

Maths and computer science for social good



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UPPSALA
UNIVERSITET

What is this course about...

- We have such incredible skills.
- We have a lot of freedom and (some) time.
- We can use this to make the world better.
- In doing so we will be rewarded with new inspiration and insight.

<https://www.tidningencurie.se/kronikor/i-started-caring-about-what-people-actually-cared-about/>

My own journey...

Gender diversity in research fellowships

University Research Fellows by gender

	Total appointments	Number of women	% of total that are women
2010	30	10	33%
2011	40	9	22.5%
2012*	37	7	18.9%
2013	41	7	17%
2014	43	2	4.6%

Can you tell the difference between real and simulated fish?

Play

Make your choice

Next

Congratulations!
You have answered 5 out of 6 questions correctly.

Click refresh button to play again

Skip

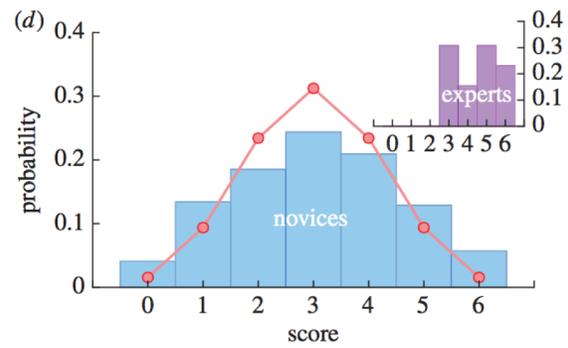
you will see two videos. Try to identify elements of real fish and not simulated data.

Begin

Get playing!

<http://www.collective-behavior.com/apps/fishgame>

Turing test for fish



A Turing test for collective motion
Herbert-Read et al. (2015)

FISH IN DANGER

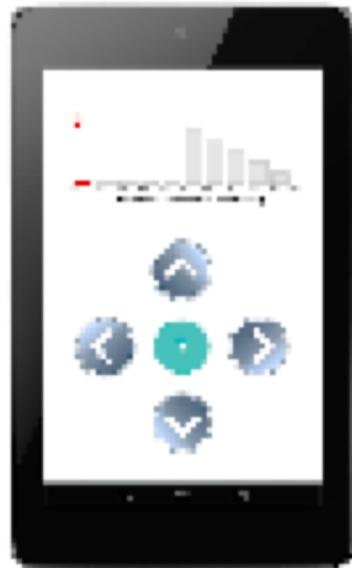
EASY



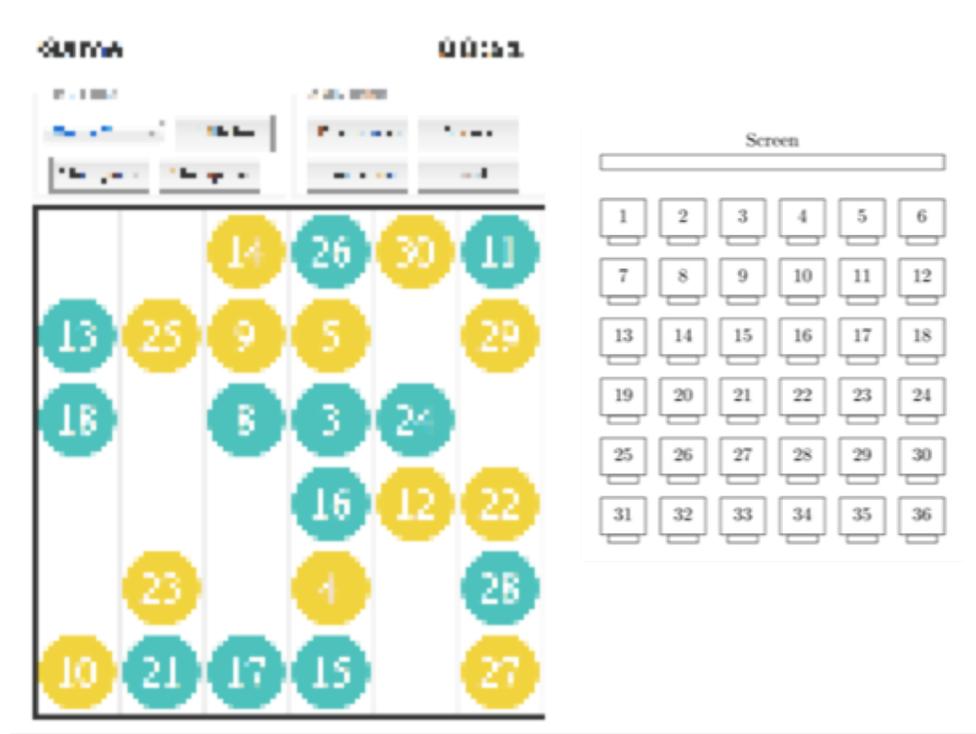
NORMAL

HARD

Classroom experiment



game control



projection screen

We created a system to let up to 25 players play the four games interactively. We visited 20 classrooms around Sweden and allowed secondary school students to play

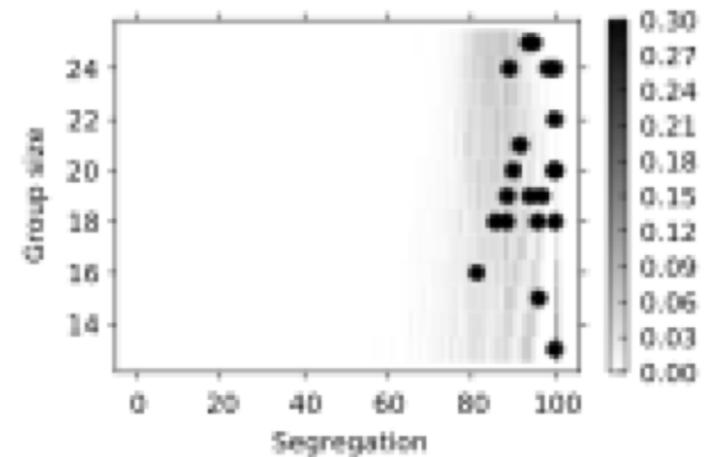
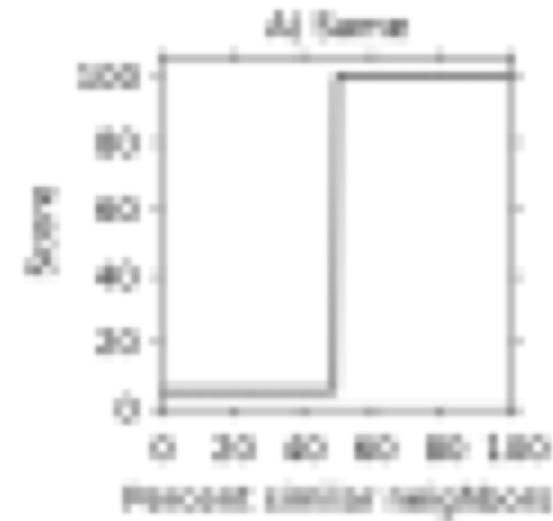
The 'Same' game

Game **02:00**

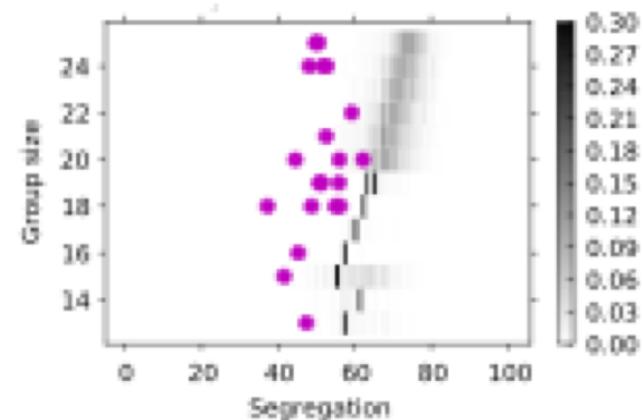
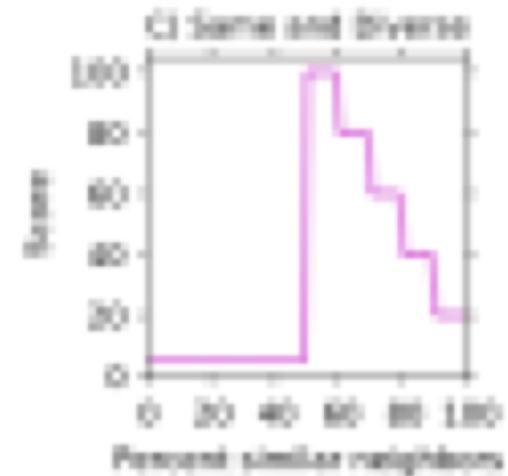
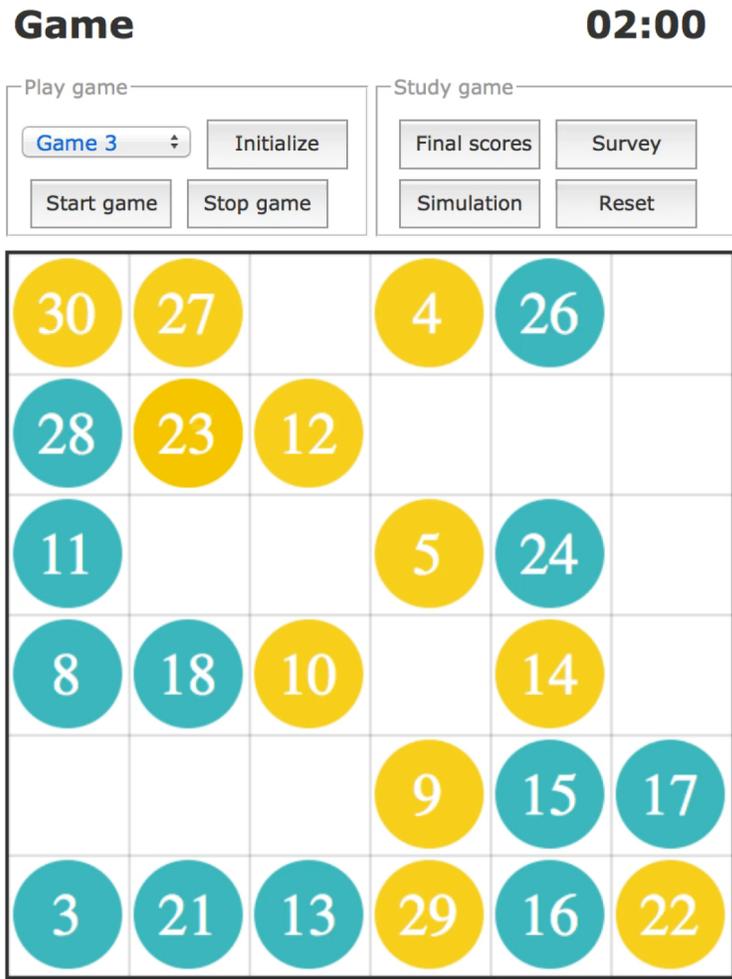
Play game: Game 1 Initialize Start game Stop game

Study game: Final scores Survey Simulation Reset

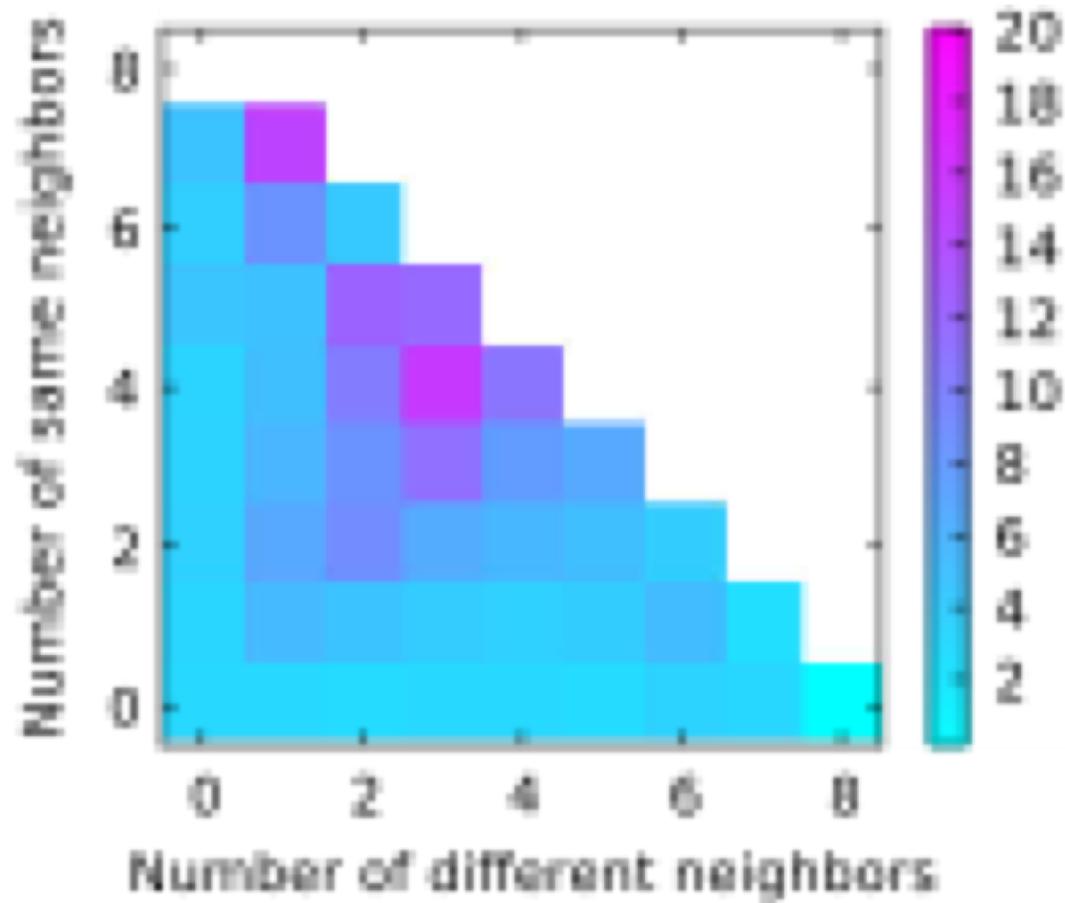
17	4	24	9		10
23	16	18	29	15	28
30		3			14
27	12		8		22
	11	21	5	26	
	25				



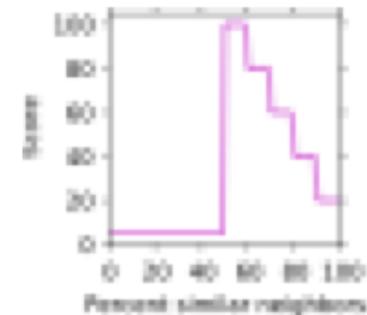
The 'Same and Diverse' game



Teenagers are hardly ever satisfied



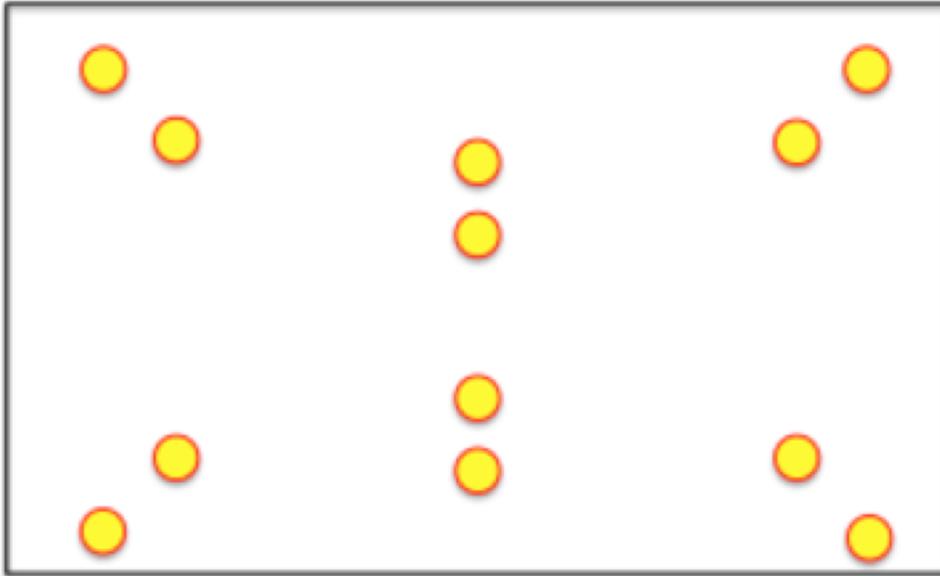
Time till next move
(seconds)



Fun Fridays



Learning graph theory by playing football



Draw a line that follows the balls path through the cones.
How many times is the ball played through all the cones?

HOW FACEBOOK KNOWS YOU BETTER THAN YOUR FRIENDS DO

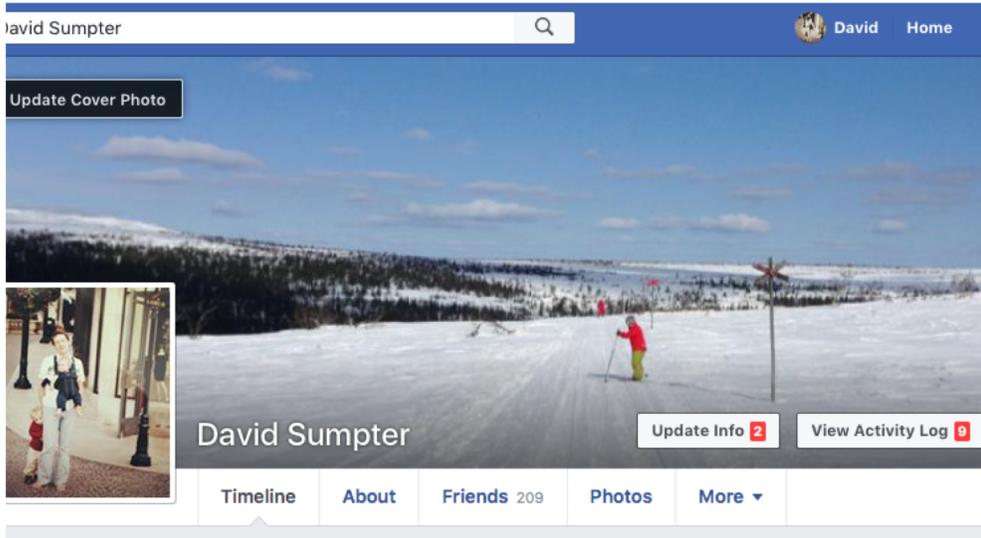
Wired, 13th Jan, 2015

Facebook knows you better than your members of your
own family

The Telegraph, 12th Jan, 2015

Facebook Knows You Better Than Anyone Else

New York Times, 19th Jan, 2015

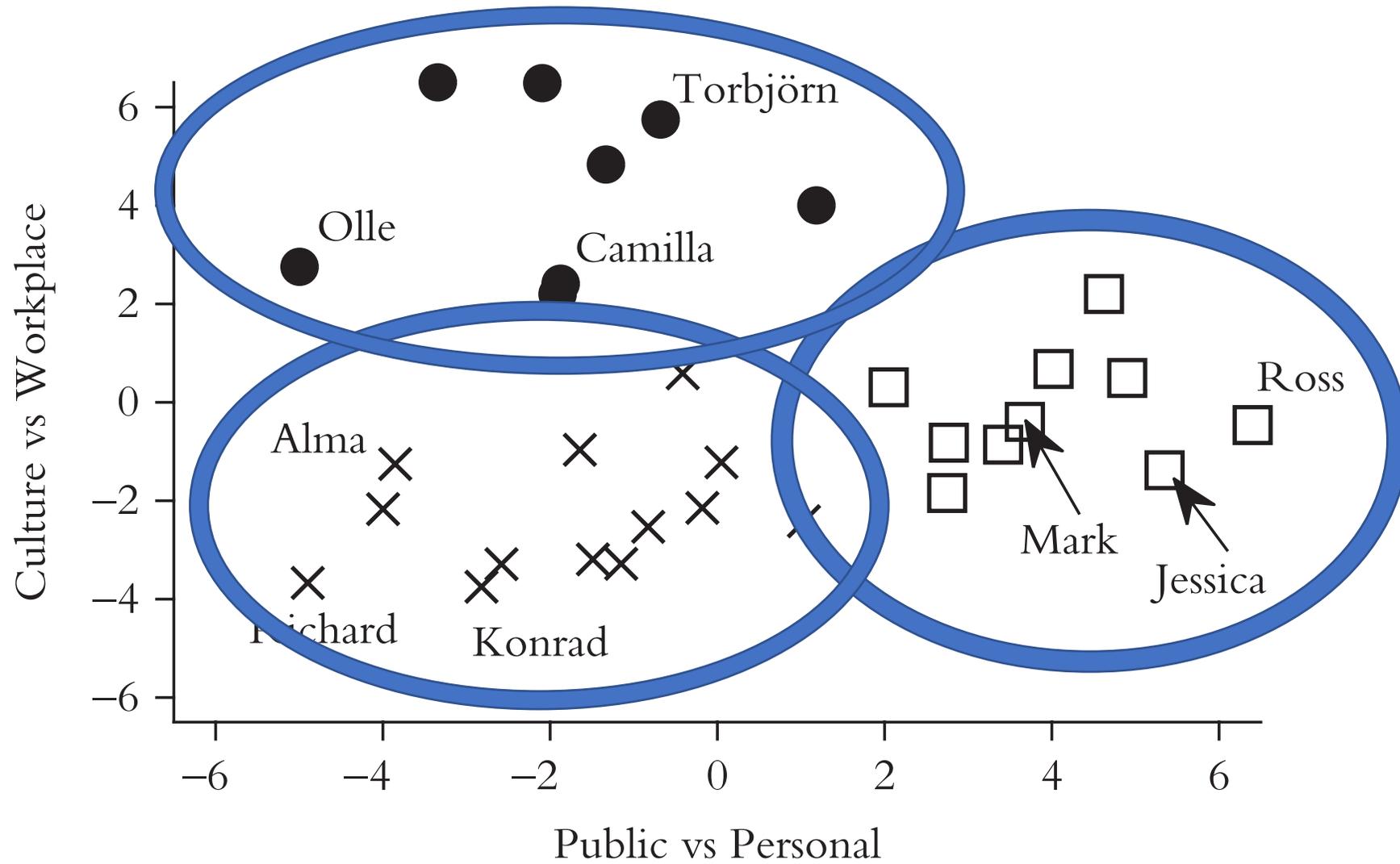


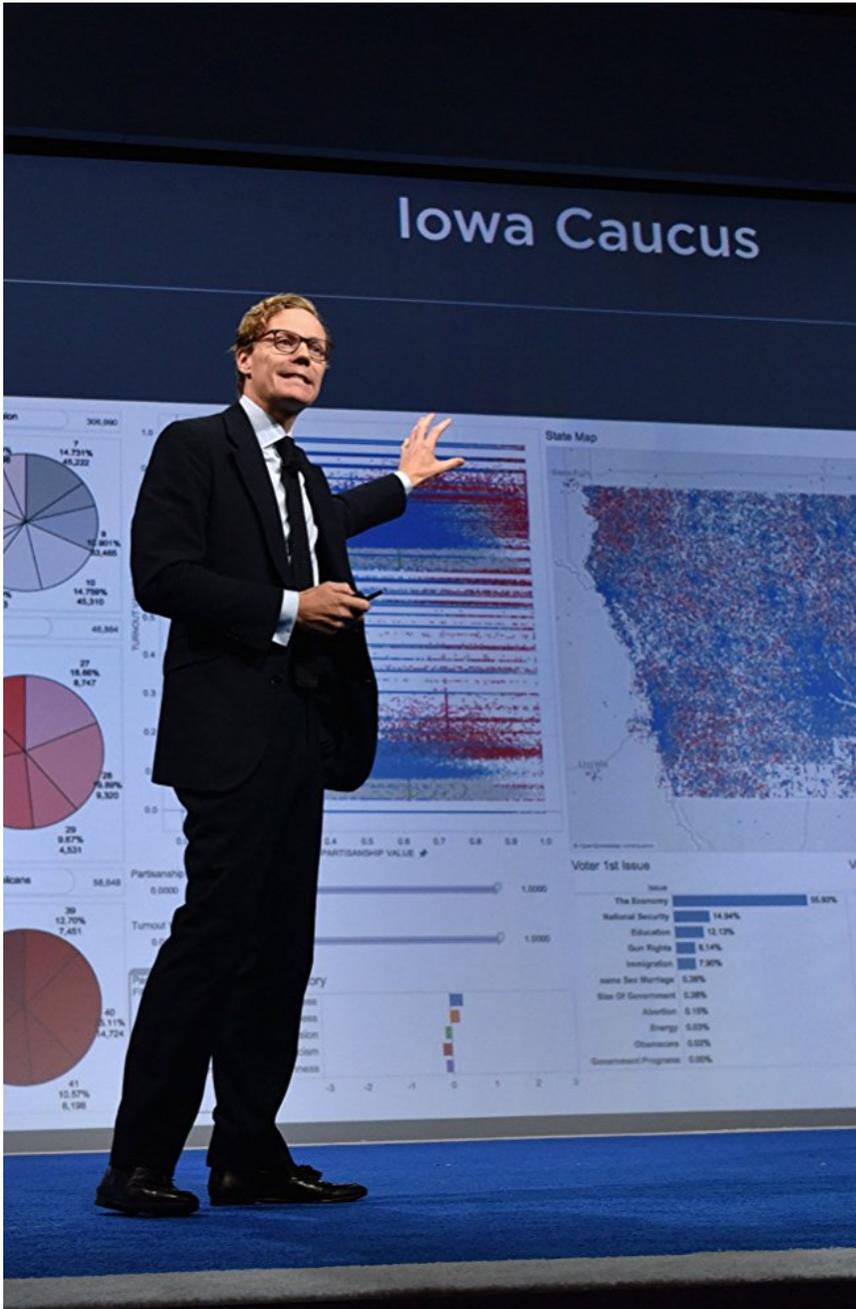
13 dimensions

- Work
- Product/Advertising
- Culture/Sport
- Family/partner
- Political/News
- Travel/Food/Lifestyle
- Joke/Funny/Meme
- Animals
- Outdoor/sport activity
- With friends
- Local events
- Activism
- Thoughts

	Camilla	Mark	Johan	Alec	...	Lovisa	Olle	Maja
Work	5	1	9	0	...	9	6	0
Product/Advertising	1	0	0	1	...	0	0	0
Culture/Sport	1	0	0	5	...	1	0	1
Family/partner	0	0	0	2	...	1	1	1
Political/News	1	0	0	0	...	0	0	3
Travel/Food/Lifestyle	1	0	0	0	...	0	0	0
Joke/Funny/Meme	0	0	0	0	...	0	0	1

→ Reduce to two dimensions



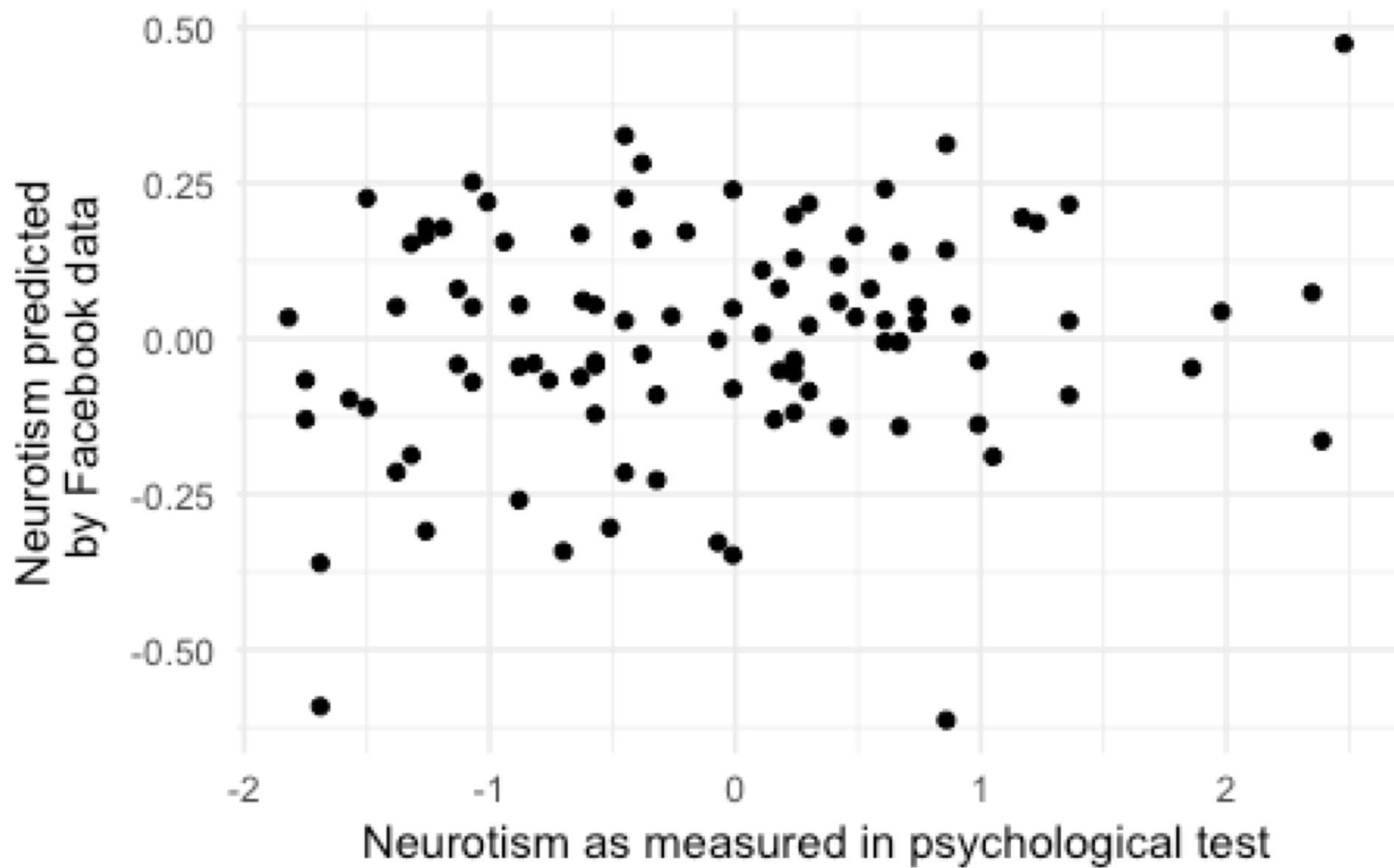


myPersonality



Descriptive Statistics of the User–Like Matrix M

Descriptive Statistic	Raw Matrix M	Trimmed Matrix M
# of users	110,728	19,724
# of unique Likes	1,580,284	8,523
# of user–Like pairs	10,612,326	3,817,840
Matrix density	0.006%	2.27%
Likes per User		
Mean	22	193
Median	96	106
Minimum	1	50
Maximum	7,973	2,487
Users per Like		
Mean	7	448
Median	1	290
Minimum	1	150
Maximum	19,998	8,445



Personality algorithms have limitations

- It can predict diehard Republicans/Democrats with 85% accuracy.
- But it predicts more neurotic/less neurotic with only 60% accuracy.
- And 'protect family with gun' neurotic is very different from 'Nirvana/Emo' neurotic.

Cambridge Analytica under fire as scandal grows

Company forced into spotlight after Facebook allegations



My interview with Aleksandr Kogan: what Cambridge Analytica were trying to do and why their algorithm doesn't work.



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Apr 22, 2018 · 11 min read



The Telegraph

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Professor David Sumpter

Delayed Gratification



#30

JAN-MAR 2018



The algorithms that control your life and the one thing that you really should be worried about

25 Apr 2018, 3:44pm

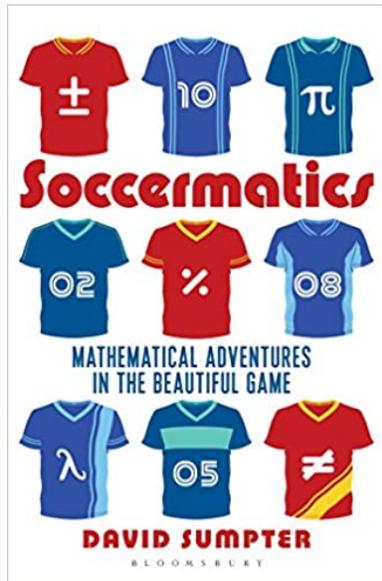
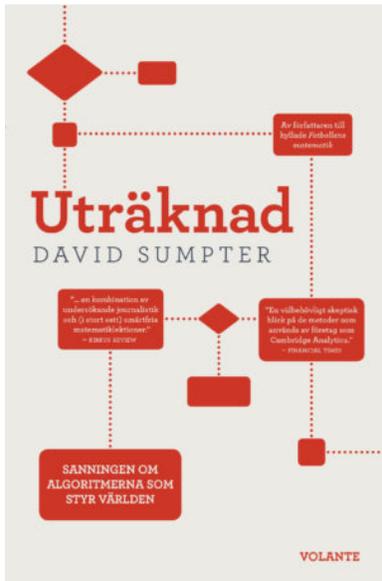


Facebook Knows You Better Than Anyone Else

Are You In A Social Media Echo Chamber? How To Take An Objective Look

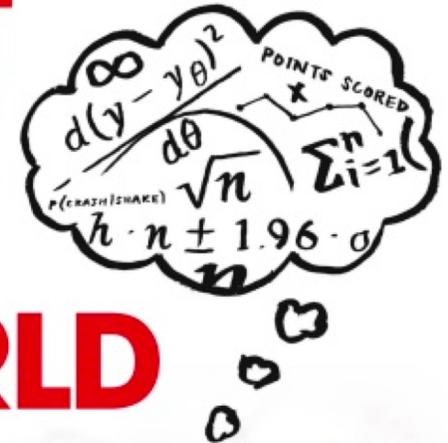


YOUR FILTER BUBBLE IS DESTROYING DEMOCRACY



David Sumpter

THE TEN EQUATIONS THAT RULE THE WORLD



And How You Can Use Them Too



allen lane

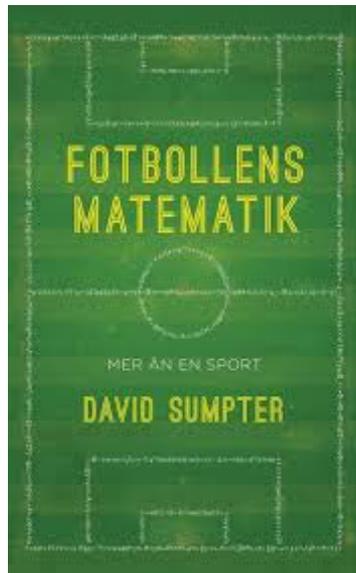
David Sumpter



Outnumbered

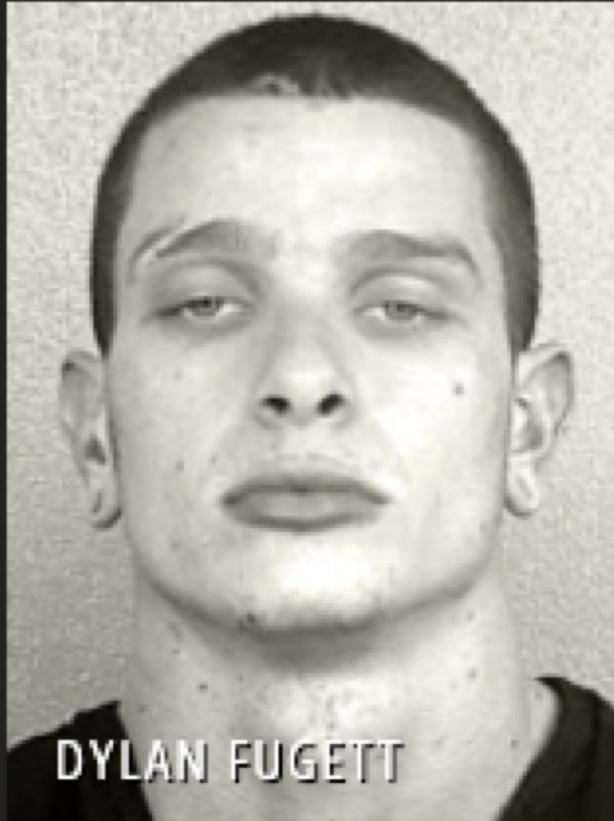
From Facebook and Google to fake news and filter-bubbles – the algorithms that control our lives

BLOOMSBURY



Using maths and stats to do
good...

Two Drug Possession Arrests



DYLAN FUGETT

LOW RISK

3



BERNARD PARKER

HIGH RISK

10

2nd Workshop on Mathematics for Social Activism

School of Mathematics, University of Leeds
June 6-7 2019.

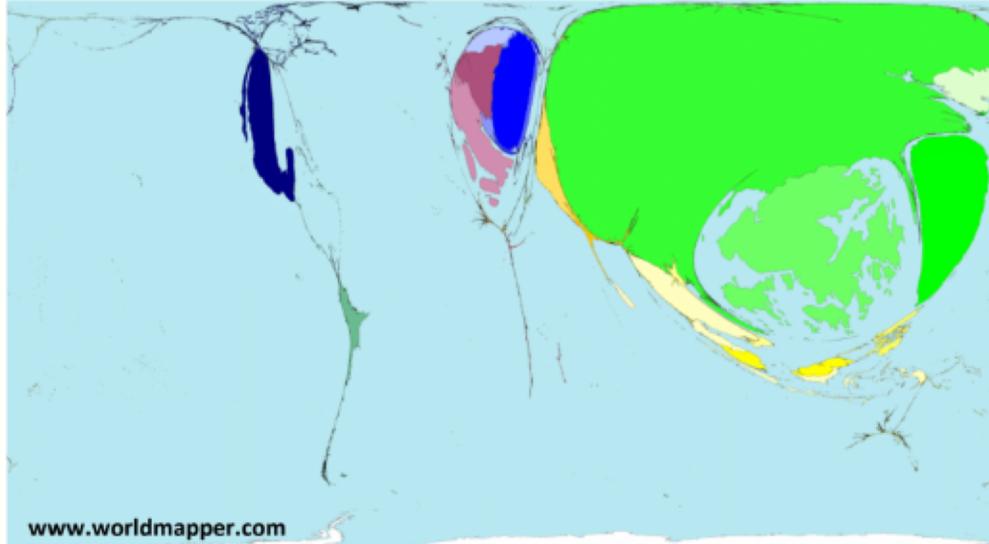
The workshop has now concluded. See below for links to
speaker slides.

[Schedule](#)

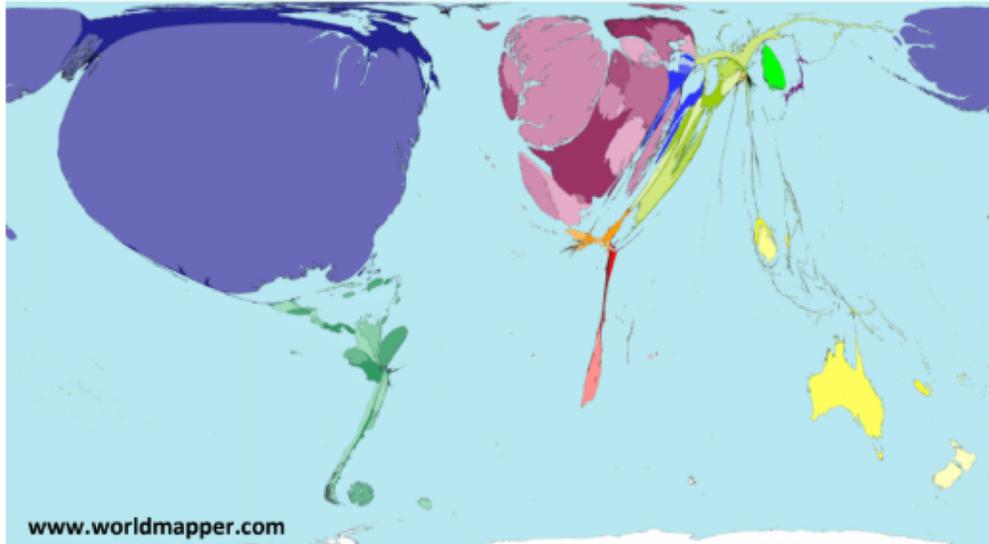


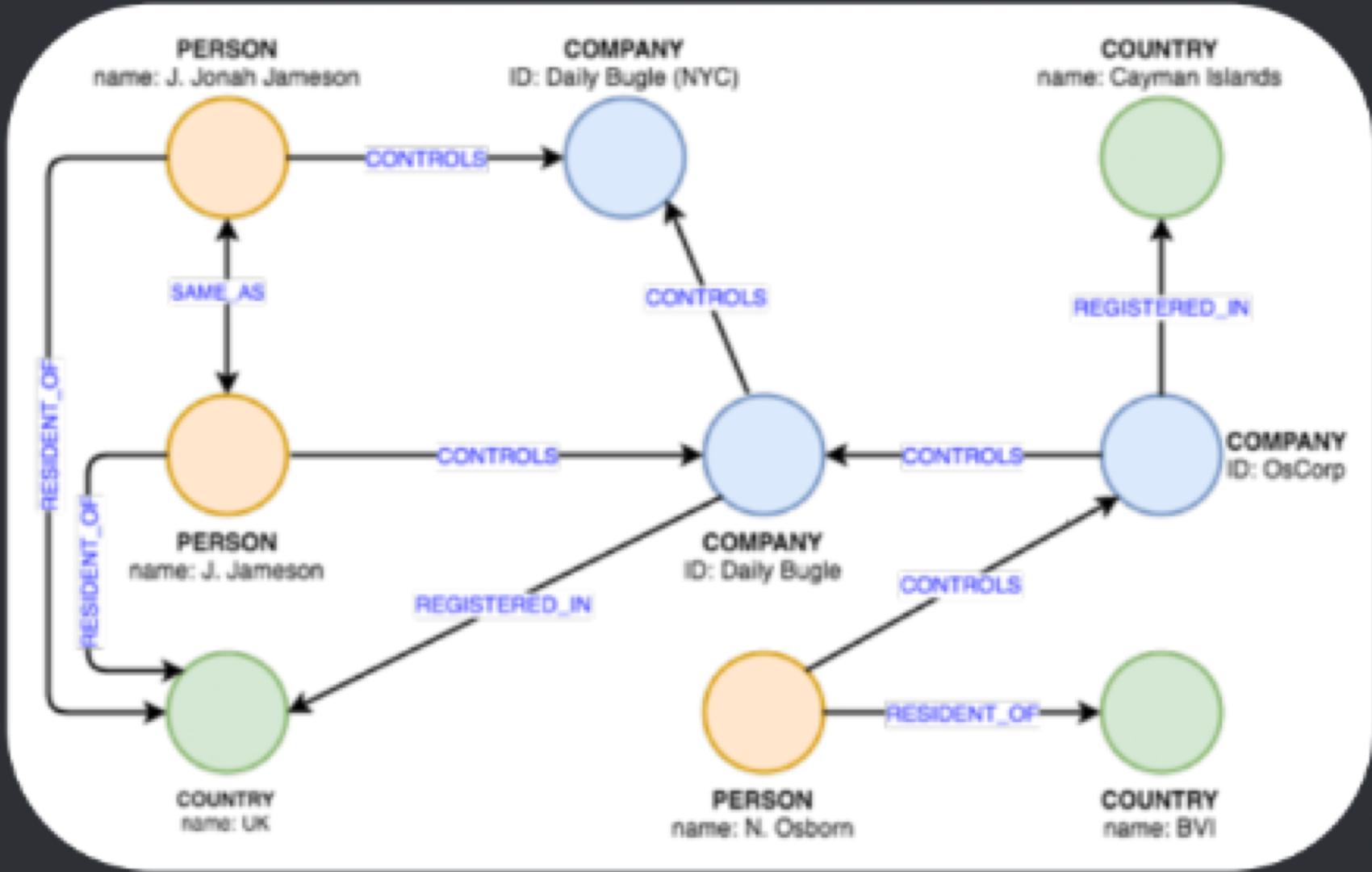
<http://www.richardpmann.com/workshop.html>

Where are the world's toys made?



Who buys the toys?





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- We have a lot of freedom and (some) time.
- We can use this to make the world better.
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What will we do...

- You will define a passion driven project, either by yourself or with others
- Ida-Maria and I will mentor you and we will help each other.
- Making the world better a better place can be anything from making one person smile to destroying Amazon or saving the Amazon.

What is good...

- We are going to find that this is difficult to define.
- But until now we know it when we see it.
- Or, at least until we realise we were seeing it wrong.
- I have some strong opinions on this matter.

Structure for the course

The work on Fridays will be organised as follows.

09:15 When there isn't lectures we have a planning round table (45 minutes).
Everyone outlines what they are working on.

10:00 - 15:00 Work on project (if possible)

15:00 Coffee together.

15:15 Longer report back from people working on a specific project.

Structure for the course

The Lectures

The lectures will be given in person at the meeting on Fridays. These will start on 3rd of September and be every second week. The topics of the first six lectures are below with links to slides.

3rd September: Examples of using maths for social good.

23rd September: Finding your own question.

7th October: Downloading relevant data, tools for development and visualisation,

14th October: Presenting your work.

28th October: Are you really doing good?

12th November: The balance between rigour and getting things done.

Examination form

- You tell me or Ida-Maria when you feel that you have done enough maths for social good.
- If you feel you have done 5hp worth of work we will pass that.
- If you feel you have done 10hp worth of work we will pass that.
- Or we will say to you that we think you have done 5hp or 10hp of good.