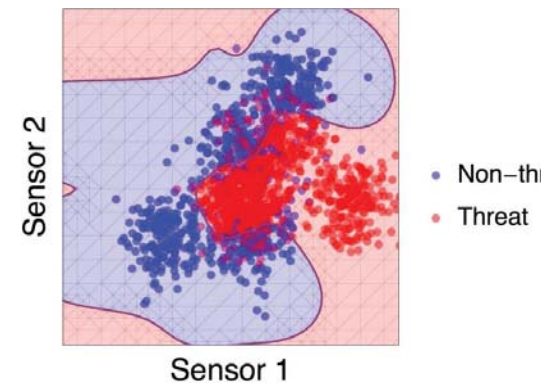
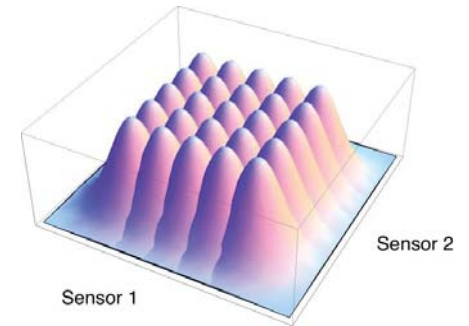


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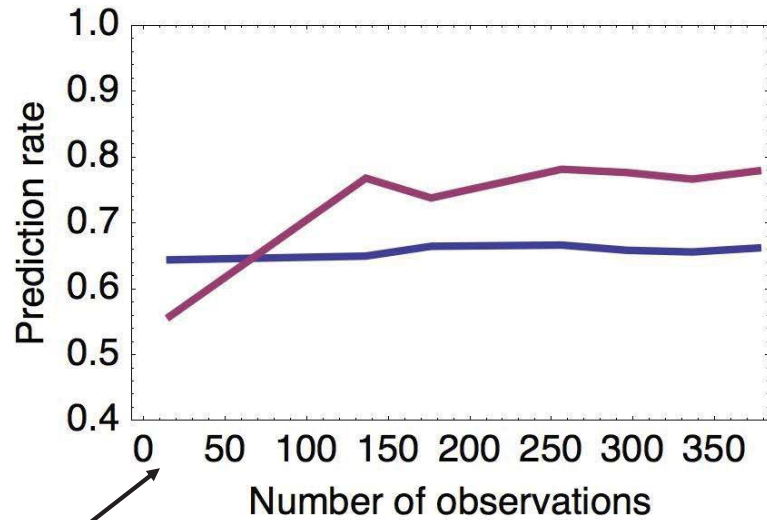
## Simple model



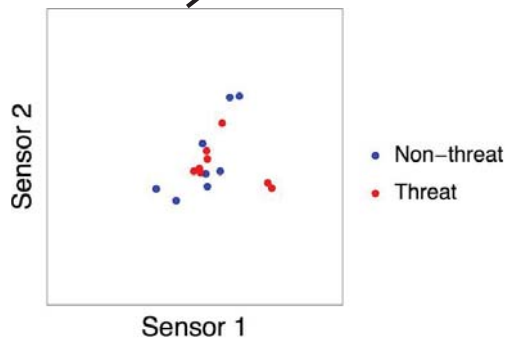
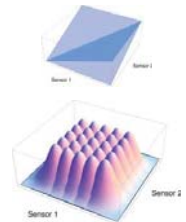
## Complex model



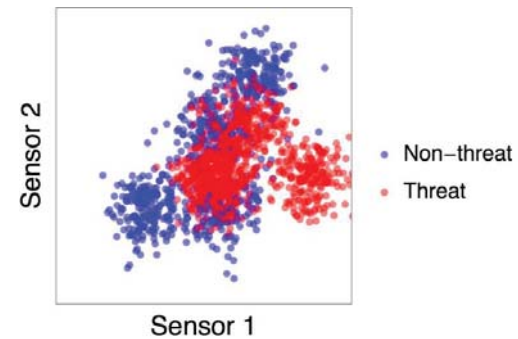
# Why “big data” works?



- Simple model
- Complex model

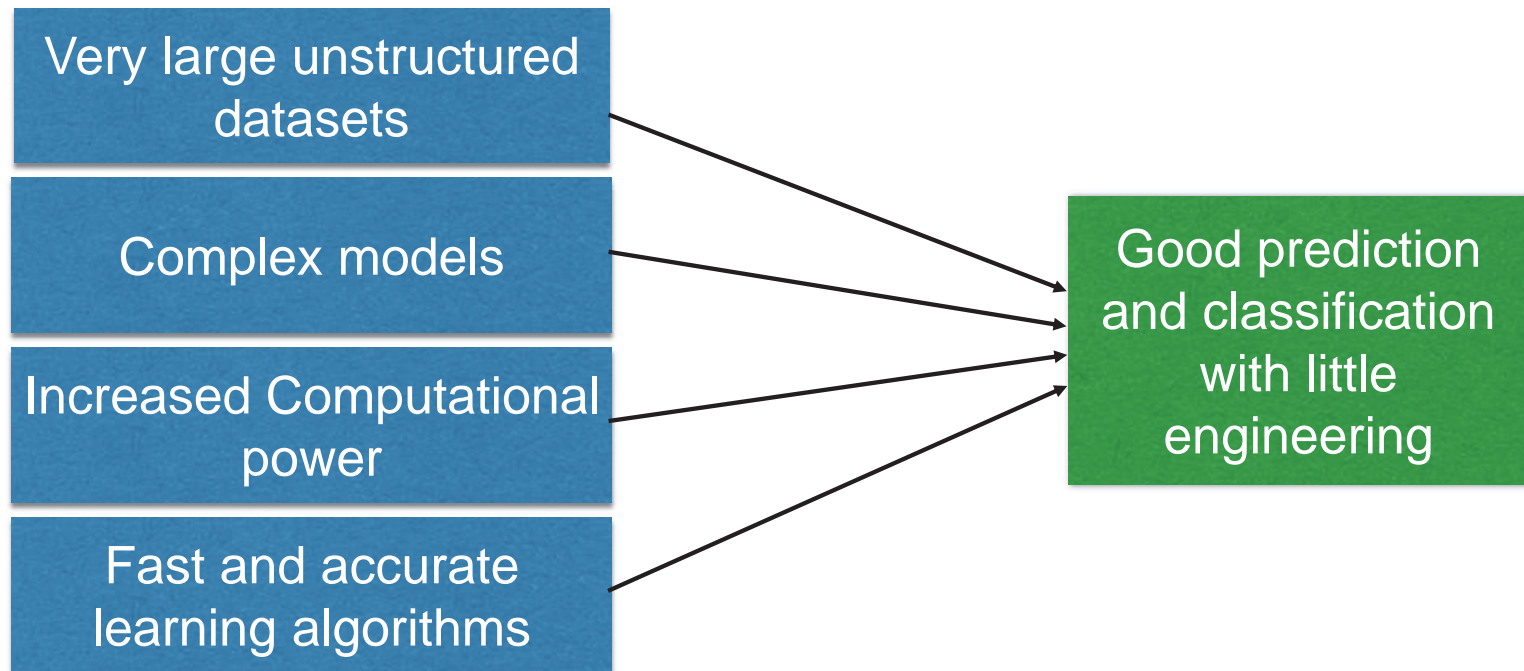


“small data”



“big data”

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