

# Making Data Accessible Through Visualization

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***UBC Robson Square, Vancouver BC, 25 April 2019***

**[www.cs.ubc.ca/~tmm/talks.html#salon19](http://www.cs.ubc.ca/~tmm/talks.html#salon19)**



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# Visualization defined & motivated

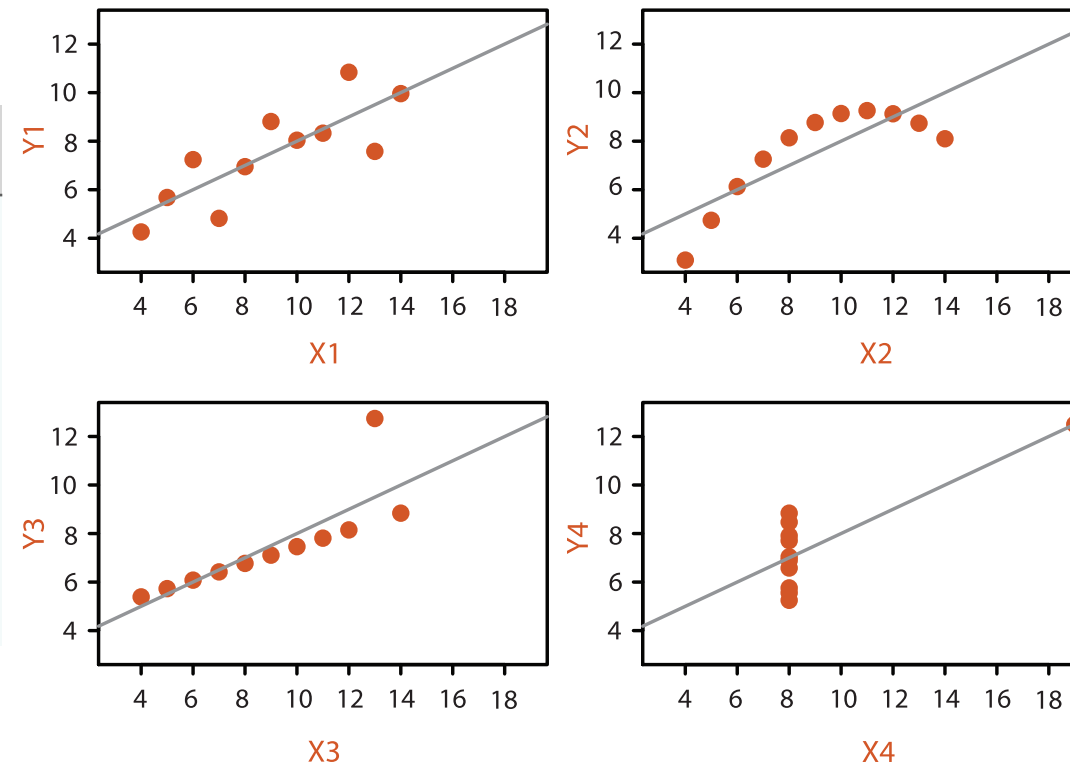
**Computer-based visualization systems provide visual representations of datasets designed to help people carry out tasks more effectively.**

- suitable when human in the loop needs details
  - often: interplay between human judgement and automatic computation

## Anscombe's Quartet

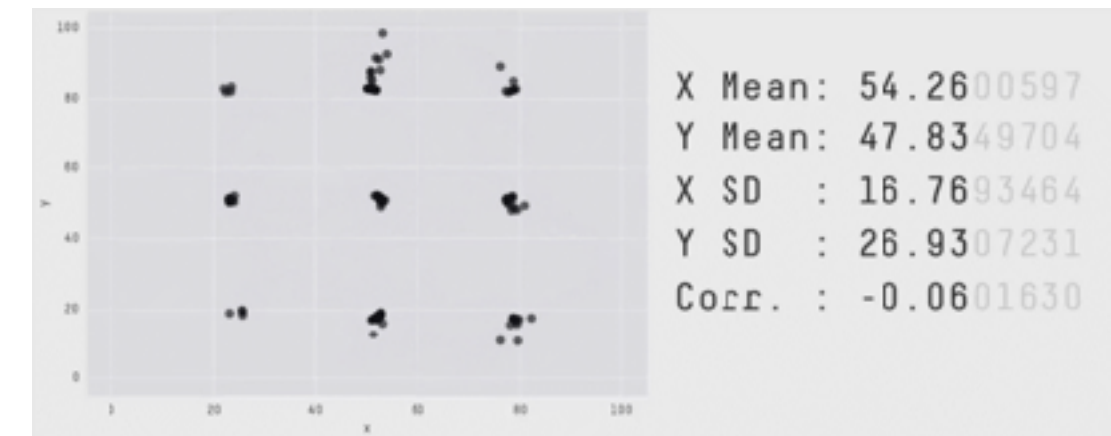
### Identical statistics

x mean	9
x variance	10
y mean	7.5
y variance	3.75
x/y correlation	0.816



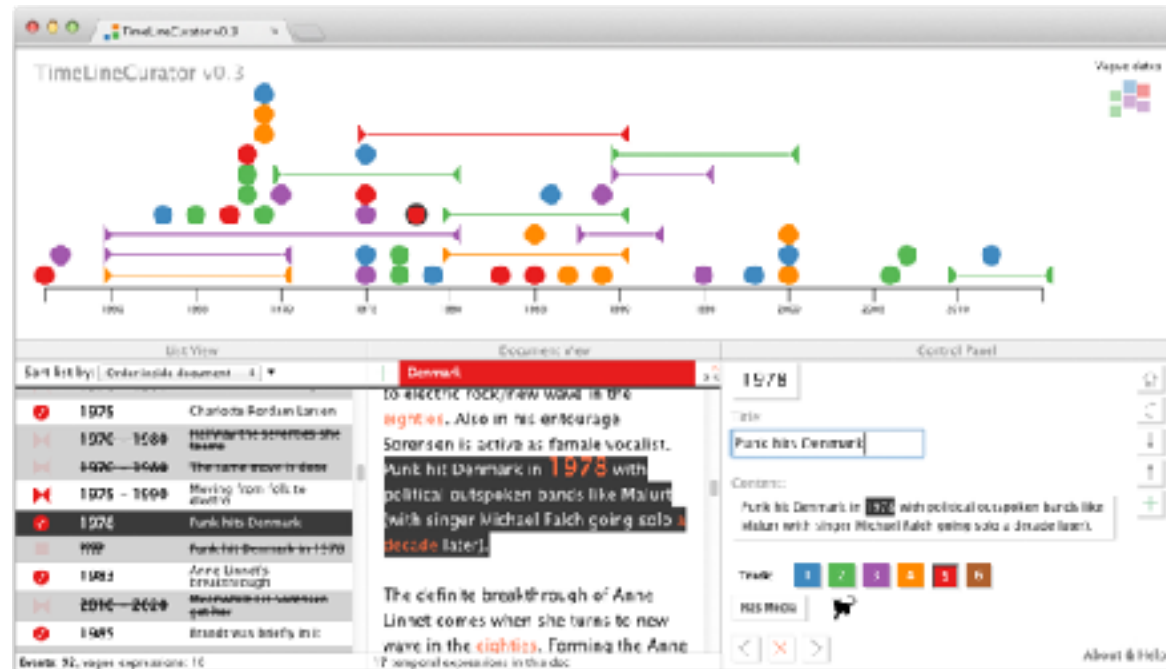
<https://www.autodeskresearch.com/publications/samestats>

## Datasaurus Dozen



Same Stats, Different Graphs: Generating Datasets with Varied Appearance and Identical Statistics through Simulated Annealing. CHI 2017.

Matejka & Fitzmaurice



Johanna Fulda  
@jofu\_



Matthew Brehmer  
@mattbrehmer



# TimeLineCurator

*Interactive Authoring of Visual Timelines from Unstructured Text*

<http://about.timelinecurator.org>

<http://timelinecurator.org>

Tamara Munzner  
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TimeLineCurator: Interactive Authoring of Visual Timelines from Unstructured Text.  
Fulda, Brehmer, Munzner. *IEEE Trans. Visualization and Computer Graphics (Proc IEEE VAST 2015)* 22(1):300-309, 2015.

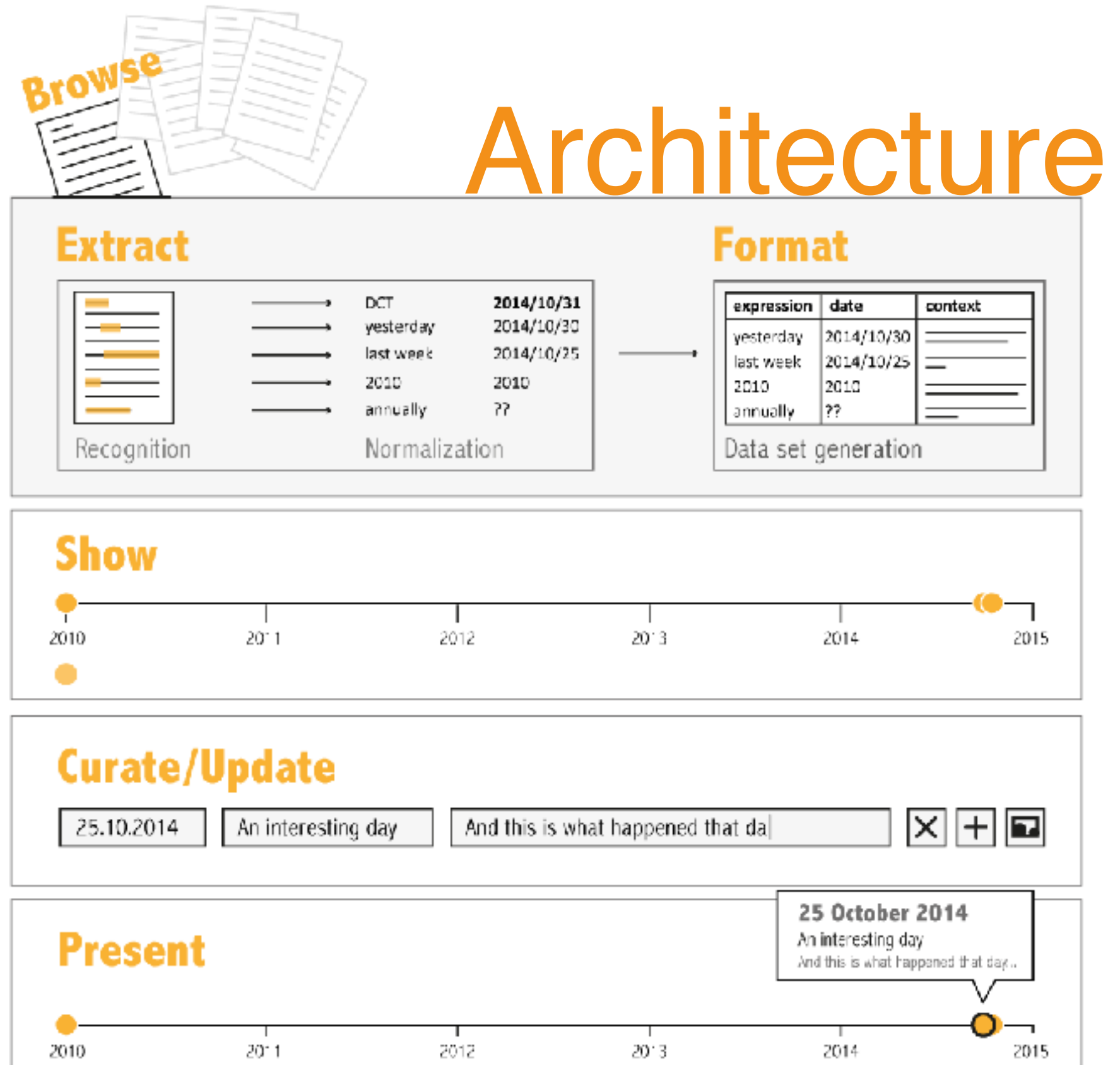
# TimeLineCurator

visual & browser-based

<https://vimeo.com/jofu/tlc>

# The general case for curation

- build for human in the loop as continuing need
  - automatic processing to accelerate not replace
  - assume computational results good but not perfect
    - for the indefinite future!
  - visual feedback to accelerate



# Manual creation process



# Structured creation process

















	A	B	C	D	E	F
	Start Date	End Date	Headline	Text	Media	Media Credit
1				Zuckerberg wrote a program called Facemash on October 28, 2003 while attending Harvard as a sophomore	<a href="http://ukbincigitalibrary.com/Uploads/2011/03/04/2003-10-28-288.jpg">http://ukbincigitalibrary.com/Uploads/2011/03/04/2003-10-28-288.jpg</a>	Dublin Digital
2	10/28/2003		Facemash	The following semester, Zuckerberg began writing code for a new website in January 2004.		
3	1/1/2004	1/3/2004	new website	On February 4, 2004, Zuckerberg launched "thefacebook", originally located at thefacebook.com		
4	2/4/2004		thefacebook.com	Six days after the site launched, three Harvard students (Cameron Winckles, Tyler Winckles, and Divya Narendra) accused Zuckerberg of intentionally misleading them into believing he would help them build a social network called HarvardConnections.com	<a href="http://www.cdnfb.org/olyp-refer/gbde/2004/03/04/2004-03-04-288.jpg">http://www.cdnfb.org/olyp-refer/gbde/2004/03/04/2004-03-04-288.jpg</a>	Capital Berg
5	2/8/2004		Harvard Connections	They later lost a lawsuit against Zuckerberg, subsequently selling its 2004 IPO for 1.5 million shares (worth \$700 million at Facebook's IPO)	<a href="http://www.cdnfb.org/olyp-refer/gbde/2004/03/04/2004-03-04-288.jpg">http://www.cdnfb.org/olyp-refer/gbde/2004/03/04/2004-03-04-288.jpg</a>	Facebook
6	1/1/2004	1/3/2004	Harvard Connections website	Membership was initially restricted to students of Harvard College, within the first month, more than half the undergraduates at Harvard were registered in the service		
7	2/4/2004	2/4/2004	thefacebook at Harvard only	In March 2004, Facebook expanded to the universities of Columbia, Stanford, and Yale (2004) in the 2004 entrepreneur Dean Porter (informal advisor)		
8	3/1/2004	3/3/2004	thefacebook expands to other universities			

TimelineJS  
[timeline.knightlab.com/](http://timeline.knightlab.com/)

# Timeline authoring model

- time required for each task

	<b>Browse</b>	<b>Extract</b>	<b>Format</b>	<b>Show</b>	<b>Update</b>
Manual Drawing	 slow	 slow		 slow	 slow
Structured Creation	 slow	 slow	 slow	 automated	 fast
<b>TimeLine Curator</b>	 fast	 automated	 automated	 fast	 fast



# The importance of being brisk

- high-profile use case: eureka moment
  - success: enable what was impossible before
  - vis tools for new insights & discoveries
- workhorse use case: workflow speedup
  - success: vis tools accelerate your prior workflow
    - sometimes enables the previously infeasible

## • TLC use cases

– started with speedup use case, for presentation

- make this doc into a timeline now!

– two other use cases nudge towards exploration

- comparison between multiple timelines
- speculative browsing



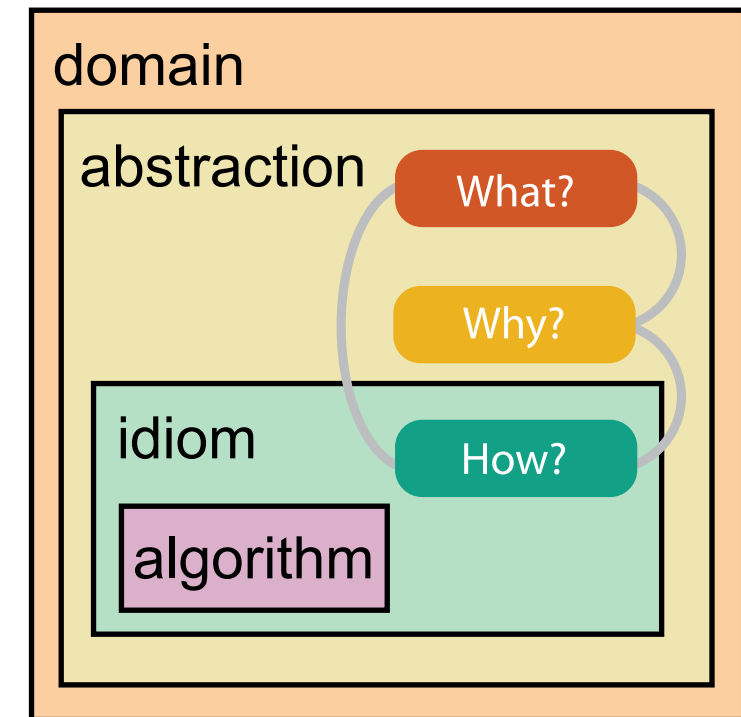
# TimeLineCurator: Speculative Browsing

speculative browsing

<https://vimeo.com/jofu/tlc>

# Nested model: Four levels of visualization design


- *domain situation*
  - who are the target users?
- *abstraction*
  - translate from specifics of domain to vocabulary of visualization
    - **what** is shown? **data** abstraction
    - **why** is the user looking at it? **task** abstraction
      - often must transform data, guided by task
- *idiom*
  - **how** is it shown?
    - **visual encoding** idiom: how to draw
    - **interaction** idiom: how to manipulate
- *algorithm*
  - efficient computation




A Nested Model of Visualization Design and Validation.  
Munzner. *IEEE TVCG 15(6):921-928, 2009 (Proc. InfoVis 2009)*.  
<https://www.cs.ubc.ca/labs/imager/tr/2009/NestedModel/>

A Multi-Level Typology of Abstract Visualization Tasks  
Brehmer and Munzner. *IEEE TVCG 19(12):2376-2385, 2013 (Proc. InfoVis 2013)*.  
<https://www.cs.ubc.ca/labs/imager/tr/2013/MultiLevelTaskTypology/>

# Different threats to validity at each level

 **Domain situation**  
You misunderstood their needs

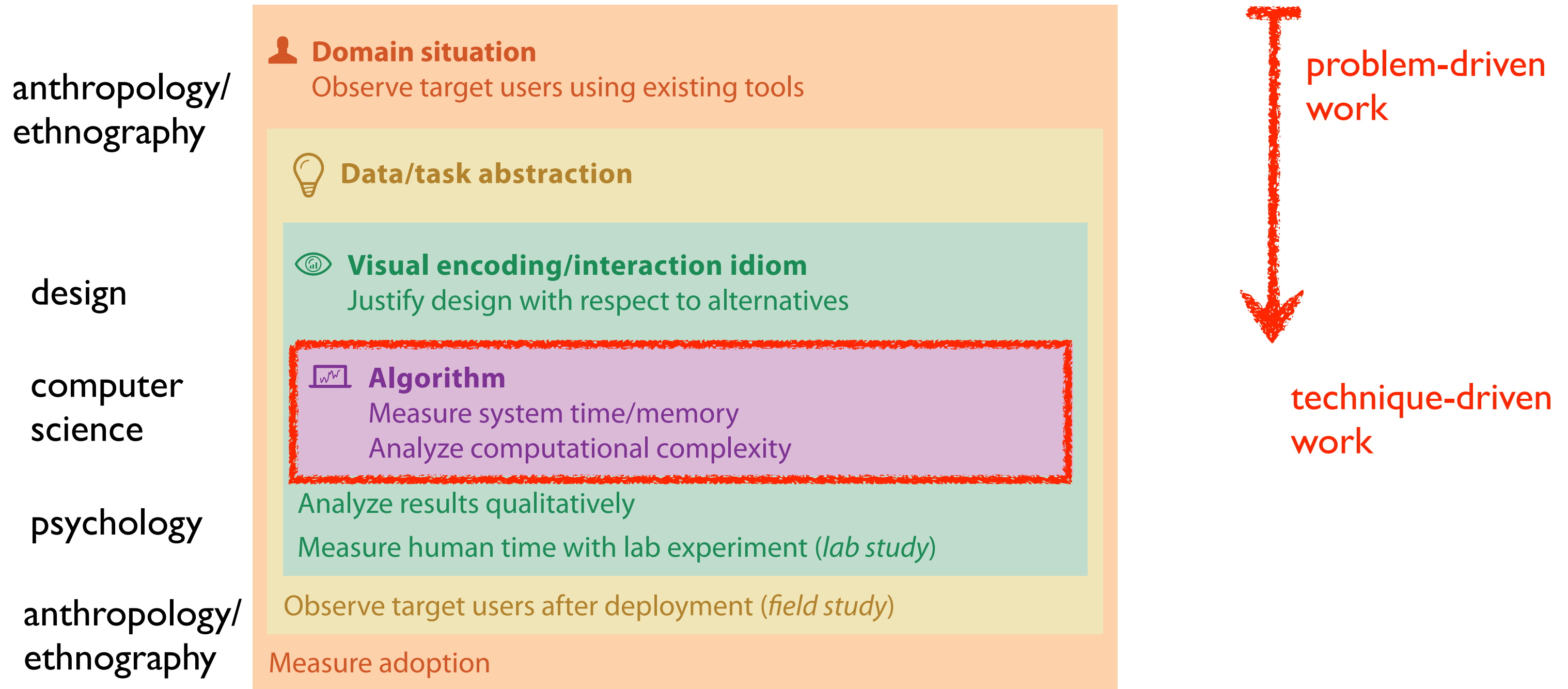
 **Data/task abstraction**  
You're showing them the wrong thing

 **Visual encoding/interaction idiom**  
The way you show it doesn't work

 **Algorithm**  
Your code is too slow

# Interdisciplinary: need methods from different fields at each level

- mix of qualitative and quantitative approaches



# More Information

[@tamaramunzner](https://twitter.com/tamaramunzner)

- papers, videos, software, talks, courses

<http://www.cs.ubc.ca/group/infovis>

<http://www.cs.ubc.ca/~tmm>

- book page (including tutorial lecture slides)

<http://www.cs.ubc.ca/~tmm/vadbook>

– 20% promo code for book+ebook combo:  
HVN17

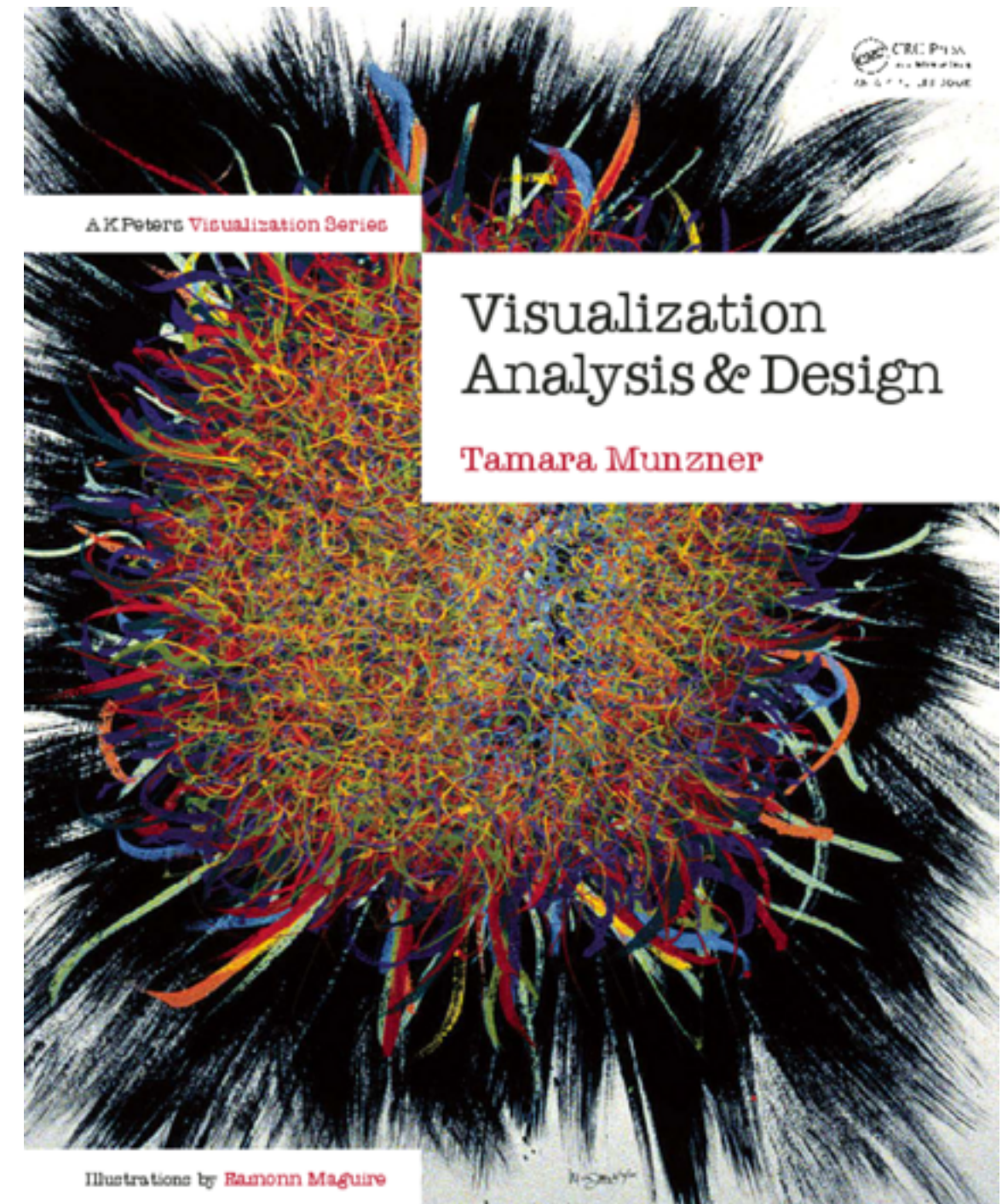
– <http://www.crcpress.com/product/isbn/9781466508910>

- Viz@UBC Initiative

<https://dfp.ubc.ca/initiatives/viz-ubc>

- this talk

[www.cs.ubc.ca/~tmm/talks.html#salon19](http://www.cs.ubc.ca/~tmm/talks.html#salon19)



Visualization Analysis and Design.  
Munzner. A K Peters Visualization Series, CRC Press, Visualization Series, 2014.