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# Predicting success based on social network analysis

**Ingo Scholtes**

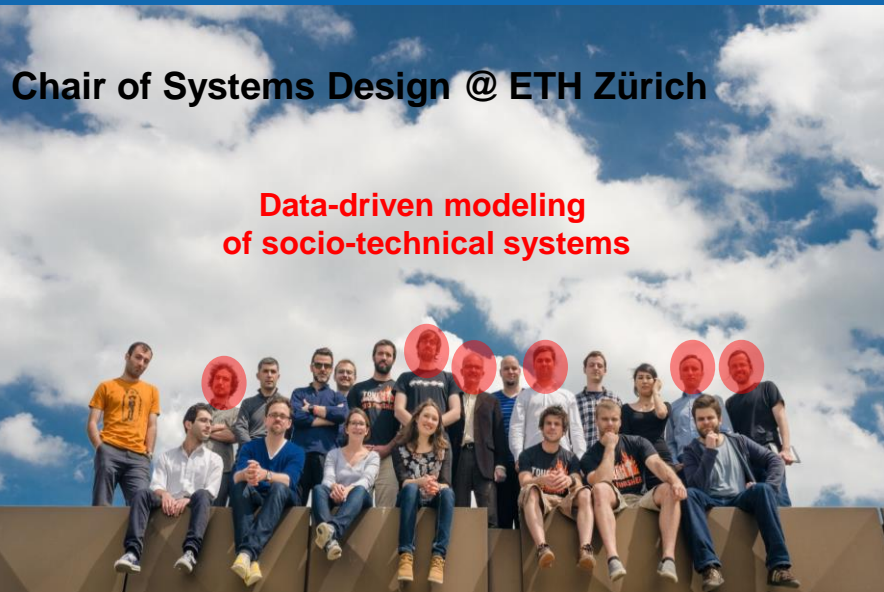
in collaboration with F Schweitzer, MS Zanetti, E Sarigöl, R Pfitzner, CJ Tessone, A Garas

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## Chair of Systems Design @ ETH Zürich

**Data-driven modeling  
of socio-technical systems**

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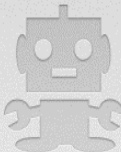
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## Welcome to Bugzilla

	Firefox	Thunderbird	Eclipse	NetBeans	Total
<b>Start date</b>	April 2002	January 2000	October 2001	January 1999	
<b>Bug reports</b>	112,968	35,388	356,415	210,921	715,692
<b>Changes</b>	1,068,070	313,957	2,594,385	1,875,878	5,852,290
<b>Valid</b>	21 %	24 %	74 %	63 %	57 %
<b>Faulty</b>	79 %	76 %	26 %	37 %	43 %

Firefox: 79 % of all bug reports are not valid

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Bugzilla Mozilla

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**How to identify a valid bug report at the time of submission?**

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Bugzilla Mozilla

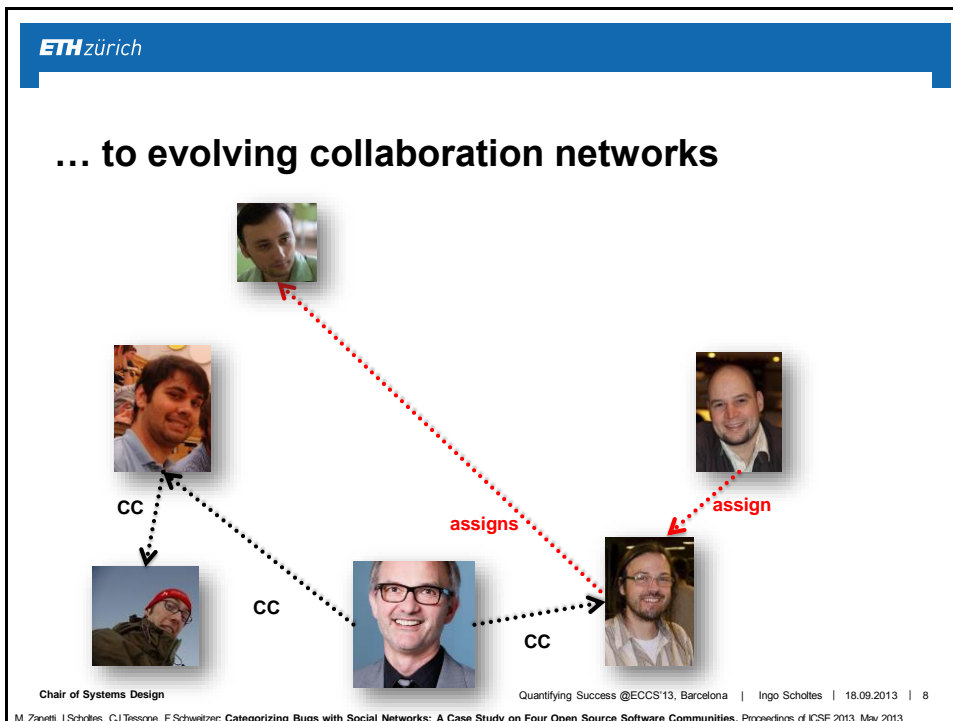
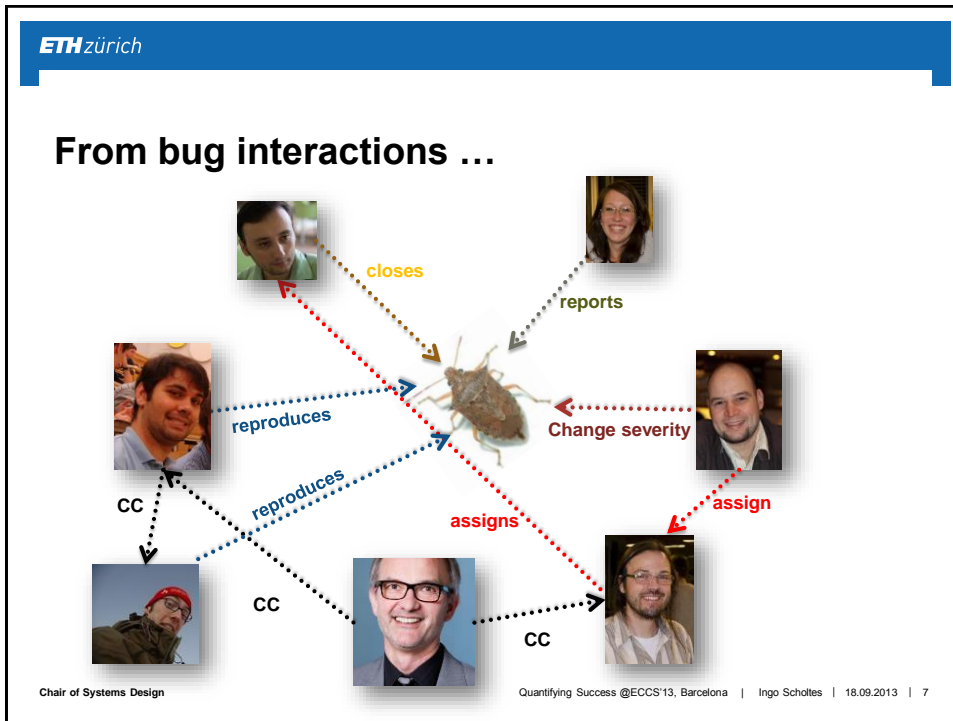
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**How to predict success?**

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## ... to evolving collaboration networks

**Success at project level?**

(a) ECLIPSE (Dec. 2002)  
244 nodes, 319 links

(b) NETBEANS (Jun. 2006)  
246 nodes, 513 links

(c) FIREFOX (Oct. 2003)  
241 nodes, 184 links

(d) THUNDERBIRD (Nov. 2004)  
245 nodes, 170 links

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M. Zanetti, I. Scholtes, C.J. Tessone, F. Schweitzer: Categorizing Bugs with Social Networks: A Case Study on Four Open Source Software Communities, Proceedings of ICSE 2013, May 2013

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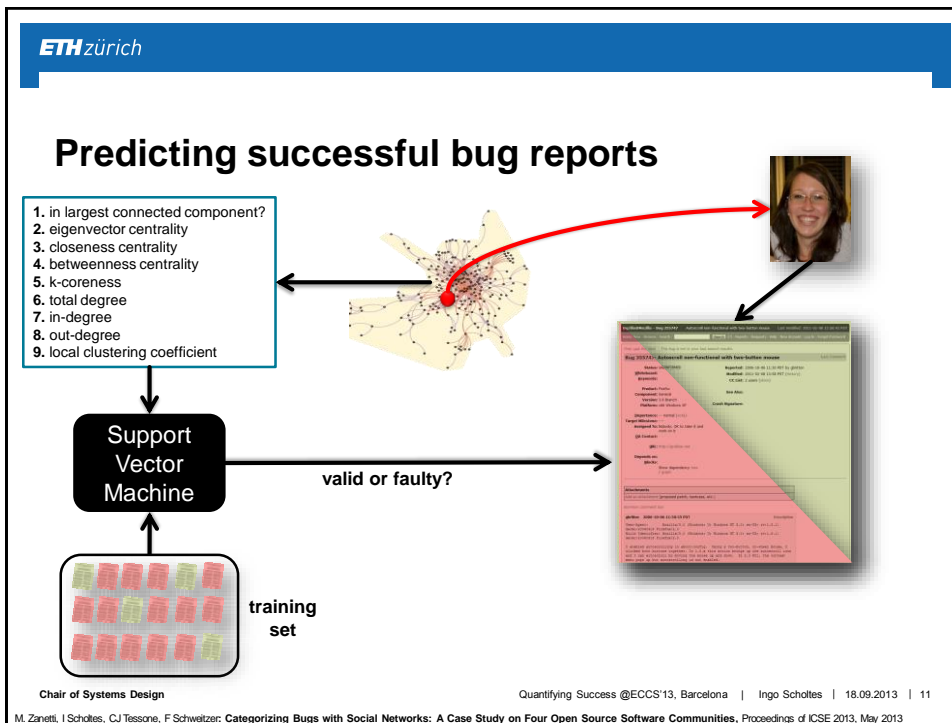
## ... to evolving collaboration networks

$t-30d$        $t$

Time

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## Predicting successful bug reports

	Firefox	Thunderbird	Eclipse	NetBeans
<b>Valid</b>	21 %	23 %	74 %	63 %
<b>Precision</b>	82.5 %	90.3 %	88.7 %	78.9 %
<b>Recall</b>	44.5 %	38.9 %	91.0 %	87.0 %
<b>F-Score</b>	0.58	0.54	0.89	0.83

**Social network analysis allows to predict successful bug reports**

**Precision and recall significantly higher than for competing methods**


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**STAND BACK**



**I'M GOING TO TRY  
SCIENCE**

Image credit: xkcd.com

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**Quality matters ... but ....**

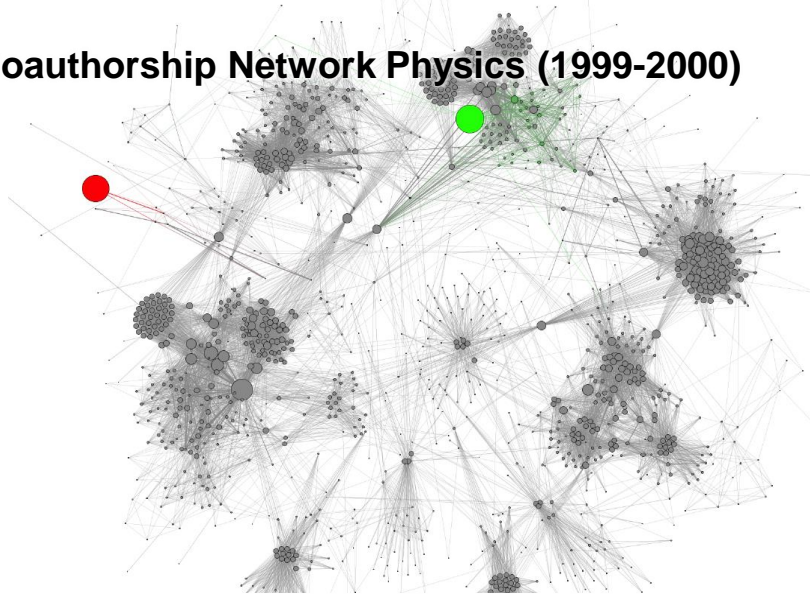


**Can social position of authors  
predict success of paper?**

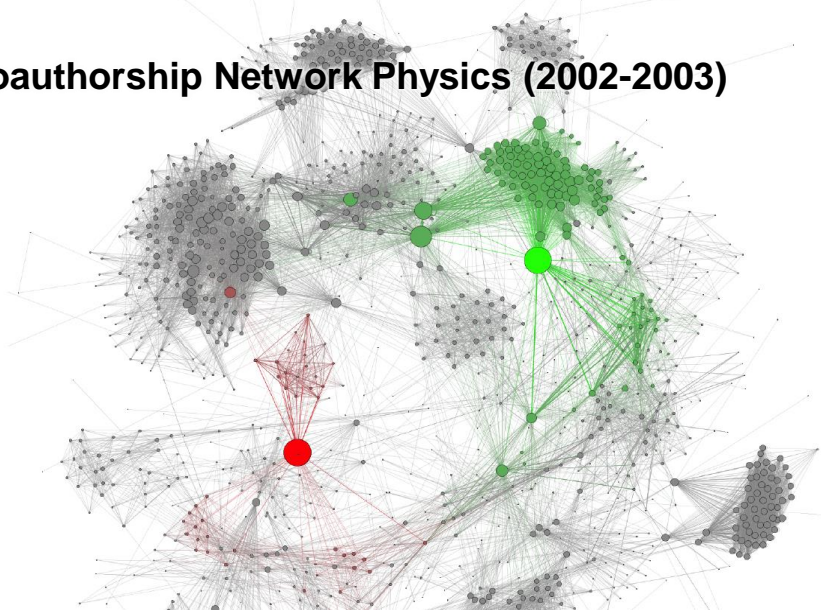
Image credit: ATLAS collaboration, www.atlas.ch

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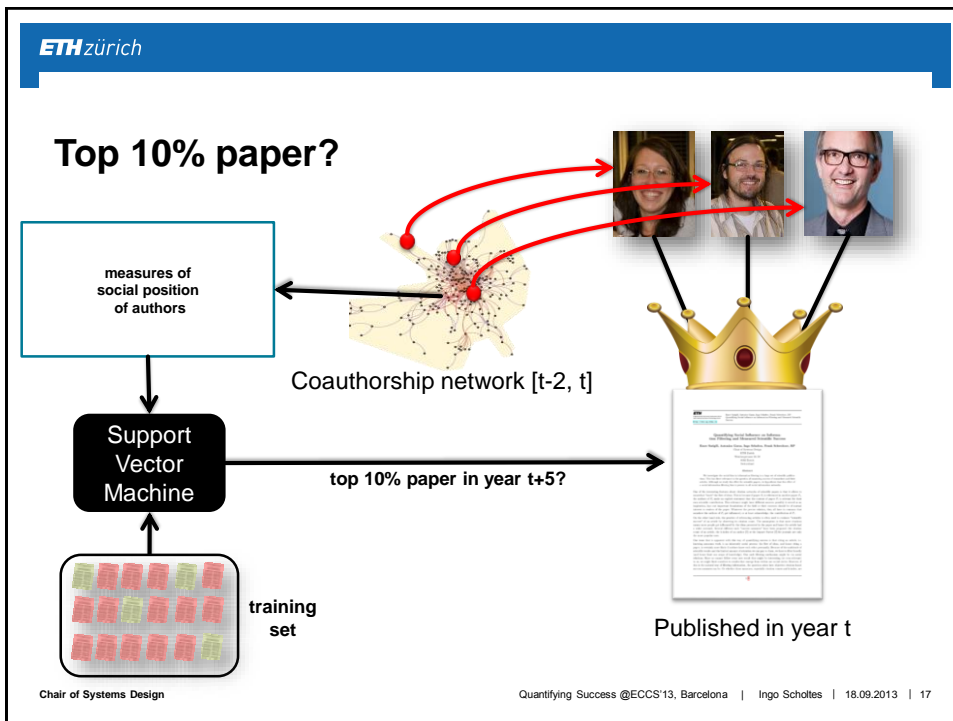
## Coauthorship Network Physics (1999-2000)



## Coauthorship Network Physics (2002-2003)







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## Social position correlates with future success

	Nr.Publications	Precision	Recall	F-Score
Chemistry	58129	53.9%	11.9%	0.19%
Computer Science	125061	55.8%	21.2%	0.31%
Biology	59871	60.6%	16.6%	0.26%
Physics	52008	49.0%	8.4%	0.14%

5 – 6 times better than random guess!

(CS) Social position indicative for success of „only“ 2580 out of 12000 papers

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**5 – 6 times better than random guess!**

**There is room for „nobodys“ to become successful**

## Good and bad news ...



Prof. Dr. Werner Heisenberg, der erst 32jährige Physiker an der Universität Leipzig, erhielt für seine Arbeiten auf dem Gebiet der Quantentheorie die Hälfte des Nobelpreises für Physik aus dem Jahre 1932.  
Foto: Max Lüthrich

Image credit: wikipedia.org

**„Science is done by people“ (Heisenberg)**

- **Social networks influence success**
  - Intuition is right
  - Can be quantified
  - Are we in the filter bubble?
- **Do networking (and write good papers)**

## Thank you!



MS Zanetti, I Scholtes, CJ Tessone, F Schweitzer: **Categorizing bugs with social networks: a case study on four open source software communities**, Proceedings of ICSE 2013, San Francisco, May 2013

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MS Zanetti, E Sarigó, I Scholtes, CJ Tessone, F Schweitzer: **A Quantitative Study of Social Organisation in Open Source Software Communities**, OpenAccess Series in Informatics , vol. 28, pp. 116–122, 2012

R Pflitzner, I Scholtes, A Garas, CJ Tessone, F Schweitzer: **Betweenness Preference: Quantifying Correlations in the Topological Dynamics of Temporal Networks**, Physical Review Letters, Vol. 110, 198701, May 10 2013

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F Schweitzer, E Sarigó, I Scholtes, A Garas, R Pflitzner: **Quantifying Social Influence on Information Filtering and Measured Scientific Success**, working paper, September 2013



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