Visualization Fundamentals

Handbook

George Legrady © 2022
Experimental Visualization Lab
Media Arts & Technology
University of California, Santa Barbara

Welcome to IEEE VIS 2021 Virtual!

The above video is a short introduction to the conference that includes a welcome message, how to navigate live and static content, and tips for navigating Gather, Discord, as well as this virtual conference website.

Social Media

Please feel free to use social media to talk about IEEE VIS 2021. Enjoy the 2021 edition of #ieeevis.

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CLEVis: A Semantic Driven Visual Analytics System for Community Level Events

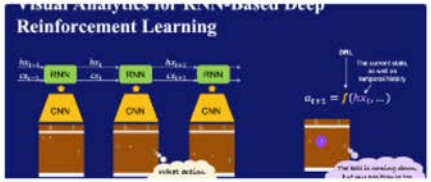
Chao Ma, Ye Zhao, Andrew Curtis, Farah Kamw, Shamal AL-Dohuki, Jing Yang, Suphanut Jamonnak, Ismael Ali

We, Oct 27, 11:00 -- Visualizing big issues: Culture, Climate Change, and Communities

Visual Analytics for RNN-Based Deep Reinforcement Learning

Junpeng Wang, Wei Zhang, Hao Yang, Chin-Chia Yeh, Liang Wang

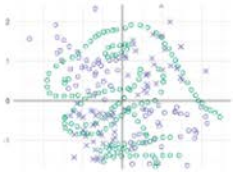
We, Oct 27, 07:15 -- Explainable AI and Machine Learning



Jurassic Mark: Inattentional Blindness for a Datasaurus Reveals that Visualizations are Explored, not Seen

Tal Boger, Steven Most, Steven Franconeri

Tu, Oct 26, 09:00 -- Best Papers



Communicating Performance of Regression Models Using Visualization in Pharmacovigilance

Ashley Suh, Gabriel Appleby, Erik W Anderson, Luca Finelli, Dylan Cashman

Su, Oct 24, 08:40 -- Clinical and Medical Decision Making

A Visualization Approach for Monitoring Order Processing in E-Commerce Warehouse

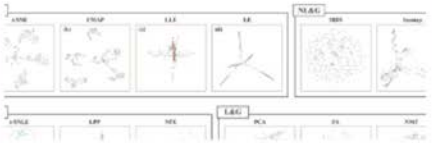
Junxiu Tang, Yuhua Zhou, Tan Tang, Di Weng, Boyang Xie, Lingyun Yu, Huaqiang Zhang, Yingcai Wu

Th, Oct 28, 06:45 -- Sports, Commerce, and Social Media

Revisiting Dimensionality Reduction Techniques for Visual Cluster Analysis: An Empirical Study

Jiazhi Xia, Yuchen Zhang, Jie Song, Yang Chen, Yunhai Wang, Shixia Liu

We, Oct 27, 10:30 -- Multi-Dimensional Data



MiningVis: Visual Analytics of the Bitcoin Mining Economy

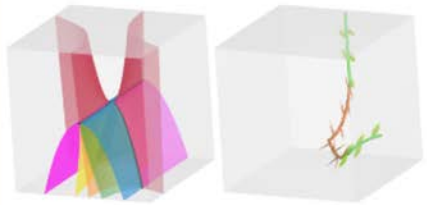
Natkamon Tovanich, Nicolas Soulié, Nicolas Heulot, Petra Isenberg

Th, Oct 28, 07:00 -- Sports, Commerce, and Social Media

Feature Curves and Surfaces of 3D Asymmetric Tensor Fields

Shih-Hsuan Hung, Yue Zhang, Harry Yeh, Eugene Zhang

Tu, Oct 26, 08:45 -- Best Papers



An Entropy-Based Approach for Identifying User-Preferred Camera Positions

Nicole J. Marsaglia, Yuya Kawakami, Samuel David Schwartz, Stefan Fields, Hank Childs

Mo, Oct 25, 11:00 -- Render/Display

Towards Visual Explainable Active Learning for Zero-Shot Classification

Shichao Jia, Zeyu Li, Nuo Chen, *Student Member, IEEE*, and Jiawan Zhang, *Senior Member, IEEE*

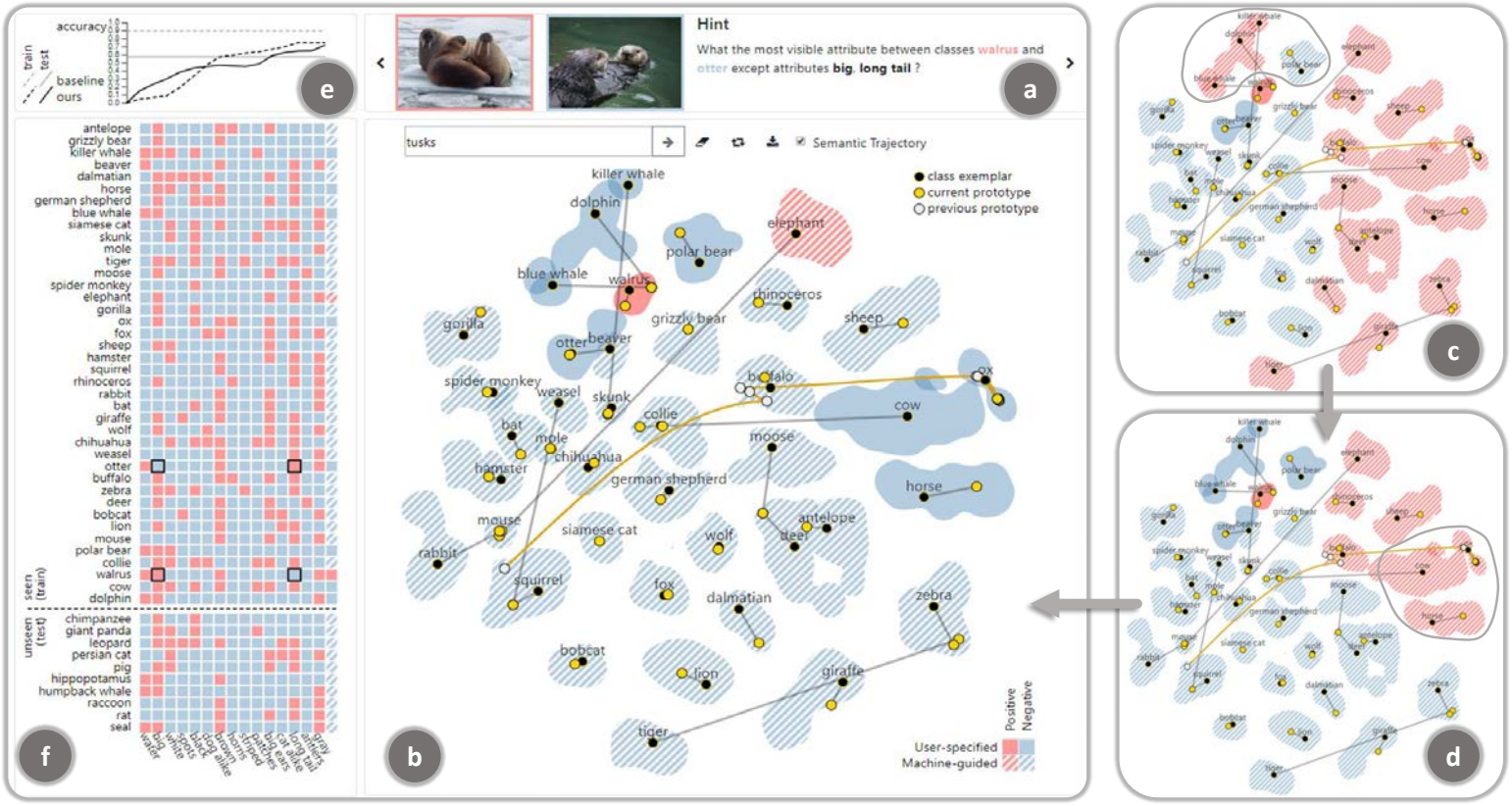
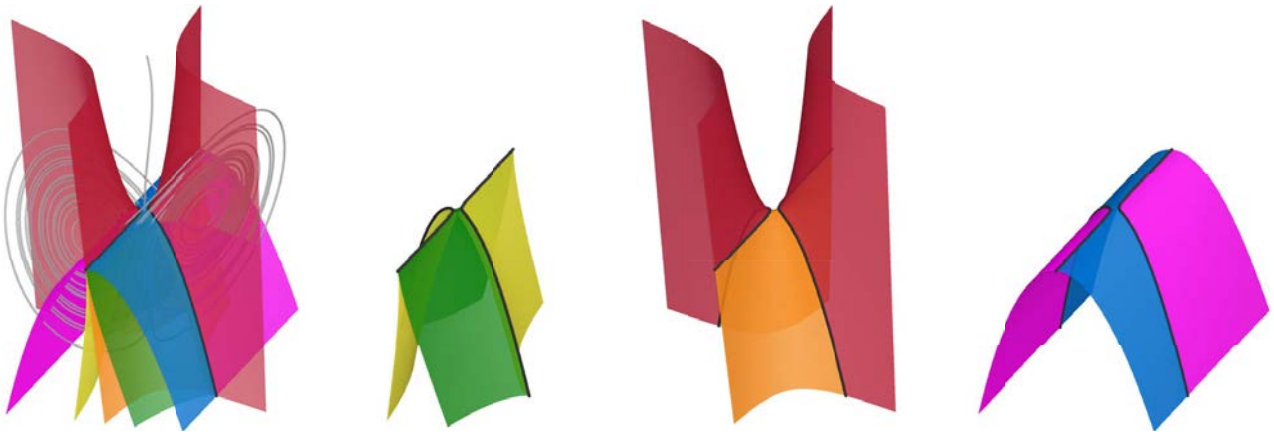


Fig. 1. Semantic navigator is a mixed-initiative visual analytics system for zero-shot classification. (a) The machine asks contrastive questions to guide analysts to come up with new attributes. (b) The semantic map explains the machine's status and presents the label recommendations (striped contours). Analysts select partial classes as positive (solid red contours) or negative (solid blue contours) to adjust the label recommendations ((c) and (d)). (e) The line chart monitors the training accuracy for seen classes and testing accuracy for unseen classes. (f) The class-attribute matrix is built interactively via collaboration between analysts and the machine.

Feature Curves and Surfaces of 3D Asymmetric Tensor Fields

Shih-Hsuan Hung, Yue Zhang, *Member, IEEE*, Harry Yeh, Eugene Zhang, *Senior Member, IEEE*



(a) all features (b) degenerate surfaces (c) neutral surfaces (d) balanced surfaces

Fig. 1: We introduce a number of topological feature curves and surfaces for 3D asymmetric tensor fields, such as the velocity gradient tensor of the Lorenz attractor [15] (a). These surfaces include (b) linear degenerate surfaces (green) and planar degenerate surfaces (yellow), (c) real neutral surfaces (orange) and complex neutral surfaces (red), and (d) linear balanced surfaces (blue) and planar balanced surfaces (magenta). Note that all of these surfaces intersect exactly at the triple degenerate curves (black). Furthermore, these surfaces exhibit a two-way rotational symmetry. Our analysis leads to an eigenvalue space for the analysis of 3D asymmetric tensor fields (Section 4). In addition, our topological feature surfaces separate the two critical points in the attractor where steady convection occurs ((a): the centers of the swirls in the butterfly-shaped trajectory).

Abstract— 3D asymmetric tensor fields have found many applications in science and engineering domains, such as fluid dynamics and solid mechanics. 3D asymmetric tensors can have complex eigenvalues, which makes their analysis and visualization more challenging than 3D symmetric tensors. Existing research in tensor field visualization focuses on 2D asymmetric tensor fields and 3D symmetric tensor fields. In this paper, we address the analysis and visualization of 3D asymmetric tensor fields. We introduce six topological surfaces and one topological curve, which lead to an eigenvalue space based on the tensor mode that we define. In addition, we identify several non-topological feature surfaces that are nonetheless physically important. Included in our analysis are the realizations that triple degenerate tensors are structurally stable and form curves, unlike the case for 3D symmetric tensors fields. Furthermore, there are two different ways of measuring the relative strengths of rotation and angular deformation in the tensor fields, unlike the case for 2D asymmetric tensor fields. We extract these feature surfaces using the A-patches algorithm. However, since three of our feature surfaces are quadratic, we develop a method to extract quadratic surfaces at any given accuracy. To facilitate the analysis of eigenvector fields, we visualize a hyperstreamline as a tree stem with the other two eigenvectors represented as thorns in the real domain or the dual-eigenvectors as leaves in the complex domain. To demonstrate the effectiveness of our analysis and visualization, we apply our approach to datasets from solid mechanics and fluid dynamics.

Index Terms—Tensor field visualization, 3D asymmetric tensor fields, tensor field topology, traceless tensors, feature surface extraction, degenerate surfaces, neutral surfaces, balanced surfaces, triple degenerate curves

IEEE VISAP/21

DIS/CONNECTED EXHIBITION

Not Suitable for Breathing

Zhouyang Lu

Not Suitable for Breathing, a data visualization and art installation, which visualizes Canadian COVID-19 mortality data through animation, physical objects, and sound. These projects provide viewers with an opportunity to contemplate and reflect on our experiences and those we have lost during the pandemic.

show more

Invisible Lives

Hye Yeon Nam, Zak Berkowitz

Invisible Lives is a robotic installation using the Twitter data and customized robot fingers to evoke understanding and spark a discussion about racism and the recent social movements Black Lives Matter and Stop Asian Hate. While Invisible Lives represents sensitive social issues, it also reveals the lack of conversation.

show more

Roads in You

Yoon C Han

Roads in You is an interactive biometric-data artwork that allows participants to scan their veins and find the roads that match their vein lines. This new artwork explores the line segmentation and the structure of veins and compares them to roads in the real world.

show more

Invisible Pixel: Short Video Narratives from a Machine Perspective

Junlin Zhu, Wenxuan Zhao, Yingjing Duan, Juanjuan Long

Invisible Pixel is a web page based on China's Internet poverty alleviation background, aiming to explore how computer technology will affect social media in the future. The project uses machine learning to transform short video texts into images, creating a machine-perspective data narratives of rural areas.

show more

FaceType: Expressing Our Spoken Expression

Kevin Maher, Fan Xiang, Liang Zhi

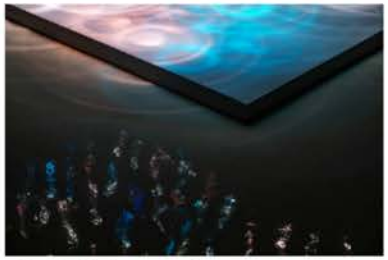
We designed the installation FaceType so that visitors could perform Chinese calligraphy, "writing" English letters that document emotion, cadence, and emphasis in audience expression. Letter shape, brush stroke, spacing and speed are "data-ink"

Decoding and Encoding of Tibetan

Anqi Song, Xintong Song, Yuhao Chen, Guangyu Luo, Qiansheng Li

The website tells a data story from Tibetan characters to Tibetan culture in an innovative and experiential way and bring the Tibetan language into the public's eye. We want to use data visualization to build a bridge between Tibetan and Chinese cultures

Spectrographies: Decomposition of Music into Light



Glacier's Lament

Jiabao Li

Glaciers are sentinels of climate change. They are the most visible evidence of global warming today. This series of works embodies the stunning beauty, rapid change, fragility, destructive power, and magnificence of glaciers. At the same time, they challenge the audience with the

VulnEx: Exploring Open-Source Software Vulnerabilities in Large Development Organizations to Understand Risk Exposure (short paper)

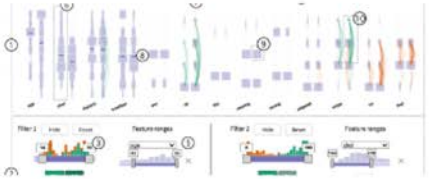
Frederik L. Dennig, Eren Cakmak, Henrik Plate, Daniel Keim

We, Oct 27, 11:00 -- Threat Detection, Computer Forensics & Software Vulnerability Analysis

AdViCE: Aggregated Visual Counterfactual Explanations for Machine Learning Model Validation

Steffen Holter, Oscar Alejandro Gomez, Jun Yuan, Enrico Bertini

We, Oct 27, 09:00 -- AI+VIS



When Red Means Good, Bad, or Canada: Exploring People's Reasoning for Choosing Color Palettes

Jarryullah Ahmad, Elaine Huynh, Fanny Chevalier

Th, Oct 28, 08:30 -- Graphs, Charts, and Perception

Invisible Pixel： Short Video Narratives from Machine Perspective

Junlin Zhu, Juanjuan Long, Yingjing Duan, Wenxuan Zhao

Th, Oct 28, 11:10 -- VISAP Session 2

Move&Find: The value of kinesthetic experience in a casual data representation

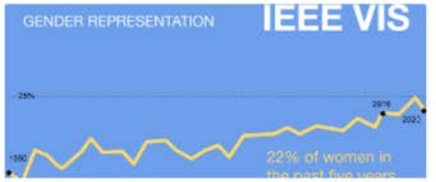
Jörn Hurtienne, Franzisca Maas, Astrid Carolus, Daniel Reinhardt, Cordula Baur, Carolin Wienrich

We, Oct 27, 08:30 -- Data Physicalization

Gender in 30 Years of IEEE Visualization

Natkamon Tovanich, Pierre Dragicevic, Petra Isenberg

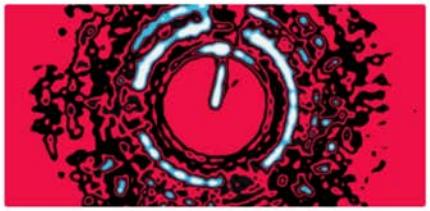
We, Oct 27, 08:45 -- Perspectives and Reflections



Spectrographies: Decompositions of Music into Light

Ignacio Pérez-Messina, Ilana Levin

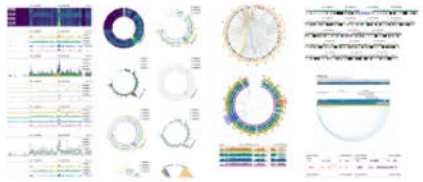
Th, Oct 28, 11:07 -- VISAP Session 2



Gosling: A Grammar-based Toolkit for Scalable and Interactive Genomics Data Visualization

Sehi L'Yi, Qianwen Wang, Fritz Lekschas, Nils Gehlenborg

Th, Oct 28, 08:30 -- Grammar and Learning



Visual Analysis of Spatio-temporal Features in Multi-field Earth's Mantle Convection Simulations

Marina Evers, Simon Leistikow, Adrian Derstroff, Tim Gerrits, Karim Huesmann, Jonathan Hollenbeck, Julian Seljami, Lars Linsen

Th, Oct 28, 10:54 -- SciVis Contest

BigVis 2022

5th International Workshop on Big Data Visual Exploration and Analytics
March 29 2022 | EDBT/ICDT 2022 | Edinburgh, UK [Online]

Special Issue

TBA

Previous BigVis Special Issues

BigVis 2021: "Machine Learning Approaches in Big Data Visualization", IEEE Computer Graphics and Applications (CG&A), 2022.

BigVis 2020: "Interactive Big Data Visualization and Analytics", Big Data Research Journal, Elsevier, 2021.

BigVis 2018: "Big Data Exploration, Visualization & Analytics", Big Data Research Journal, Elsevier, 2019.

News

IMPORTANT DATES

Submission: January 28, 2022 (AoE)
Notification: February 20, 2022
Camera-ready: February 25, 2022
Workshop: March 29, 2022 [Online]

SUBMISSION TYPES

Regular/Short Research papers: 8/4 pages
Work-in-progress, Vision & Demos papers: 4 pages

2022 SPECIAL THEME

Human-AI Collaboration BigVis 2022 will devote a session to Human-AI collaboration approaches in the context of Big data visualization and analytics.

BIGVIS PREVIOUS SPECIAL ISSUES

BigVis 2021: "Machine Learning Approaches in Big Data Visualization", IEEE Computer Graphics and Applications (CG&A), 2022.

BigVis 2020: "Interactive Big Data Visualization and Analytics", Big Data Research Journal, Elsevier, 2021.

BigVis 2018: "Big Data Exploration, Visualization & Analytics", Big Data Research Journal, Elsevier, 2019.

BigVis 2022 Workshop Topics

- Visualization, exploration & analytics techniques for various data types; e.g., stream, spatial, graph
- Human-in-the-loop processing
- Human-centered databases
- Data modeling, storage, indexing, caching, prefetching & query processing for interactive applications
- Interactive & human -centered machine learning
- Interactive data mining
- User -oriented visualization; e.g., recommendation, assistance, personalization
- Visualization & knowledge; e.g., storytelling
- Progressive analytics
- In-situ visual exploration & analytics
- Novel interface & interaction paradigms
- Visual representation techniques; e.g., aggregation, sampling, multi-level, filtering
- Scalable visual operations; e.g., zooming, panning, linking, brushing
- Scientific visualization; e.g., volume visualization
- Analytics in the fields of scholarly data, digital libraries, multimedia, scientific data, social data, etc.
  Immersive visualization
- Interactive computer graphics
- Setting-oriented visualization; e.g., display resolution/size, smart phones, visualization over networks
- High performance, distributed & parallel techniques
- Visualization hardware & acceleration techniques
- Linked Data & ontologies visualization
- Benchmarks for data visualization & analytics
- Case & user studies
- Systems & tools

Miriah Meyer (https://miriah.github.io/projects/)

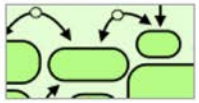
MODELS FOR VISUALIZATION DESIGN

Making Data Visual

Practical guidance for translating data into insightful visualizations.
related material: [book18]

Rigor and Knowledge Construction

How visualization designers (can) construct rigorous knowledge.
related material: [infovis20] [infovis19] [cga18]



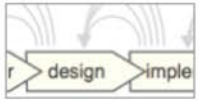
Visualization Design Research

Models that describe what visualization design researchers do and the design decisions they make.
related material: [beliv16] [infovis14] [iv13] [leo13] [cga13] [beliv12] [infovis12] [visweek10]

Workshops

Participatory design workshops for discovering visualization opportunities.
related material: [beliv20] [infovis18] [methods]

DESIGN STUDIES



Projects that target specific, real-world, data analysis challenges.
related material: [Trevo] [ImplicitError] [Graffinity] [BubbleNet] [WeaVER] [Poemage] [ShotViewer] [PoemViewer] [MulteeSum] [Pathline] [Mizbee]

CRITICAL DATA VISUALIZATION

Words Matter

Critique of 'chartjunk' as misaligned and inappropriate for vis research.
related material: [altvis21]

Data Hunches

Valuing personal knowledge in visual analysis.
related material: [preprint]

VISUALIZATION OF PERSONAL DATA

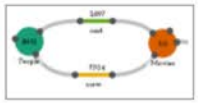
The Personal Informatics Analysis Gap

Three-year study with asthamtic families that reveals opportunities for visualization.
related material: [vis21] [ubicomp18] [lcn18]

AQ&U

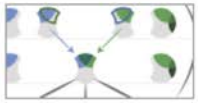
Empowering citizens to reason about air quality using networks of low-cost sensors.
related material: [enviro20] [envres20] [ubicomp18] [lcn18] [cityvis18] [website]

RAPID PROTOTYPING WITH DATA



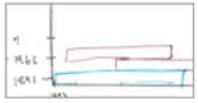
Reshaping Graphs

Tool for representing, reshaping, and reimagining data as a graph.
related material: [vast19] [software]



Iterating Between Tools

Model that describes how to bridge between generative and drawing tools, and Hanpuku, a tool that bridges D3 and Illustrator.
related material: [infovis16] [software]



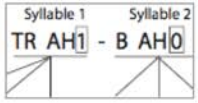
How Designers Design with Data

Results of a qualitative study that describe how designers use data and existing tools to create infographics.
related material: [avi14]

DIGITAL HUMANITIES

Visualizing Poetry

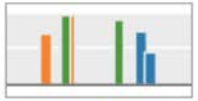
Visual encoding of poetic devices for poets.
related material: [infovis15] [eurovis13]
software: [poemage] [poemviewer]



RhymeDesign

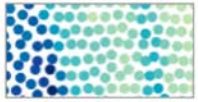
A formalism for analyzing sonic devices in poetry.
related material: [clfl15] [software]

VISUALIZATION OF BIOLOGICAL DATA



inSite

Interactive viewer for comparing patterns of binding sites across multiple genomics regions.
related material: [software]

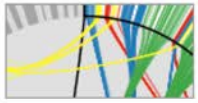


MulteeSum

Exploration tool that supports the comparison of multiple gene expression data sets defined both spatially and temporally.
related material: [infovis10] [software]

Pathline

Tool that visualizes temporal gene expression data over multiple molecular pathways and across multiple species.
related material: [eurovis10] [software]



MizBee

Browser that enables analysis of comparative genomics data through visualization across multiple scales.
related material: [infovis09] [software]

Example of postdoc position in critical datavis

- The research will focus on how *visualization tools impact the ways that data is understood*, imagined, valued or dismissed through situated, visual analysis practices with and by domain experts, and how these understandings are entangled in collaborations with visualization designers and tool development.

- Feminist research on visual analysis tools is an emerging international field of inquiry, and addresses *how data and digital visualization technologies are entangled in the practices of doing and making science but also in the norms and values of social groups*.

- This position will engage with critical analyses of intersectional power dynamics in visualization practices and technologies as well as questions about *social justice and the design of effective tools, where 'effective' is unpacked*.

- The research will involve ethnographic fieldwork in expert settings and is expected to result in pragmatic recommendations for designing more ethical, responsible, and inclusive visual analysis tools.

https://liu.se/en/work-at-liu/vacancies?rmpage=job&rmjob=18009&rmlang=UK

From Data to Visualization

collcode	itemtype	barcode	title	callNumber	deweyClass
nacd	accd	0010053294418	tigers have spoken	CD 782.421642 C2665T	782.421642
cafic	acbk	0010046075908	Heart on the line	FIC ARNOLD	NULL
nalpfic	acbk	0010047150288	Too hot to handle	FIC LOWELL	NULL
canf	acbk	0010027180271	Governing public schools new times new requirements	371.2 DANZBER 1992	371.2
cs9	acbk	0010002326972	great deception the inside story of how the Kremlin took over Cuba	972.91 M741G	972.91
canf	acbk	0010041599258	Logic or The right use of reason in the inquiry after truth with a va...	160 L793W 1996	160
cafic	acbk	0010050230746	Something about Emmaline	FIC BOYLE2005	NULL
canf	acbk	0010048238389	Understanding installation art from Duchamp to Holzer	709.04 R7277U 2003	709.04
cs9	acbk	0000103502175	Frank B Kellogg a biography	B K292 B	NULL
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canf	acbk	0000102981248	Reservation narrow gauge Omak Creek railroad Bow Arrow Short Li...	385.52097 L587R	385.52097
canf	acbk	0010004731641	place no one knew Glen Canyon on the Colorado	779 P833P2a	779
canf	acbk	0010002691342	Buddhism in translations passages selected from the Buddhist sacr...	294 W252B	294
canf	acbk	0010048100100	death in Washington Walter G Krivitsky and the Stalin terror	327.1247 K4592D 2003	327.1247
canf	acbk	0010054269096	101 diseases you dont want to get	614.5 P8715o 2005	614.5
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nanf	acbk	0010041237933	Boundless healing meditation exercises to enlighten the mind and...	294.34435 T387B 2000	294.34435
canf	acbk	0010050859288	fragrance of faith the enlightened heart of Islam	297 R1294F 2004	297
nanf	acbk	0010053789672	How to reduce workplace conflict and stress how leaders and their...	658.1053 M327H 2005	658.1053
canf	acbk	0010034758416	home of the blizzard a true story of Antarctic survival	919.8904 MAWSON 1998	919.8904
nab	acbk	0010045761730	Lives of mothers daughters growing up with Alice Munro	B M9265M 2001	NULL
canf	acbk	0010054107684	Foxes in the henhouse how the Republicans stole the South and th...	324.70973 R29996J 2006	324.70973
canf	acbk	0010045523353	False intimacy understanding the struggle of sexual addiction	241.66 Sch196F 1997	241.66
canf	acbk	0010025511717	Lakota recollections of the Custer fight new sources of Indian milit...	973.82 LAKOTA 1991	973.82
cafic	acbk	0010020070768	Furors die a novel	FIC HOFFMAN	NULL
nanf	acbk	0010042818186	devils dictionary of business monkey business high finance and lo...	330.0207 V895D 2005	330.0207
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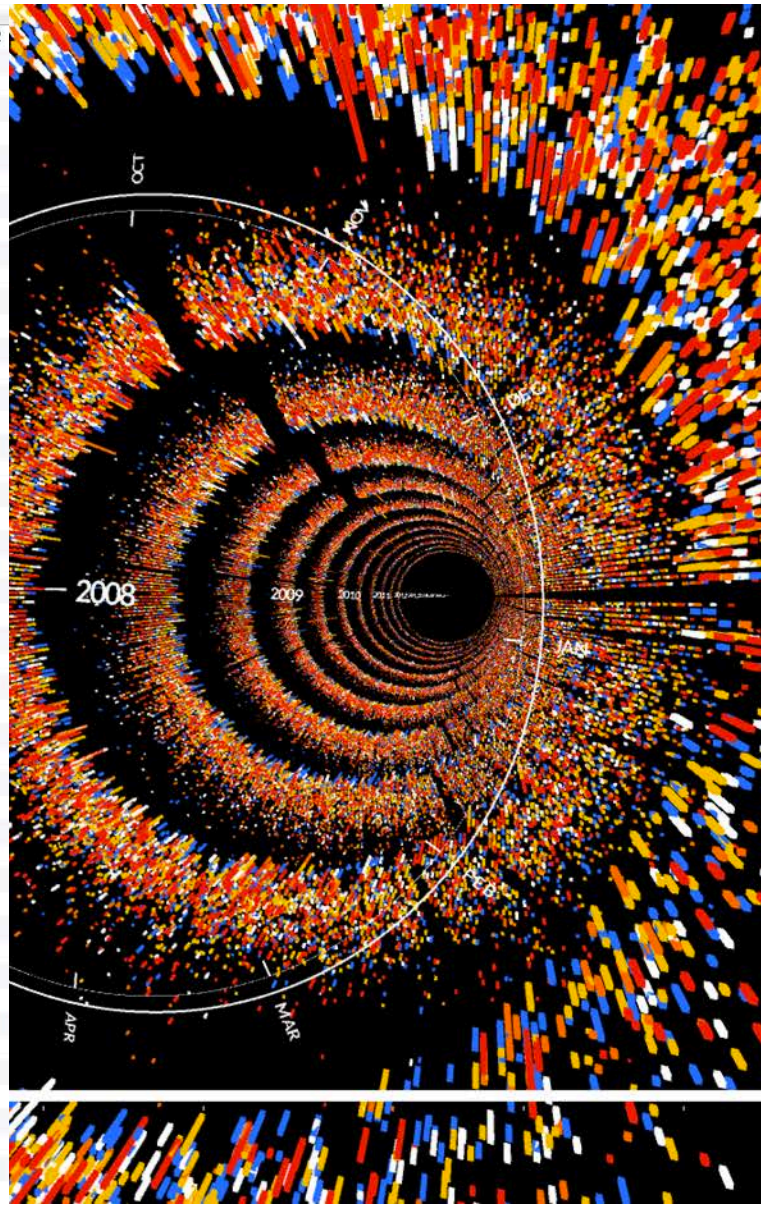
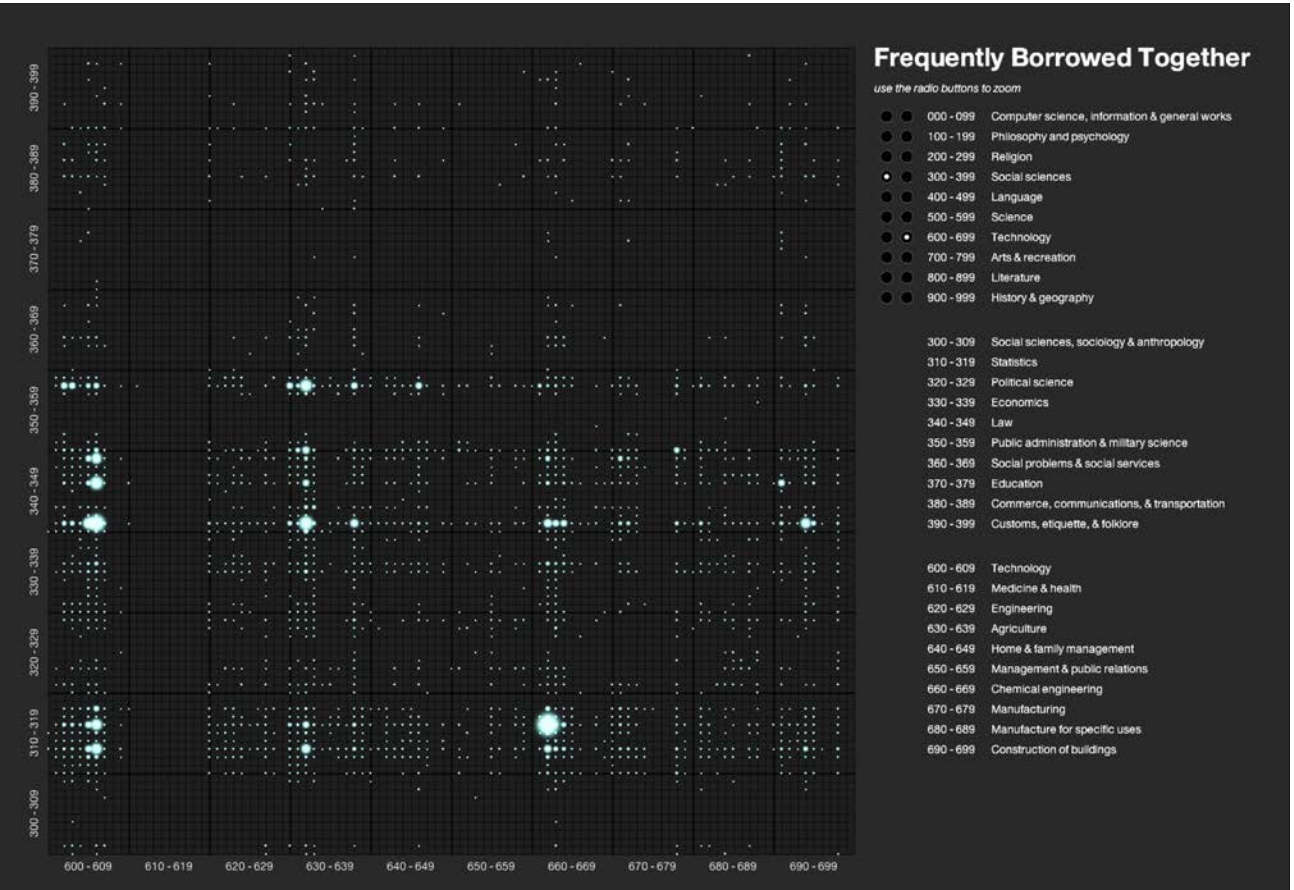
nchol	jcbk	0010045871109	Jothams journey a storybook for Advent	J YTREEID	NULL
cs9o	acbk	0010001512887	Burri	B B942B	NULL
ncnew	jcbk	0010050556819	Lady in the water a bedtime story	E SHYAMAL	NULL
cs6ro	arbk	0010019836690	Bullard Arms	338.76834 J241B	338.76834
canf	acbk	0010038257472	Perfect bones a six point plan to promote healthy bones	616.716 L5785P 2000	616.716
nanf	acbk	0010050592780	Satisfaction the science of finding true fulfillment	155.9 B4581S 2005	155.9
nafic	acbk	0010022410574	Fly fishing tales literary bait by angling authors	FIC FLY FIS1994	NULL
nanf	acbk	0010037361580	Chariots of the gods unsolved mysteries of the past	001.94 DANIKEN 1999	001.94
canf	acbk	0010036046778	way of agape	241.4 MISSLER 1999	241.4
canf	acbk	0010026014141	Future of medicine toward a science of prevention based on ancie...	613 DUGLISS 1993	613
canf	acbk	0010045701462	Tanker operations a handbook for the person in charge PIC	623.88245 H8627T 2001	623.88245
caesl	bcbk	0010034398809	Angliiskii iazyk prosto o slozhnom prakticheskii kurs	RUSSIAN 428.24917 L576A	428.24917
canf	acbk	0010051680022	Gorgeous disaster the tragic story of Debra LaFave	364.153 L131L 2006	364.153
nacd	accd	0010040958539	Spirituals in concert	CD784.73 B322S	784.73
capf	acbk	0010025431536	Kathy and Mo show parallel lives	812.54 GAFFNEY 1992	812.54
nafic	acbk	0010046761242	revelation	FIC LITTLE	NULL
cacd	accd	0010046200415	peaceful Christmas	CD 782.21723 P3133	782.21723
canf	acbk	0010048571573	Tauntons family home idea book	728.37 St546T 2003	728.37



http://vislab.mat.ucsb.edu/2020/p2/Lu_Ye/index.html

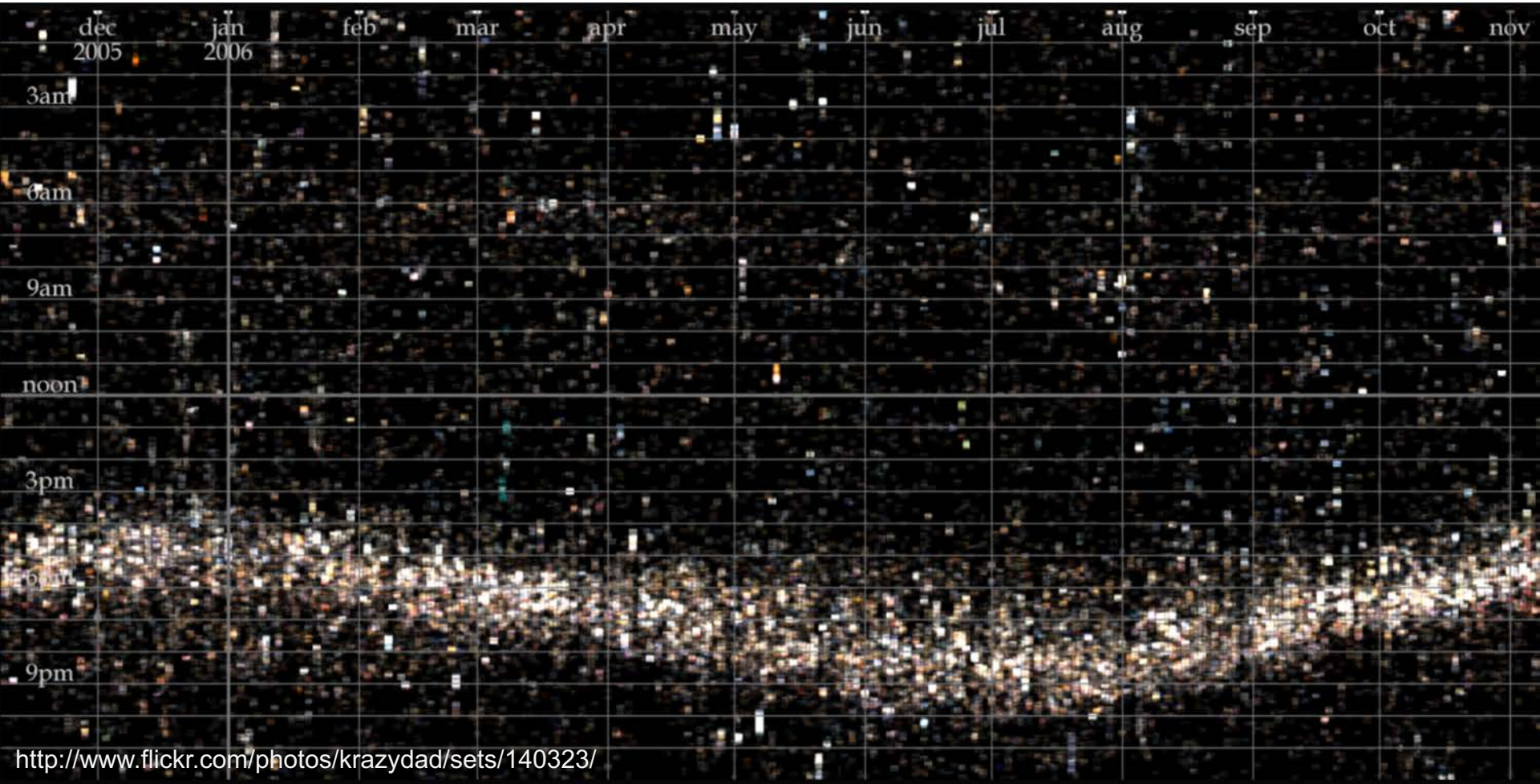
4 Fundamental Visualization Methods

- **Spatial Organization (Global to detail)**
- **Hierarchical Encoding**: Color, Scaling, etc.
- **Clustering & Classification**
- **Labeling (on demand/turn ON or OFF)**



Rules in spatializing & organizing data

- Use full screen for final version (use small screen during development)
- Subdivide Screen (rule of thirds; or according to any set of rules)
- Use invisible grid system to determine how things are placed



http://www.flickr.com/photos/krazydad/sets/140323/

Data Organization Within a Grid System

NATURE COMMUNICATIONS | https://doi.org/10.1038/s41467-021-27439-6 ARTICLE

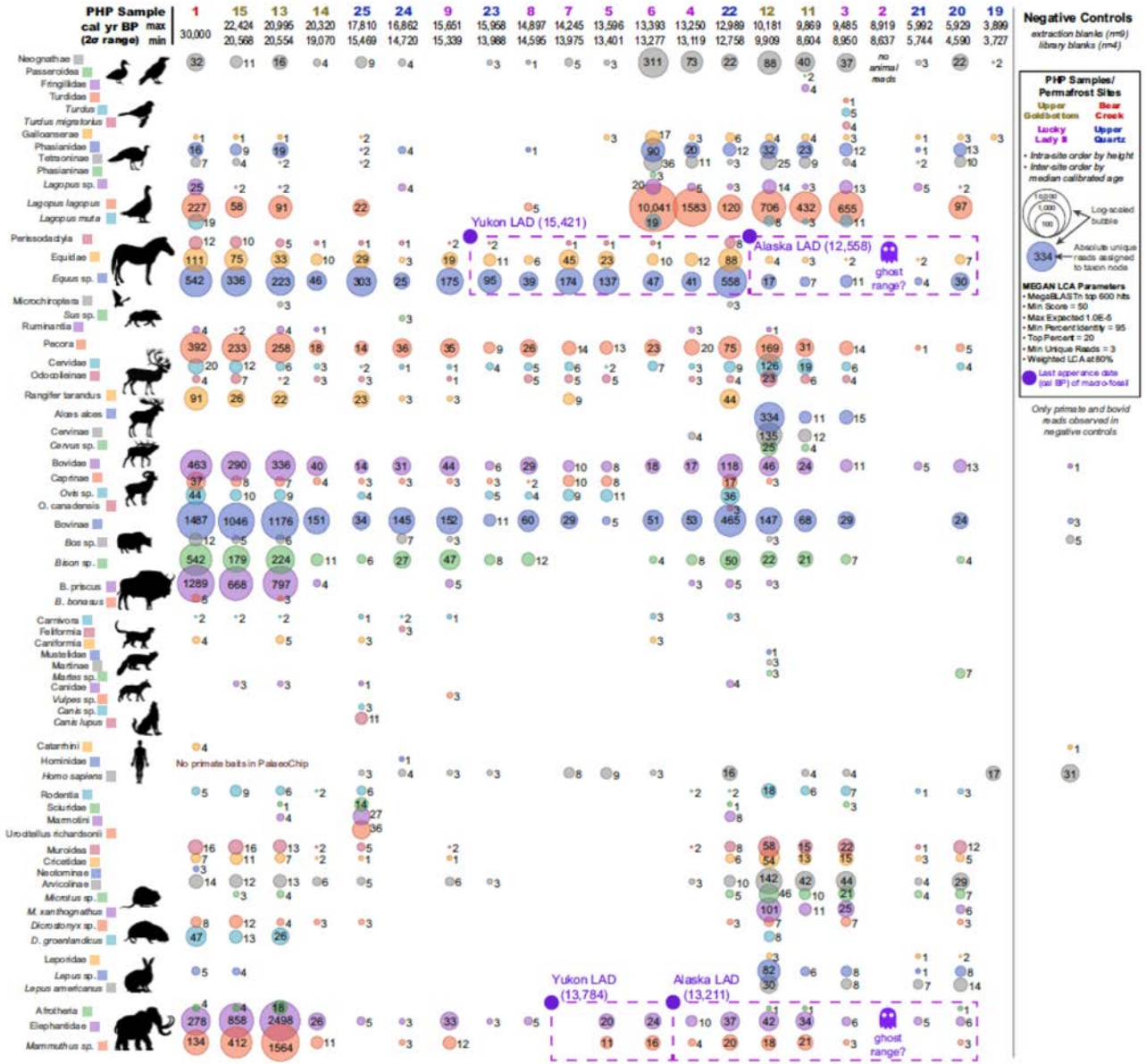


Fig. 2 Metagenomic comparison of animal reads assigned using BLASTn to MEGAN. Values indicate unique reads assigned to that taxon node. Source

Grid System (Joseph Müller-Brockmann)

008
Tai Kwun Centre for Heritage & Arts, Hongkong / Hong Kong, HK

Bauherr /
Client:
The Hong Kong Jockey Club,
HK-Hong Kong

Herzog & de Meuron team:
Partner /
Partners:
Jacques Herzog, Pierre de Meuron, Ascan Mergenthaler (Partner in Charge)

Project team:
Vladimir Pajkic (Associate, Project Director), Edman Choy (Associate, Project Director), Chi-Yan Chan (Project Manager), Raymond Jr. Gaëtan (Associate)

Abdulfatah Adan, Roman Aebi, Maximilian Beckenbauer, Aurélie Blanchard, Emi Jean Bryan, Alexander Bürgi, Soohyun Chang, Julien Combes, Massimo Correali, Duarte De Azevedo Coutinho Lobo Antunes, Dorothee Dietz, Peter Dougherty, Piotr Fortuna, Luis Gisler, Carl Kristoffer Hägerström, Kelvin Ho, Justin Hui, Kentaro Ishida, Anna Jach, Sara Jardim Manteigas, Hauke Jungjohann, Anasi Kanikkunen, Rina Ko, Johannes Rudolf Kohnle, Dannes Kok, Paweł Krzeminski, Jin Teck Lim, Mark Loughman, Jaroslav Mach, Donald Mak, James Albert Martin, José Ramón Mayoral Moratilla, Olivier Meystre, Lukas Nordström, Cristian Opree, Leonardo Pérez-Alonso, Thomas Polster, Maki Portilla Kawamura, Tom Powell, Günter Schwob, Oana Stanescu, Kai Strehlke, Fumiko Takahama, Zachary Vourlas, Kenneth Wong, Sung Goo Yang, Daniela Zimmer

Ausführungsplanung /
Executive architects:
Rocco Design Architects, HK-Hong Kong

Denkmalschutz /
Conservation architects:
Purcell, GB-London

Tragwerksplanung, Lichtplanung / Structural engineering, Lighting design:
Arup, HK-Hong Kong / GB-London

Bauingenieure, Fassaden- und Sicherheitsplanung, Brandschutz, Geotechnik / Civil engineering, Facade engineering and Security consultants, Fire engineering, Geotechnical engineering:
Arup, HK-Hong Kong

Akustik, Medientechnik /
Acoustics engineering, AV consultant:
Shen Milsom & Wilke, HK-Hong Kong

BEAM + Nachhaltigkeitsberatung /
BEAM + Sustainability consultant:
Hyder Consulting, HK-Hong Kong

Umweltberatung, Archäologie /
Environmental and archaeology consultant:
ERM, HK-Hong Kong

Landschaftsplanung /
Landscape consultant:
AECOM, HK-Hong Kong

TGA-Planung /
MEP engineering:
J. Roger Preston, HK-Hong Kong

Stadtplanung /
Planning consultant:
Townland Consultants, HK-Hong Kong

Kostenplanung /
Quantity surveyor:
Rider Levett Bucknall, HK-Hong Kong

Bauphysik /
Building physics:
Transsolar, DE-Stuttgart

018
Elbphilharmonie, Hamburg, DE

Bauherr /
Client:
Freie und Hansestadt Hamburg
vertreten durch / represented by:
ReGe Hamburg Projekt-Realisierungsgesellschaft mbH, Hamburg

Herzog & de Meuron team:
Partner /
Partners:
Jacques Herzog, Pierre de Meuron, Ascan Mergenthaler (Partner in Charge), David Koch (Partner in Charge Project Management)

Project team:
Jan-Christoph Lindert (Associate, Project Director), Nicholas Lyons (Associate, Project Architect), Stefan Goeddertz (Associate, Project Architect), Christian Riemenschneider (Associate, Project Manager), Henning Severmann (Project Manager), Stephan Wedrich (Associate, Project Director until 2012), Carsten Heppel (Associate, Project Manager)

Birgit Föllmer (Project Manager Main Concert Hall), Kai Zang (Project Manager Detailing New Building, Small Hall), Peter Scherz (Project Manager Granary, Kaistudio), Jan Per Groach (Project Manager Envelope)

Christiane Anding, Thomas Arnhardt, Petra Arnold, Christian Baumgarten, Tobias Becker, Johannes Beinhauer, Uta Beissert, Lina Merike Belling, Anna Benschke, Inga Benkendorf, Christine Binswanger (Partner), Johannes Bregel, Francesco Brenta, Johann Brunk, Julia Katrin Buse, Ignacio Cabezas, Jean-Claude Cadalbert, Maria Christou, Sergio Cobos Alvarez, Massimo Corradi (Digital Technologies), Guillaume Delemazure, Anniks Delorette, Fabian Dieterle, Annette Donat, Philipp Doukakis, Patrick Ehrhardt, Carman Eichenberger, Stephanie Eickelmann, Magdalena Agata Falska, Daniel Fernández, Stefan Flore, Hana Fousek, Bernhard Fortheus, Andreas Friss, Asko Fromm, Florian Gast, Catherine Gay Menzel, Marco Gelsomini, Ulrich Grenz, Jana Grundmann, Hendrik Gruss, Luis Guzmán Grossberger, Christian Hahn, Yvonne Hahn, Naghmeh Hajibeik, David Hammer, Michael Hansmeyer, Nikolai Happ, Bernd Heidlindemann, Anne-Kathrin Hellermann, Magdalena Hellmann, Lars Höffgen, Philip Hogrebe, Ulrike Horn, Robert Hösl (Partner), Michael Iking, Ina Jansen, Nils Jarre, Damun Jawanrudi, Jürgen Johner (Associate), Leweni Kelentzi, Andreas Kimmel, Anja Klein, Frank Klimek, Julia Kniess, Alexander Kolbinger, Benjamin Koren, Tomas Kraus, Nikolaus Kraus, Nicole Lambrich, Jana Lasorik, Matthias Lehmann, Monika Lietz, Julian Löffler, Philipp Loeper, Thomas Lorenz, Christina Loweg, Florian Loweg, Xiaojing Lu, Anne Lüdtke, Lilian Lyons, Jan Maasjosthusmann, Janos Magyar, Klaus Marten, Petrina Meier, Götz Menzel, Alexander Meyer, Simone Meyer, Henning Michelsen, Alexander Montero Herberth, Felix Morczinek, Jana Münsterteicher, Christiane Netz, Andreas Niessen, Monika Niggemeyer, Mónica Ors Romagosa, Angel Padilla Figueroa, Benedikt Pedde, Sebastian Pellatz, Malte Petersen, Jorge Manuel Pices de Carvalho, Philipp Poppe, Ahrun Porkert, Yanbin Qian, Robin Quass, Julian Raffelsieper, Holger Rasch (Digital Technologies), Leila Resse, Chantal Reichenbach, Leonard Reichert, Thorge Reinke, Ina Riemann, Nina Rittmeier, Dimitra Riza, Miguel Rodriguez Martinez, Guido Roth, Christoph Röttinger, Patrick Sandner, Philipp Schaerer (Digital Technologies), Chasper Schmidlin, Alexandra Schmitz, Martin Schneider, Leo Schneidewind, Malte Schoemaker, Katharina Schommer, Helene Schüler, Katrin Schwarz, Garrit Christopher Seil, Heeri Song, Nadine Steckling, Markus Stern, Sebastian Stich, Sophie Stöbe, Stephanie Stratmann, Kai Strehlke (Digital Technologies), Ulf Sturmi, Stefano Tagliacarne, Anke Theaforf, Henning Többen, Kerstin Treiber, Florian Tschecher, Chih-Bin Tseng, Jan Ulbricht, Inga van Husen, Florian Voigt, Jonathan Volk, Maximilian Vomhof, Constance von Rüge, Christof Weber, Ruth Maria Weber, Catharina Weis, Philipp Welzel, Douwe Wiebrs, Julius Wienholt, Julia Wildfeuer, Boris Wolf, Patrick Yong, Xiang Zhou, Bettina Zimmermann, Marco Zürn

Generalplanung /
General designer:

Joint Venture Arbeitsgemeinschaft Planung Elbphilharmonie:
Herzog & de Meuron GmbH, Hamburg
HPP Planungsgesellschaft mbH & Co. KG, DE-Aachen
Hochtief Solutions AG

ARGE Generalplaner Elbphilharmonie, Hamburg (2005–2013):
Herzog & de Meuron AG, Basel
Höhler + Partner Architekten und Ingenieure, DE-Aachen

Tragwerksplanung /
Structural engineering:
Hochtief Solutions AG
2005–2013:
WGG Schnetzer Puskas Ingenieure AG, CH-Basel
Rohwer Ingenieure VBI GmbH,
Jarplund-Weding
Brick Facade 2005–2013:
Jäger Ingenieure, DE-Radebeul

Akustik /
Acoustics:
Nagata Acoustics Inc., US-Los Angeles / JP-Tokyo

036
Blavatnik School of Government, Oxford, GB

Bauherr /
Client:
The University of Oxford

Herzog & de Meuron team:
Partner /
Partners:
Jacques Herzog, Pierre de Meuron, Ascan Mergenthaler (Partner in Charge)

Project team:
John O'Mara (Associate, Project Director), Marinka Boehm (Project Manager), Ben Duckworth (Associate), Simon Demeuse (Associate)

Farhad Ahmad, Maximilian Beckenbauer, Frederik Bojesen, Blanca Bravo Reyes, Thomas Cardew, Oliver Cooke, Sheine McCamley, Massimo Corradi, Joseph Dejardin, Martin Eriksson, Francis Fawcett, Elizabeth Ferguson, Andrew Gibbs, Stefan Goeddertz (Associate), Jennifer Gutteridge, Shusuke Inoue, Sara Jiménez Núñez, Yuichi Kodai, Áron Lőrincz, Martin Näsén, Tyler Nobiln, Julian Ogilvie, Kristian Pedersen, Holger Rasch, Martha Rewlinson, Nina Andrea Renner, Steffen Riegas, Rebecca Roberts, Raúl Torres Martín, Yves Wanger, Mika Zacharias

Tragwerksplanung /
Structural engineering:
Pell Frischmann, GB-London

Elektro-, Haustechnik-, Akustik- und Lichtplanung /
Electrical, mechanical, plumbing and HVAC engineering, lighting consulting and acoustics, vertical transportation:
Hoare Lea, GB-Oxford

Landschaftsplanung /
Landscape design:
Townshend Landscape Architects, GB-London

Kostenplanung /
Cost consulting:
EC Harris, GB-London

Nachhaltigkeit /
Sustainable consulting:
AECOM, GB-Bristol

Generalunternehmer /
General contractor:
Laing O'Rourke, GB-Dartford

Fassadenberatung, Fassadenplanung / Facade consulting, Facade engineering:
Murphy Facade Studio, IE-Dublin

Detailplanung /
Planning consulting:
Montagu Evans, GB-London

Bauleitung /
Project management:
Oxford University Estates Services
GB-Oxford,
Gardiner & Theobald, GB-London

042
Chäserrugg, Toggenburg, CH

Bauherr /
Client:
Toggenburg Bergbahnen TBB AG,
CH-Unterwasser

Herzog & de Meuron team:
Partner /
Partners:
Jacques Herzog, Pierre de Meuron, Christine Binswanger (Partner in Charge)

Project team:
Michael Fischer (Associate, Project Director)
Bergstation: Beatus Kopp (Project Manager), Hendrik Steinigeweg (Project Manager)

Konzeptstudie: Salomé Gutscher (Project Architect), Roman Aebi (Workshop), Michael Bär (Associate), Frederik Bo Bojesen, Leif Buchmann, Yannick Claessens, Santiago Espitia-Berndt, Alexander Franz, Alan Guberinic, Justin Hui, Maria Krastava, Victor Lefebvre (Workshop), Severin Odermatt, Philipp Schaefle, Kasper Stöbe, Christoph Wassmann, Freya Winkelmann

Bauleitung /
Construction management:
Ghisleni Partner AG
CH-Rapperswil

Tragwerksplanung /
Structural engineering:
Schnetzer Puskas Ingenieure, CH-Basel mit / with:
Pirmin Jung Ingenieure für Holzbau
CH-Sargans
Schällibaum Ingenieure & Planer
CH-Herisau

Haustechnik /
HVAC engineering:
Amstein + Walthert, CH-St. Gallen

Bauphysik /
Building physics:
Zimmermann & Leuthe, CH-Aetigkofen

Brandschutz /
Fire protection:
Brandschutz Amstein + Walthert
CH-St. Gallen

Beratung Catering /
Catering consulting:
Gastro-Fachplanungen Ruedi Menet
CH-Walzenhausen

Beratung Inneneinrichtung /
Interior consulting:
Rondelli Consulting, CH-Zürich

048
Tate Modern, London, GB

(1) Tate Modern (Extension)

Bauherr /
Client:
Tate, GB-London

Herzog & de Meuron team:
Partner /
Partners:
Jacques Herzog, Pierre de Meuron, Ascan Mergenthaler (Partner in Charge), Harry Gugger (until 2009)

Project team:
John O'Mara (Associate, Project Director), Kwamina Monney (Project Manager), Ben Duckworth (Associate), Christoph Zeller

Abdulfatah Adan, Roman Aebi (Workshop), Marta Alonso Yebra, Israel Alvarez Matamoros, Renata Arpagaus, Shayan Bahluli Zamani, Jayne Barlow, Peter Karl Becher, Michael Bekkar, Alexander Berger, Ann Bertholdt, Abel Blancas, Marinke Boehm, Frederik Bojesen, Vincent Bowman, Blanca Bravo Reyes, Emi Jean Bryan, Catriona Cantwell, Michael Casey (Associate), Mark Chan, Edman Choy, David Connor, Oliver Cooke, Massimo Corradi (Digital Technologies), Corinne Curk, Duarte De Azevedo Coutinho Lobo Antunes, Francisco de Freitas, Joseph Dejardin, Miguel del Rio Sanin, Dorothea Dietz, Stefan Dobnig, Gemma Douglas, Carina Ebeling, Samir Tarek El Kordy, Martin Eriksson, Joris Jakob Fach, Francis Fawcett, Elizabeth Ferguson, Alexander Franz, Mario Gasser, Giuseppe Giacoppo, Andrew Gibbs, Luis Gisler, Stefan Goeddertz (Associate), James Grainger, Jennifer Gutteridge, Volker Helm, Arnaldo Hernandez, Pasqual Herrero, Iela Herring, Johannes Hilfenhaus, Daisuke Hirabayashi, Fabienne Hoelzel, Dara Huang, Kasia Jackowska, Sofia Chinita Janeiro, Sara Jardim Manteigas, Simon Johnson, Jihoon Kim, Yuichi Kodai, Paweł Krzeminski, Tomoyuki Kurokawa, Lorenz Selim Lachauer, David Leech, Kenan Liu, Áron Lőrincz (Visualisations), Johnny Lui, Alexandre Massé, Donald Matheson, Olivier Meystre, Cynthia Morales Castillo, Ingrid Moye Verduzco, Martin Nässén, Dominik Nüssen, Julian Oggier, Benjamin Olschner, Mónica Ors Romagosa, Chi Won Park, Dirk Peters, Callum John Pirie, James Pockson, Maki Portilla Kawamura, Catherine Preiswerk, Georg Rafailidis, Tanya Rainsley, Holger Rasch, Andreas Reeg, Steffen Riegas (Digital Technologies), Kathrin Riemenschneider, Rebecca Roberts, Jeannine Roschi, Phillip Schaefle, Chasper Schmidlin, Harald Schmidt, Günter Schwob (Workshop), Mónica Sedano Peralta, Jad Silvester, Karolina Slawecka, Iva Smrke Krüger, Maria Krastava, Victor Lefebvre (Workshop), Severin Odermatt, Philipp Schaefle, Kasper Stöbe, Christoph Wassmann, Freya Winkelmann

Tragwerksplaner /
Structural engineering:
Schnetzer Puskas Ingenieure, CH-Basel mit / with:
Pirmin Jung Ingenieure für Holzbau
CH-Sargans
Schällibaum Ingenieure & Planer
CH-Herisau

Haustechnik /
HVAC engineering:
Amstein + Walthert, CH-St. Gallen

Bauphysik /
Building physics:
Zimmermann & Leuthe, CH-Aetigkofen

Brandschutz /
Fire protection:
Brandschutz Amstein + Walthert
CH-St. Gallen

Beratung Catering /
Catering consulting:
Gastro-Fachplanungen Ruedi Menet
CH-Walzenhausen

Beratung Inneneinrichtung /
Interior consulting:
Rondelli Consulting, CH-Zürich

Project team:
Michael Casey (Associate, Project Architect)

Thomas Baldauf, Ed Burton, Victoria Castro, Emanuel Christ, Peter Cookson, Irina Davidovici, Liam Dewar, Catherine Fierens, Herman Fierro, Adam Firth, Matthias Gnehm, Nik Graber, Konstantin Karagiannis, Angelika Krestas, Patrik Linggi, José Ojeda Martos, Mario Meier, Filipa Moura, Yvonne Rudolf, Juan Salgado, Vicky Thornton, Kristen Whittle, Camillo Zanardini

Partnerarchitekten /
Associate Architects:
Shepard Robson + Partners, GB-London

Tragwerksplaner /
Structural engineering:
OAP Ova Arup Partner, GB-London

Fassadenplanung /
Facade engineering:
Emmer + Pfenninger AG,
CH-Münchenstein

Kostenplanung /
Cost consulting:
Davis Langdon & Everest, GB-London

Haustechnik /
HVAC engineering:
OAP Ova Arup Partner, GB-London

Innenarchitektur /
Interior design:
Herzog & de Meuron in Zusammenarbeit mit / in collaboration with Office for design, Lumsden Design Partnership (Retail consultant), GB-London

062
Musée Unterlinden, Colmar, FR

Bauherr /
Client:
City of Colmar, FR-Colmar

Herzog & de Meuron team:
Partner /
Partners:
Jacques Herzog, Pierre de Meuron, Christine Bindwanger (Partner in Charge)

Project team:
Christoph Röttinger (Associate, Project Director), Christophe Lubiond (Project Manager), Marco Zürn (Project Manager)

Edyta Augustynowicz (Digital Technologies), Farhad Ahmad (Digital Technologies), Aurélien Caetano, Delphine Camus, Arnaud Delugeard, Carlos Higinio Esteban, Judith Funke, Daniel Graignic Ramiro, Yann Gramegna, Wolfgang Hardt (Partner), Thorsten Kamper, Aron Lorincz (Digital Technologies), Donald Mak (Associate), Severin Odermatt, Valentin Ott, Alejo Pallard, Nathalie Rinne, Jordan Soriot, Raul Torres Martin (Digital Technologies), Guy Turin, Paul Vantieghem, Maria Vega Lopez, Caesar Zumthor

Partnerarchitekten /
Partner architects:
DeA Architectes, FR-Mulhouse

Tragwerksplaner /
Structural engineers:
ARTELIA, FR-Oberhausbergen

Fassadenplaner /
Facade engineering:
PPEngineering, CH-Basel
Prof. Jäger, DE-Dresden

Lichtplaner /
Lighting design:
Arup, GB-London

Akustik/
Acoustics:
Echologos, FR-Livry-Louvercy

Museumskunde /
Museography:
Jean-François Chevrier, art historian, assisted by Elia Pijollet, FR-Paris

Signaletik /
Signage:
NEWID, CH-Basel

Landschaftsplanung /
Landscape consulting:
Cap Vert Ingénierie, FR-Grenoble
August Künzel Landschaftsarchitekten, CH-Basel (Tree Consultant)

Kostenplanung /
Cost consulting:
C2Bi, FR-Strasbourg

Generalplanung /
General planning:
Herzog & de Meuron SARL, France

066
Nouveau Stade de Bordeaux, Bordeaux, FR

Bauherr /
Client:
ADIM Sud-Ouest (Vinci Construction), FR-Mérignac
CPI SOFIMA (Fayat Group), FR-Floirac

Bauherrenvertreter /
Client representative:
François Fitori, Direction CPI SOFIMA – ADIM Sud Ouest

Herzog & de Meuron team:
Partner /
Partners:
Jacques Herzog, Pierre de Meuron, Stefan Marbach (Partner in Charge)

Project team:
Tobias Winkelmann (Associate, Project Director), Paul Vantieghem (Associate, Project Manager), Thomas de Vries (Associate, Project Mensger)

Farhad Ahmad (Visualisations), Alexandria Agard, Edyta Augustynowicz (Digital Technologies), Florian Becker, Aurélie Blanchard, Claire Clément, Arianna Conca, Corina Ebeling, Martin Eriandsson, Billy Guidoni, YukoHimeno, Elisabeth Hinz, Marc Hölscher, Julia Jamrozik, Hamit Kaplan, Thorsten Kemper, Evert Klinkenberg, Solène Le Gallo, Christina Liao (Animations), Aron Lorincz (Visualisations), Donald Mak (Associate), David Palussiere, Kevin Peter, Yann Patter, Louis Pulot, Susanna Rahm, Steffen Riegas (Digital Technologies), Christoph Röttinger (Associate), Amanda Hope Sachs Mangold, Katharina Schneiste, Günter Schwob (Workshop), Jan Skuratowski, Johannes Staudt, Ida Sze, Masato Takahashi, Raha Talebi, Miriam Waltz, Shuo Susan Wang, Romy Weber, Claudia Winkelmann, Mika Zacharias (Visualisations), Christian Zerreis

Ausführende Architekten /
Executive architects:
Groupe 6, FR-Grenoble

Tragwerksplaner /
Structural engineering:
Cabinet Jaillet-Rouby, FR-Orléans
Structures Ile de France, FR-Monrouge

Landschaftsplanung /
Landscape design:
Michel Desvigne Paysagiste, FR-Paris

Bauphysik, Haustechnik /
Building physics, HVAC engineering:
Egis Bâtimenta Sud-Ouest, FR-Toulouse

Ausführung /
Civil engineering:
Ingerop, FR-Courbevoie

Unterhalt /
Maintenance:
Vinci Facilities, FR-Rueil Malmaison

Akustik /
Acoustics:
IdB Acoustique, FR-Pessac

Lichtplanung /
Lighting consulting:
Agence ON, FR-Paris

Signaletik /
Signage:
Agence Franck Tallon, FR-Bordeaux

Brandschutz /
Fire protection
SSI Coor, FR-Cestas

Generalunternehmer /
General contractor:
SOGEA Sud-Ouest Hydraulique, FR-Pessac
Castel & Fromaget, FR-Fleurance

GTM Bâtiment Aquitaine (Contractor Group Representative), FR-Merignac
GTM TP GC, FR-Merignac
Razel-Bec, FR-Orsay
SEG Fayat, FR-Floirac

074
Südpark Baufeld D, Basel, CH

Bauherr /
Client:
SBB Schweizerische Bundesbahnen Immobilien, CH-Bern

Herzog & de Meuron team:
Partner /
Partners:
Jacques Herzog, Pierre de Meuron, Harry Gugger, Robert Hösl (Partner in Charge)

Project team:
Martin Fröhlich (Associate, Project Director), Philippe Fürstenberger (Associate), Patrick Holl, Gabriella Bertozzi Werner, Mark Bähr

Farhad Ahmad, Thomas Arnhardt, Enzo Augello, Edyta Augustynowicz (Digital Technology Group), Ida Basic, Lukas Baumann, Béla Berec, Benito Blanco Avellano, Nils Büchel, Ufuk Celik, Massimo Corradi, Dorothee Dietz, Carmen Eichenberger, Moritz Till Einselen, Gustavo Espinoza, Lisa Kathrin Euler, Nicolas Feldmeyer, Lucas Fernandez-Trapa Chias, Michael Fischer, Judith Funke, Mario Gasser, Luis Gisler, Yann Gramegna, Salomé Gutscher, Markus Habacivtek, Norman Peter Heck, Yuki Hamura, Nikolai Happ, Volker Helm (Digital Technology Group), Yuko Himeno, Daniela Hofer, Ines Huber, Anna Jach, Ondrej Jaklu, Hauke Jungjohann, Martin Krapp, Benjamin Krüger, Lorenz Selim Lachauer, Kevin Harvey Lawson, Enrico Manzanell, Ulrik Mathiasson, Jolanda Meyer, Olivier Meystre, Angel Padilla Figueroa, Kamilla Pastzoid, Alejo Pallard, Valentina Patrono, Cornel Pfister, Daniel Pokora, Catherine Preiswerk, Salome Rätz, Steffen Riegas (Digital Technology Group), Chesper Schmidlin, Marc Schmidt, Mónica Sedano Peralta, Lara Semler, Guobin Shen, Basil Spiess, Simon Stolze, Stephanie Stratmann, Thomas Strebel, Kai Strehlke (Digital Technology Group), Katinka Temme, Andreas Thoma, Adrian Verschuere, Dag Vierfuss, Isabel Volkmar, Christian Voss, Thomas Wyssen, Camillo Zanardini, Daniel Zielinski, Martin Zimmerli

Tragwerksplaner /
Structural engineering:
ZPF Ingenieure AG, CH-Basel

Fassadenplanung (Konzeptphase) / Facade planning (concept phase):
Emmer Pfenninger Partner AG,
CH-Münchenstein

Fassadenplanung (Ausführung) / Facade planning (realisation):
Neuschwander + Morf AG, CH-Basel

Parametrisches Entwerfen (Konzept) / Parametric designing (concept):
ETH Zürich, Lehrstuhl für Computer-Aided Architectural Design
Prof. Dr. Ludger Hovestadt, CH-Zürich

Parametrisches Entwerfen (Ausführung) / Parametric designing (realisation):
Herzog & de Meuron, Digital Technology Group, CH-Basel

Innenausbau Seniorenresidenz /
Fitting out senior residence:
Atlas Stiftung, CH-Zürich

Akustik /
Acoustics:
Lienhard Bau- und Raumakustik,
CH-Langenbruck

Haustechnik /
HVAC engineering:
Stokar + Partner AG, CH-Basel

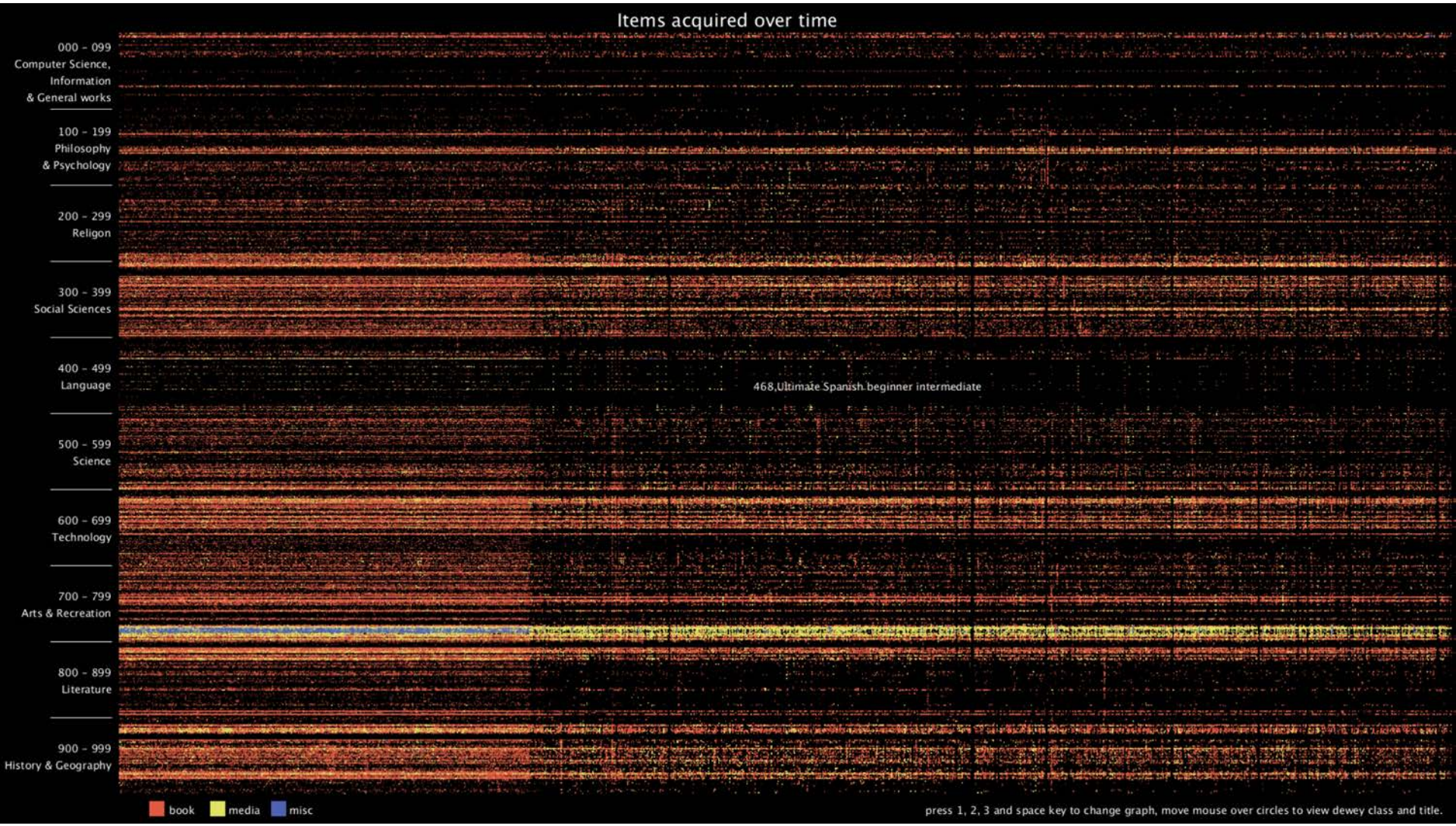
Bauphysik /
Building physics:
Zimmermann + Leuthe GmbH,
CH-Aetikofen

Landschaftsplanung /
Landscape design:
Vogt Landschaftsarchitekten, CH-Zürich

Generalunternehmer /
General contractor:
priora, CH-Basel

Die Nennung der Projektbeteiligten erfolgt nach Angabe Herzog & de Meuron / Details of design teams are based on information provided by Herzog & de Meuron

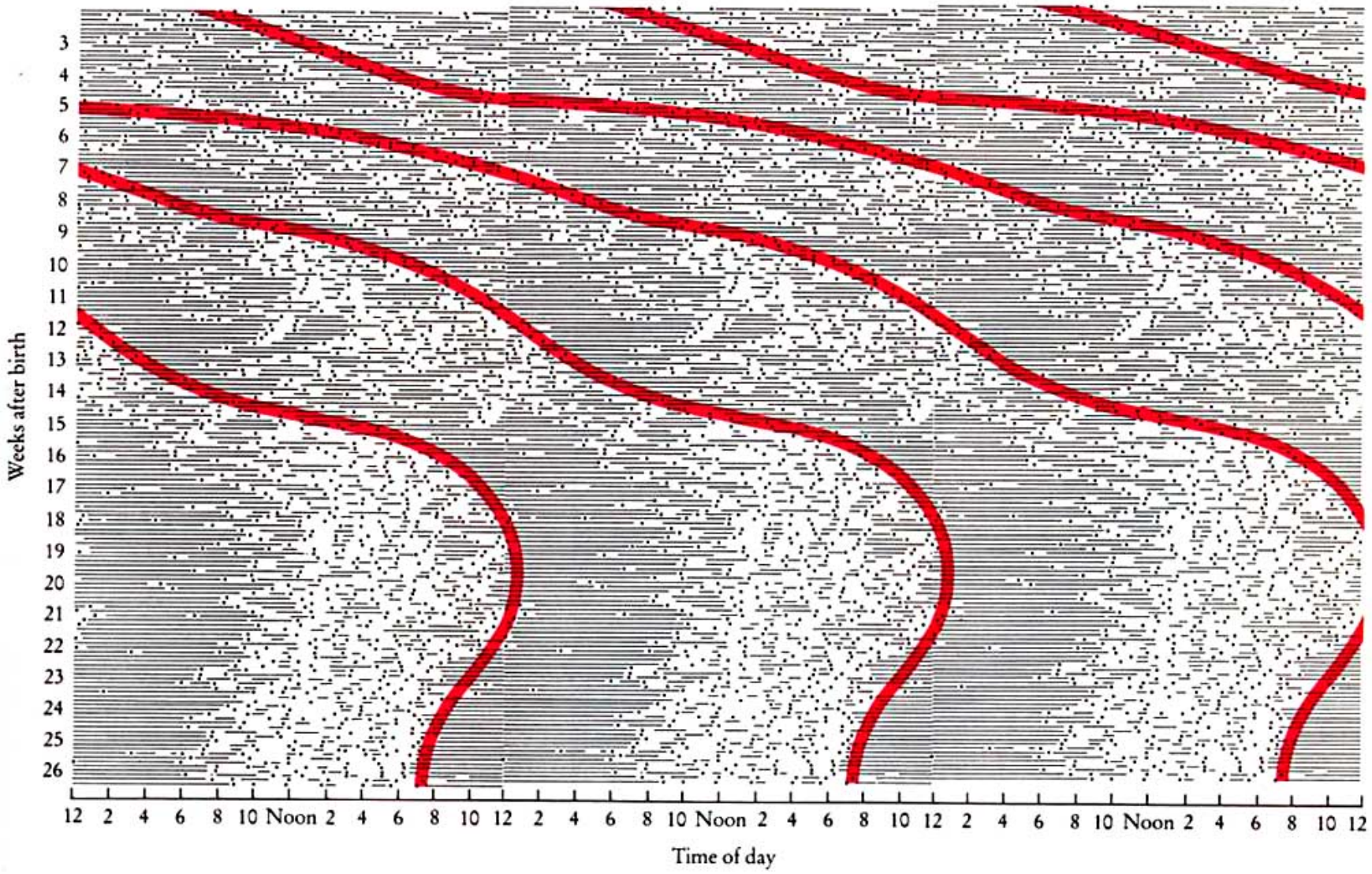
Pixel-Data: The Most Basic Unit



http://vislab.mat.ucsb.edu/2019/p1/Jiaheng_Tang/index.html

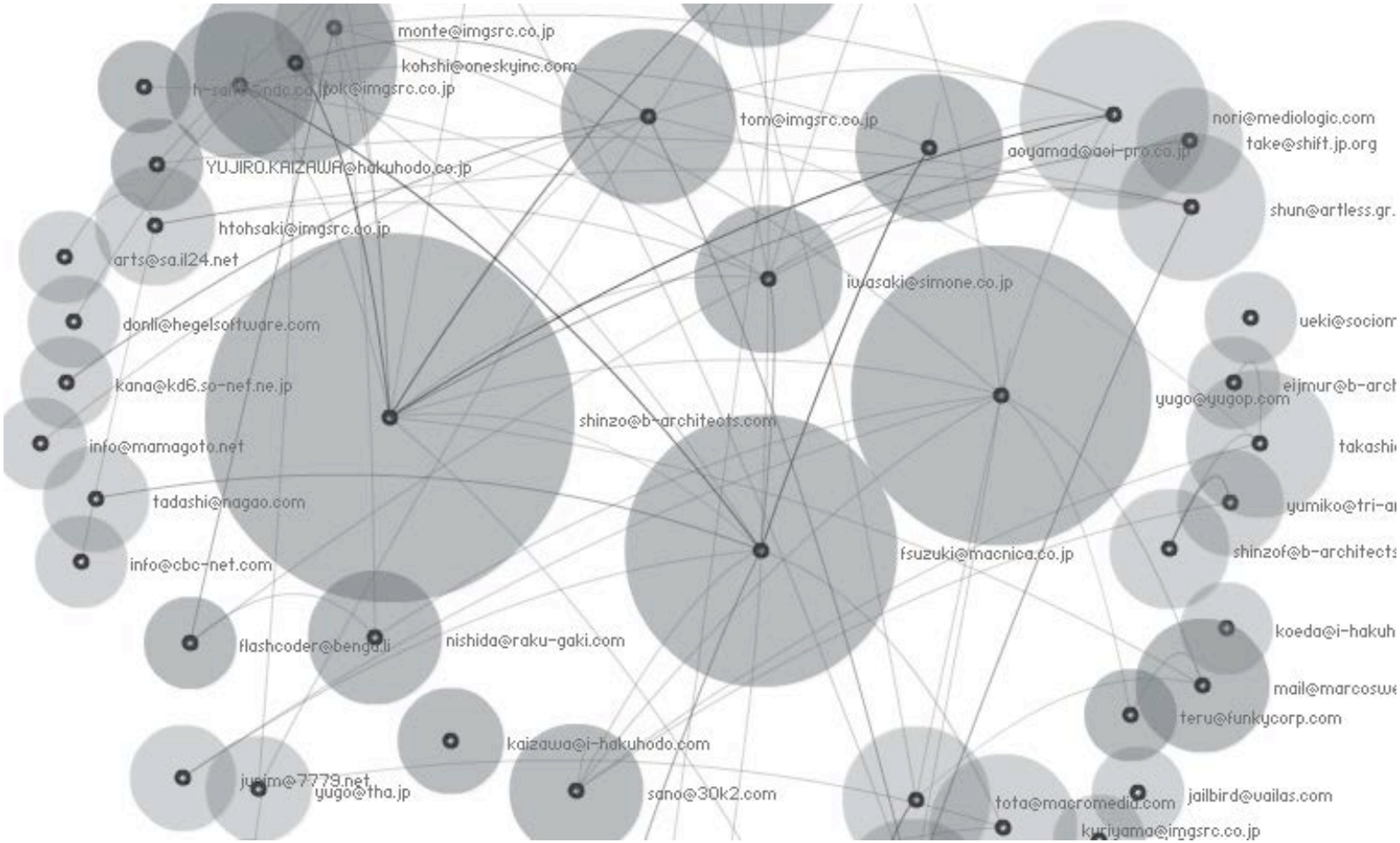
Frequency Mapping

Bio-Rhythm: Frequency Map Reveals Patterns



Non-Grid Spatial Distribution

Network & Nodes



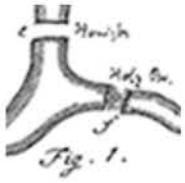
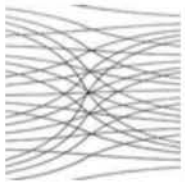
visual complexity

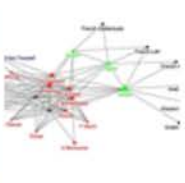
Search the VC database: GO

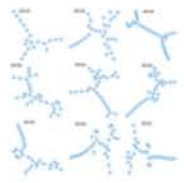
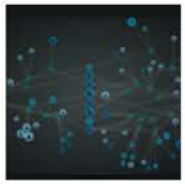
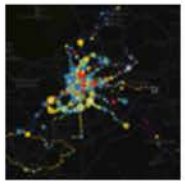
http://www.visualcomplexity.com/vc/

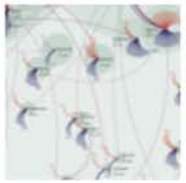
Latest Projects:

Indexing **1000** projects

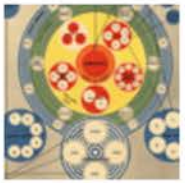
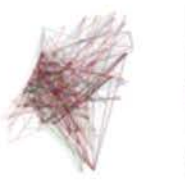


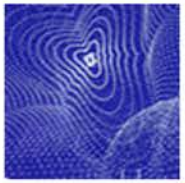



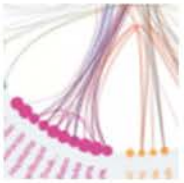


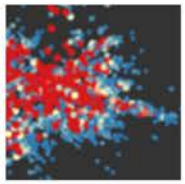


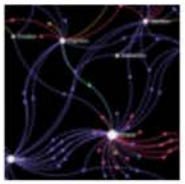
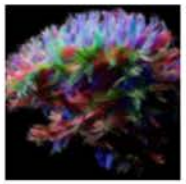


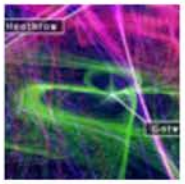


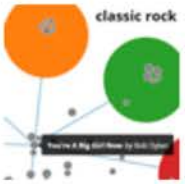









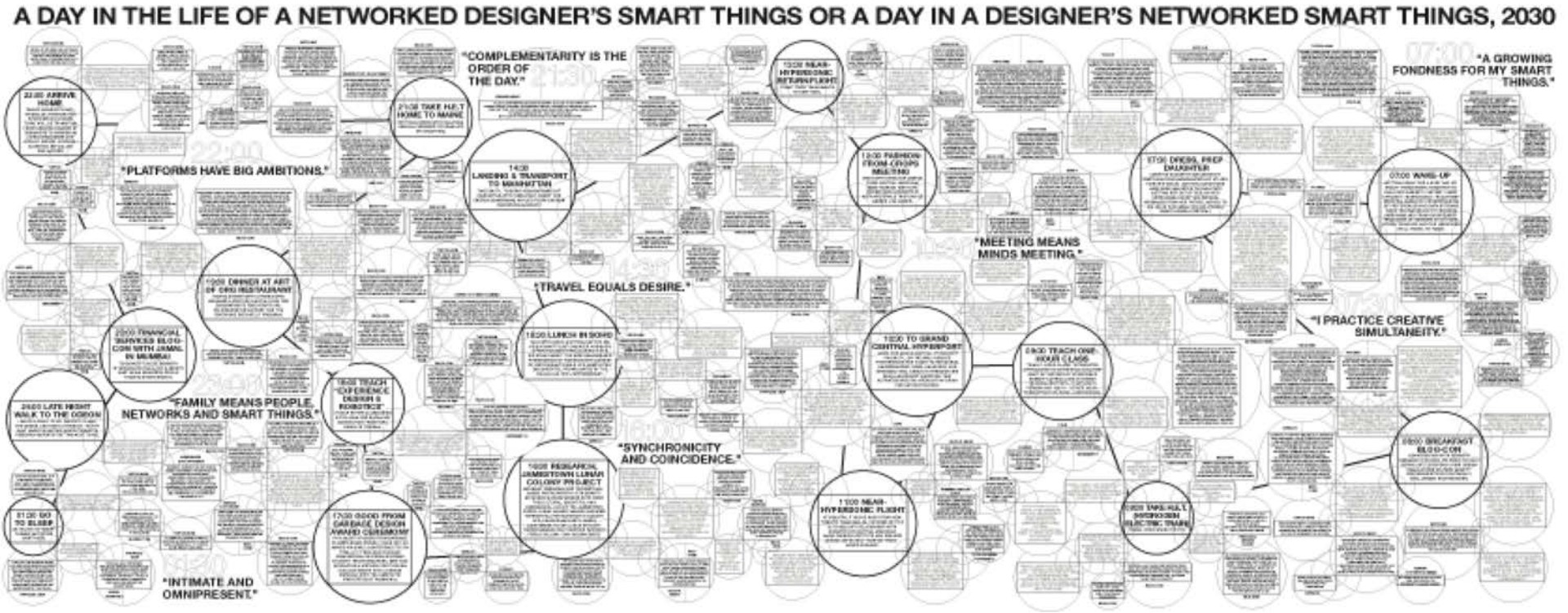

Filter by: SUBJECT

- Art (74)
- Biology (60)
- Business Networks (50)
- Computer Systems (39)
- Food Webs (16)
- Internet (35)
- Knowledge Networks (141)
- Multi-Domain Representation (70)
- Music (47)
- Others (77)
- Pattern Recognition (53)
- Political Networks (34)
- Semantic Networks (44)
- Social Networks (135)
- Transportation Networks (70)
- World Wide Web (55)

See All (1000)

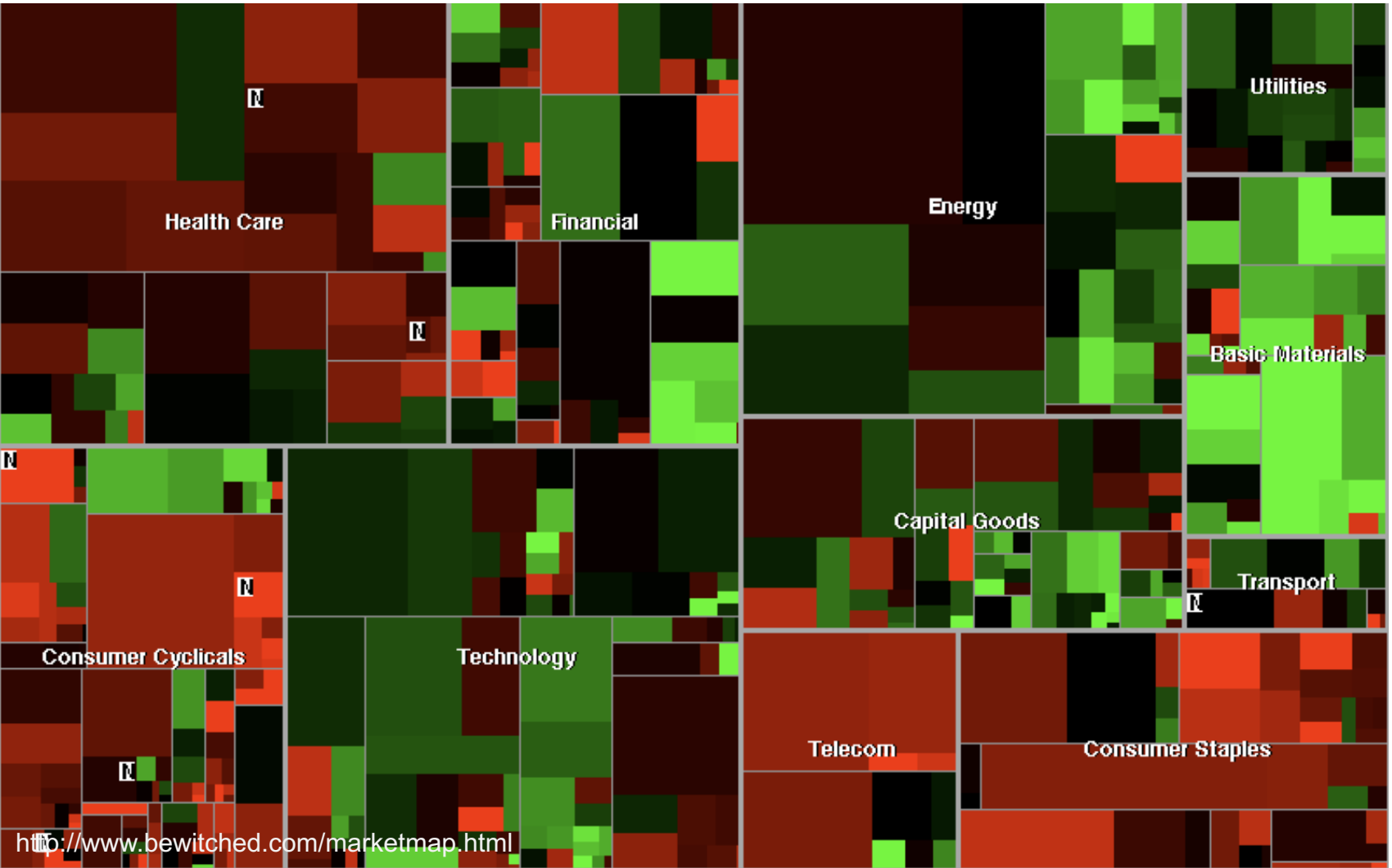
Node Mosaic Spatial Distribution

Node Mosaic (combines nodes and grid - Somewhat like a bin-packing algorithm)



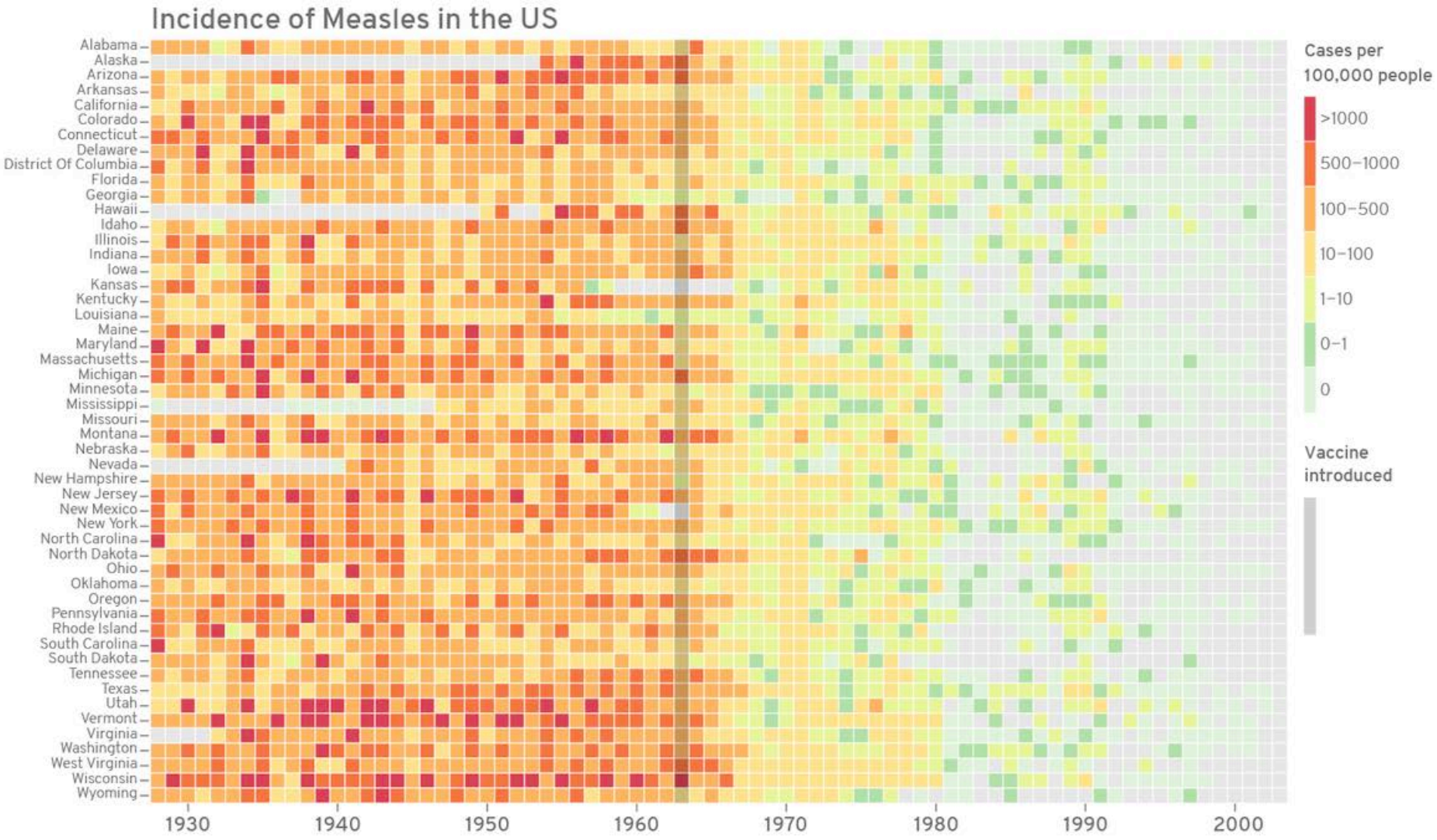
Color Coding & Clustering

Treemap: Smart Money



Color Coding & Clustering

Heatmap: Magnitude of phenomenon using color either by hue or intensity



How to Pick Colors (limit to max of 12)

2 modes in computing:

- **RGB** (Red, Green, Blue) Additive system
- **HSB** (Hue, Saturation, Brightness) // best to use this as you can control all colors hues (0-255), or saturation (0-255)

Color Impact greatly depends on the relationships

- **Colorpicker:** http://tristen.ca/hcl-picker/#/hlc/6/1/20313E/EFEE68
- **HCL Wizard**: http://hclwizard.org/hclcolorpicker/
- **w3Schools**: https://www.w3schools.com/colors/colors_picker.asp

Some geeky discussions: https://www.vis4.net/blog/2011/12/avoid-equidistant-hsv-colors/

Fonts Recommendation (Swiss Graphic Design)

Sans Serif ()

- This is **Arial** designed for Windows but also works well on Mac
- This is **Acumin** (from Adobe designed in 1989)
- `This is` **`Courier`** `(looks like industrial IBM typewriter)`
- This is **Futura**, Bauhaus aesthetic from 1927
- This is **Helvetica** developed in 1957 has been adopted by industry
- **This is Univers font in bold**
- This is **Univers Condensed** often used in book publishing

Serif (Decorative Stroke)

- This is **Baskerville** designed in 1750 in Birmingham, England
- This is **Times New Roman** designed in 1931, popular for documents

Schneiderman's Data Visualization Design

- **Overview**: Gain an overview of the entire collection
- **Zoom** : Zoom in on items of interest
- **Filter**: filter out uninteresting items
- **Details-on-demand**: Select an item or group and get details when needed
- **Relate**: View relationships among items
- **History**: Keep a history of actions to support undo, replay, and progressive refinement
- **Extract**: Allow extraction of sub-collections and of the query parameters

https://www.mat.ucsb.edu/~g.legrady/academic/courses/11w259/schneiderman.pdf

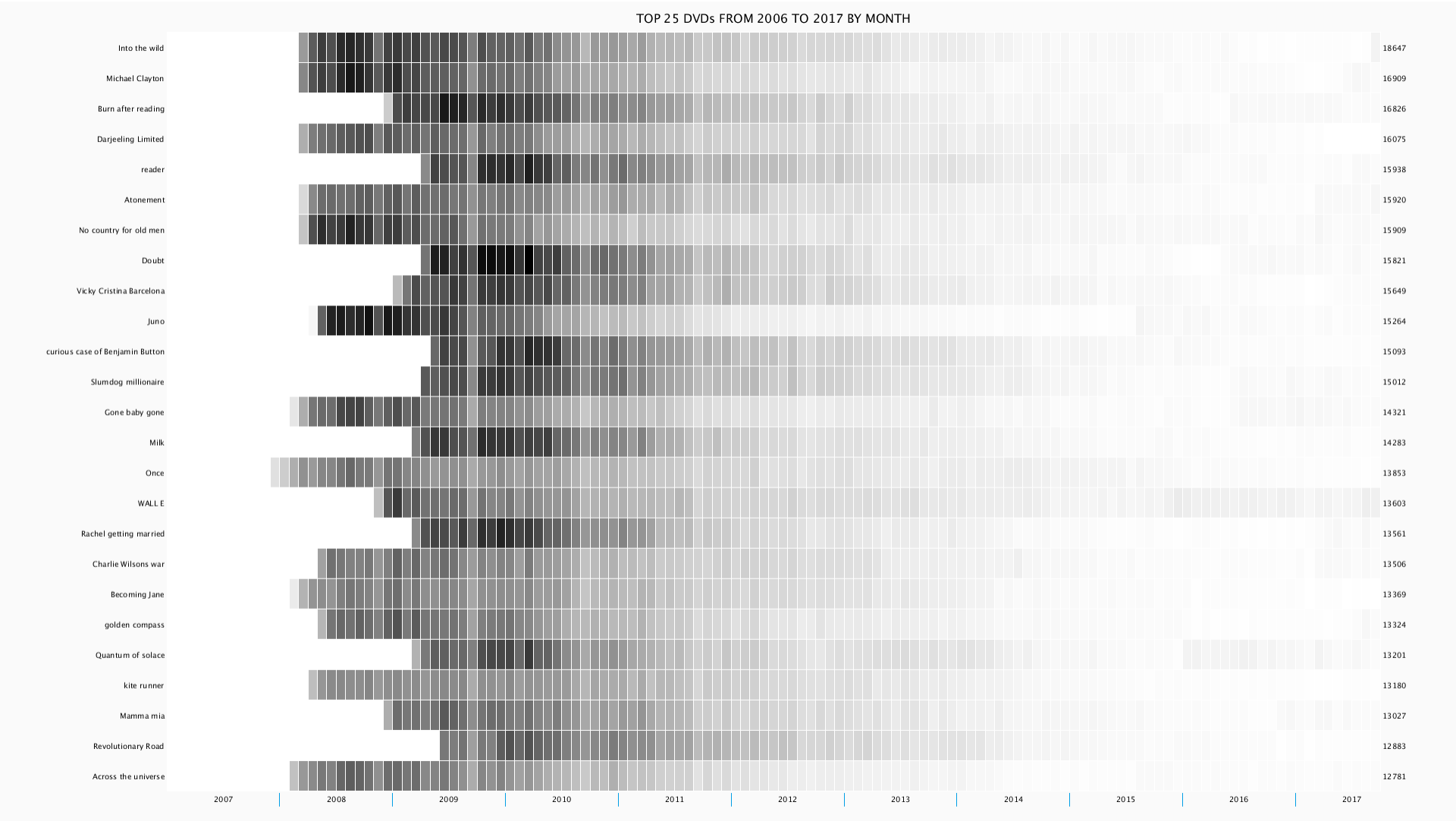
Goals & Challenges

- Visualizing data increases accessibility in meaning, and identifies relationships
- Because data is illustrated in flat media, most visualizations are 2D but 3D and interactivity increase opportunities to study the data
- Explorative Data Visualization – Let the data reveal its relationship through the visualization

From Nelson Goodman, “Languages of Art”

- **Syntax**: a set of rules by which language is structured. Also applies to visualization
- **Semantic**: The study of meaning. In what ways, does visual elements convey meaning? To what degree does changing the visual elements transform meaning?

25 Top DVDs By Month from 2006-2017



25 Top DVDs By Month from 2006-2017

title	count	2007-1	2007-2	2007-3	2007-4	2007-5	2007-6	2007-7	2007-8	2007-9	2007-10	2007-11	2007-12	2008-1	2008-2	2008-3	2008-4	2008-5	2008-6	2008-7	2008-8	2008-9	2008-10	2008-11	2008-12	2009-1	2009-2	2009-3	2009-4	2009-5	2009-6	2009-7	2009-8	2009-9	2009-10	2009-11	2009-12	2010-1	2010-2
Into the wild	18647	0	0	0	0	0	0	0	0	0	0	0	0	0	0	259	417	497	449	544	555	529	507	356	483	507	467	491	442	424	466	461	434	331	456	403	399	408	366
Michael Clayton	16909	0	0	0	0	0	0	0	0	0	0	0	0	0	0	307	441	493	455	546	592	570	516	425	507	541	455	476	414	414	409	402	390	280	381	381	360	383	328
Burn after reading	16826	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	129	457	496	476	467	469	591	573	554	433	548	499	536	507	452
Darjeeling Limited	16075	0	0	0	0	0	0	0	0	0	0	0	0	0	0	206	331	369	383	413	428	446	454	330	424	418	375	410	356	409	383	376	369	264	385	326	359	366	330
reader	15938	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	298	485	455	437	436	308	531	536	520	547	461
Atonement	15920	0	0	0	0	0	0	0	0	0	0	0	0	0	0	95	301	375	382	366	373	404	415	346	404	428	352	414	362	365	377	348	356	277	350	326	350	354	302
No country for old men	15909	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150	449	537	484	503	566	512	513	388	489	496	418	452	377	376	401	430	369	260	366	342	341	338	277
Doubt	15821	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	355	580	567	489	524	434	622	622	592	613	520
Vicky Cristina Barcelona	15649	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	176	351	460	401	436	438	507	484	354	507	491	517	505	437
Juno	15264	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	401	563	581	538	561	609	441	588	574	518	521	448	461	512	477	434	320	409	396	383	391	353
curious case of Benjamin Button	15093	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	388	483	463	466	282	425	429	524	511	446
Slumdog millionaire	15012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	425	411	448	466	456	302	505	498	521	502	432
Gone baby gone	14321	0	0	0	0	0	0	0	0	0	0	0	0	63	210	349	380	372	470	478	480	412	345	408	453	385	426	339	347	354	361	340	216	332	314	319	313	278
Milk	14283	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	327	445	514	509	452	437	362	543	517	510	515	447
Once	13853	0	0	0	0	0	0	0	0	0	0	0	77	126	206	280	257	309	309	353	385	342	339	268	355	355	310	312	284	258	276	283	284	218	262	262	291	260	232
WALL E	13603	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	162	432	504	384	422	360	366	353	382	372	261	358	309	315	346	272
Rachel getting married	13561	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	298	442	480	462	424	498	386	531	497	563	531	472
Charlie Wilsons war	13506	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	240	366	347	321	319	345	269	328	401	330	385	318	348	373	357	305	252	317	287	318	309	248
Becoming Jane	13369	0	0	0	0	0	0	0	0	0	0	0	0	51	193	274	292	274	328	351	333	318	267	351	371	296	345	289	284	315	306	294	226	283	282	291	285	271
golden compass	13324	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	186	352	387	364	401	373	321	401	442	343	419	350	352	344	359	333	236	326	336	346	354	306
Quantum of solace	13201	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	197	342	412	406	380	385	325	451	467	469	474	383
kite runner	13180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	165	269	300	305	290	292	311	263	288	302	281	294	268	293	305	296	304	214	286	282	267	299	250
Mamma mia	13027	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	208	372	347	364	333	363	424	399	368	292	356	376	373	339	319
Revolutionary Road	12883	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	344	331	355	245	342	323	415	442	384
Across the universe	12781	0	0	0	0	0	0	0	0	0	0	0	0	0	158	264	298	345	320	391	411	395	360	283	373	383	351	372	304	318	345	318	283	211	308	277	317	273	241

2014-6	2014-7	2014-8	2014-9	2014-10	2014-11	2014-12	2015-1	2015-2	2015-3	2015-4	2015-5	2015-6	2015-7	2015-8	2015-9	2015-10	2015-11	2015-12	2016-1	2016-2	2016-3	2016-4	2016-5	2016-6	2016-7	2016-8	2016-9	2016-10	2016-11	2016-12	2017-1	2017-2	2017-3	2017-4	2017-5	2017-6	2017-7	2017-8	2017-9
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48	47	46	37	37	28	34	33	28	30	25	26	26	15	26	20	18	17	14	12	7	11	11	11	12	10	9	11	8	7	6	9	4	6	5	5	3	5	2	5
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39	29	36	24	22	16	21	19	16	24	15	15	14	10	10	11	10	8	5	29	31	25	28	27	29	34	31	18	28	20	22	17	11	29	18	12	13	18	14	10
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26	24	22	18	27	25	24	22	19	24	18	16	15	14	18	11	11	9	9	8	11	10	7	8	8	9	5	3	5	15	19	11	9	18	18	10	17	11	11	12
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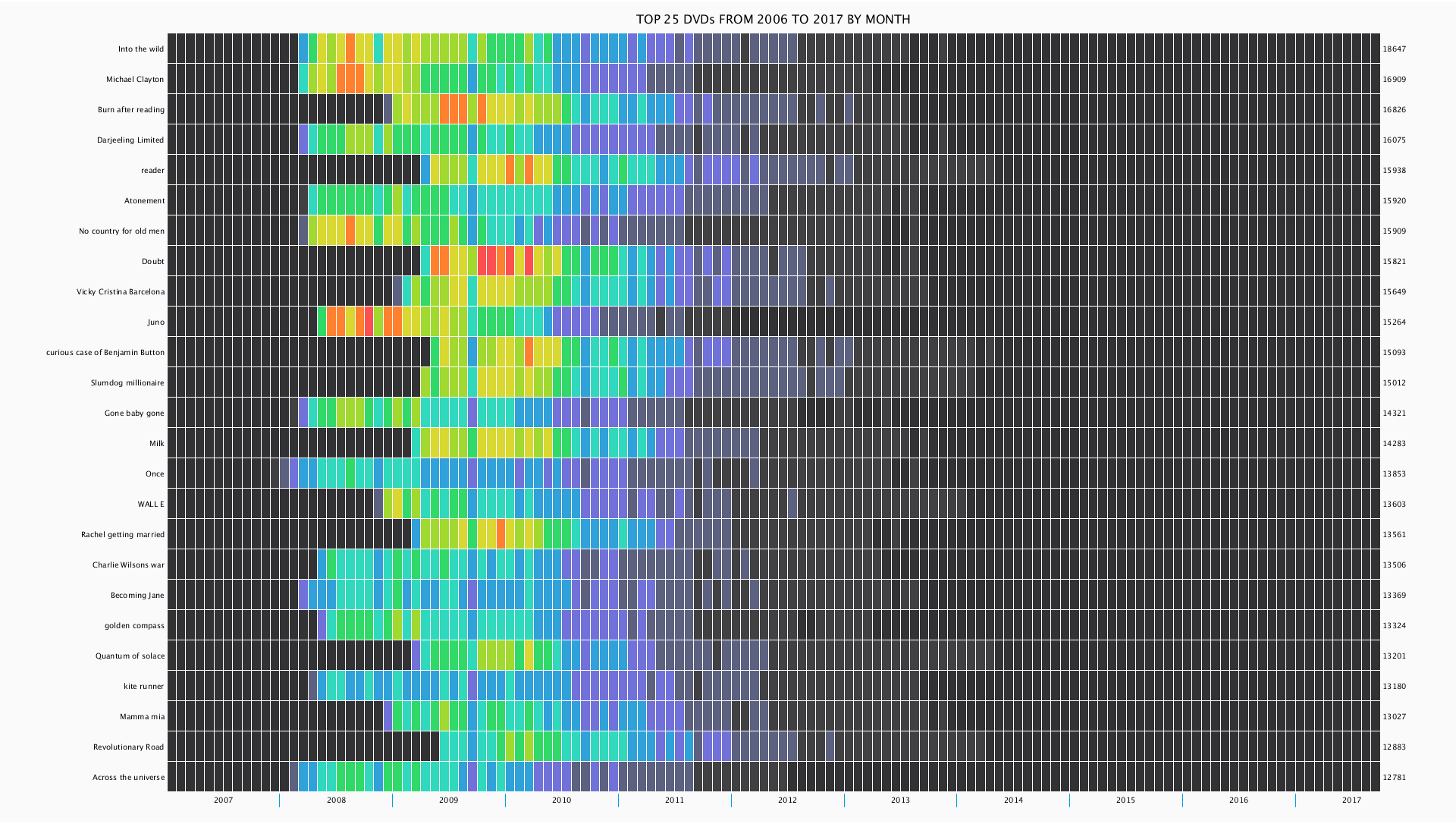
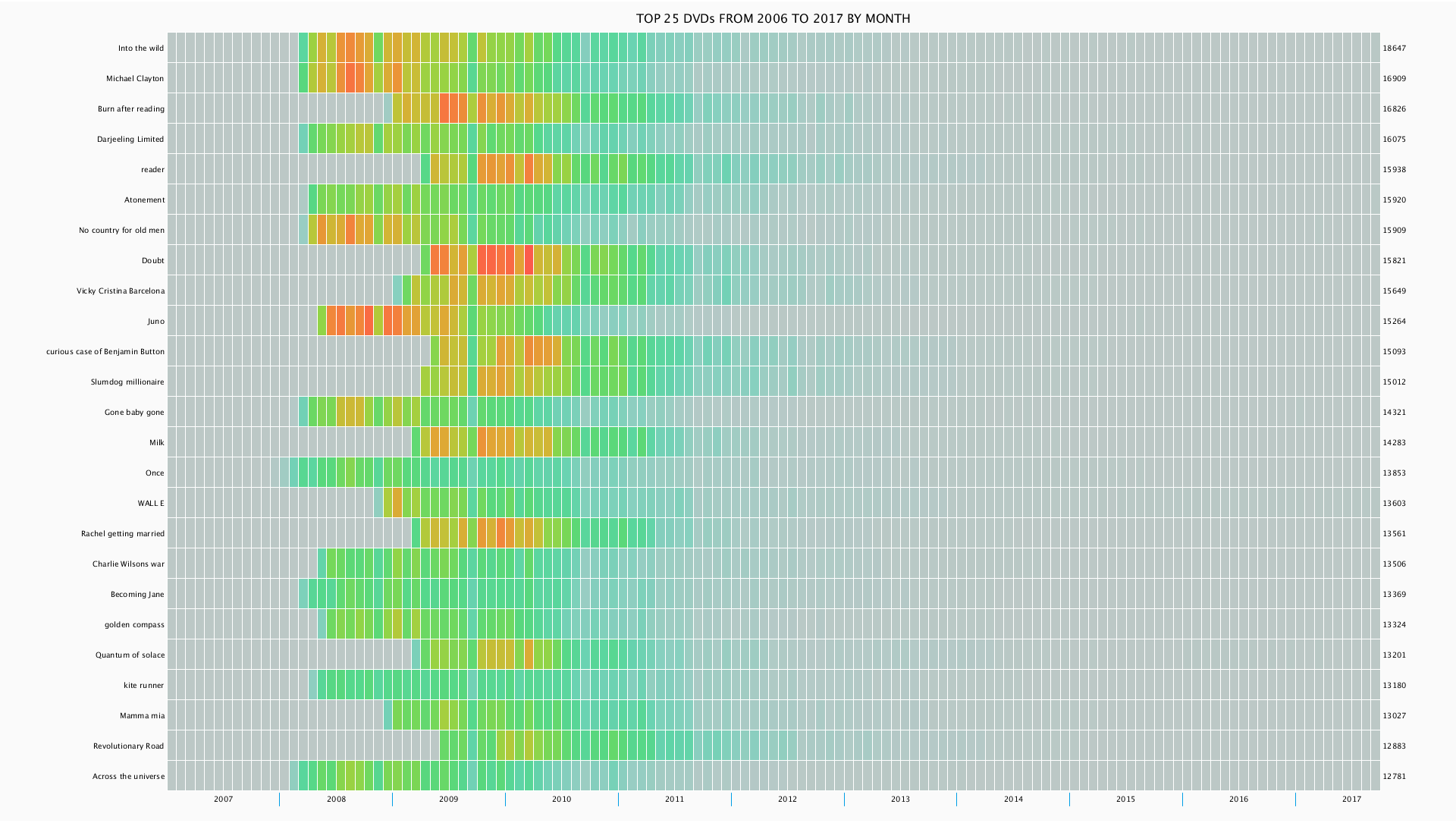
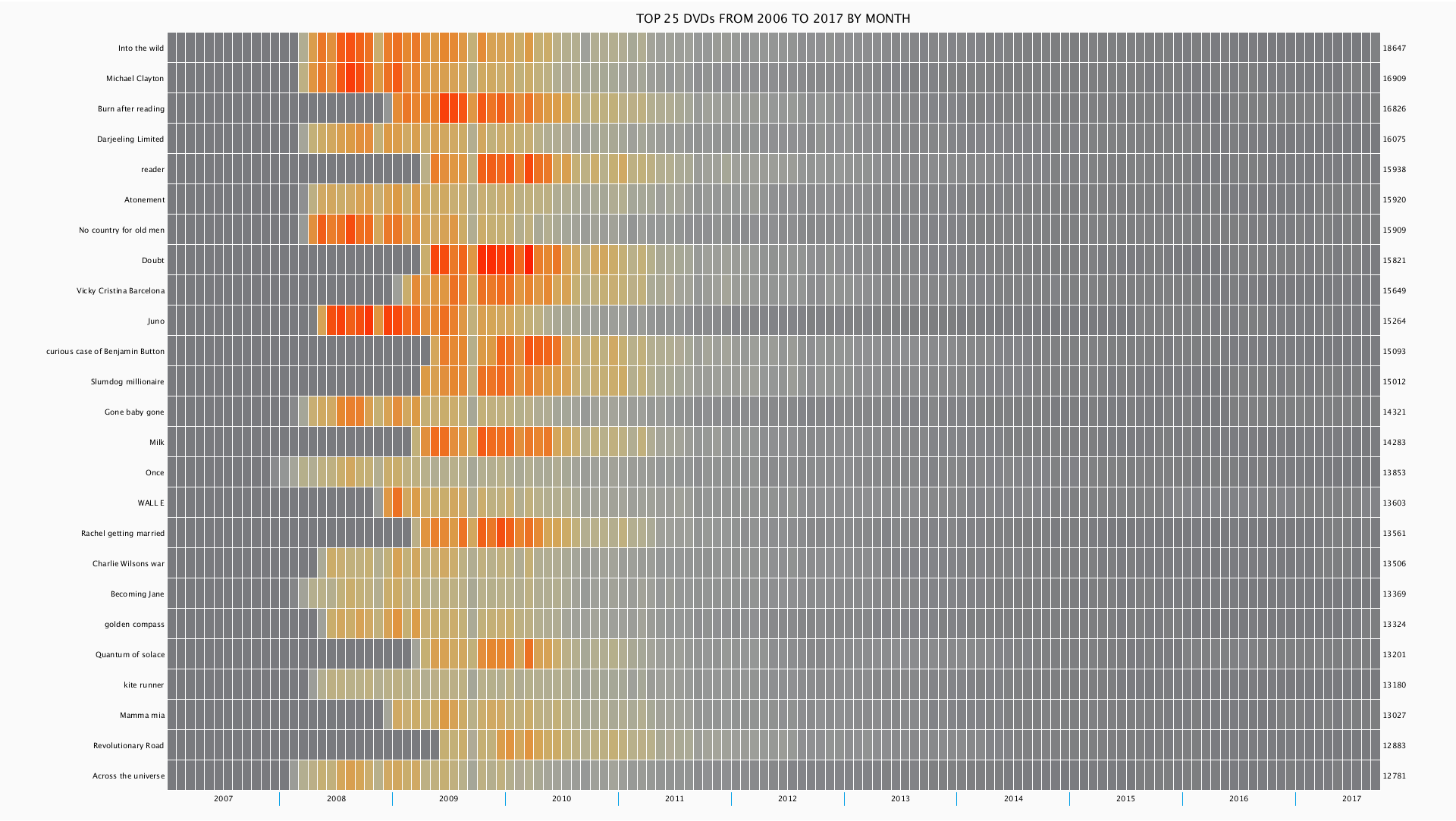
25 Top DVDs By Month from 2006-2017



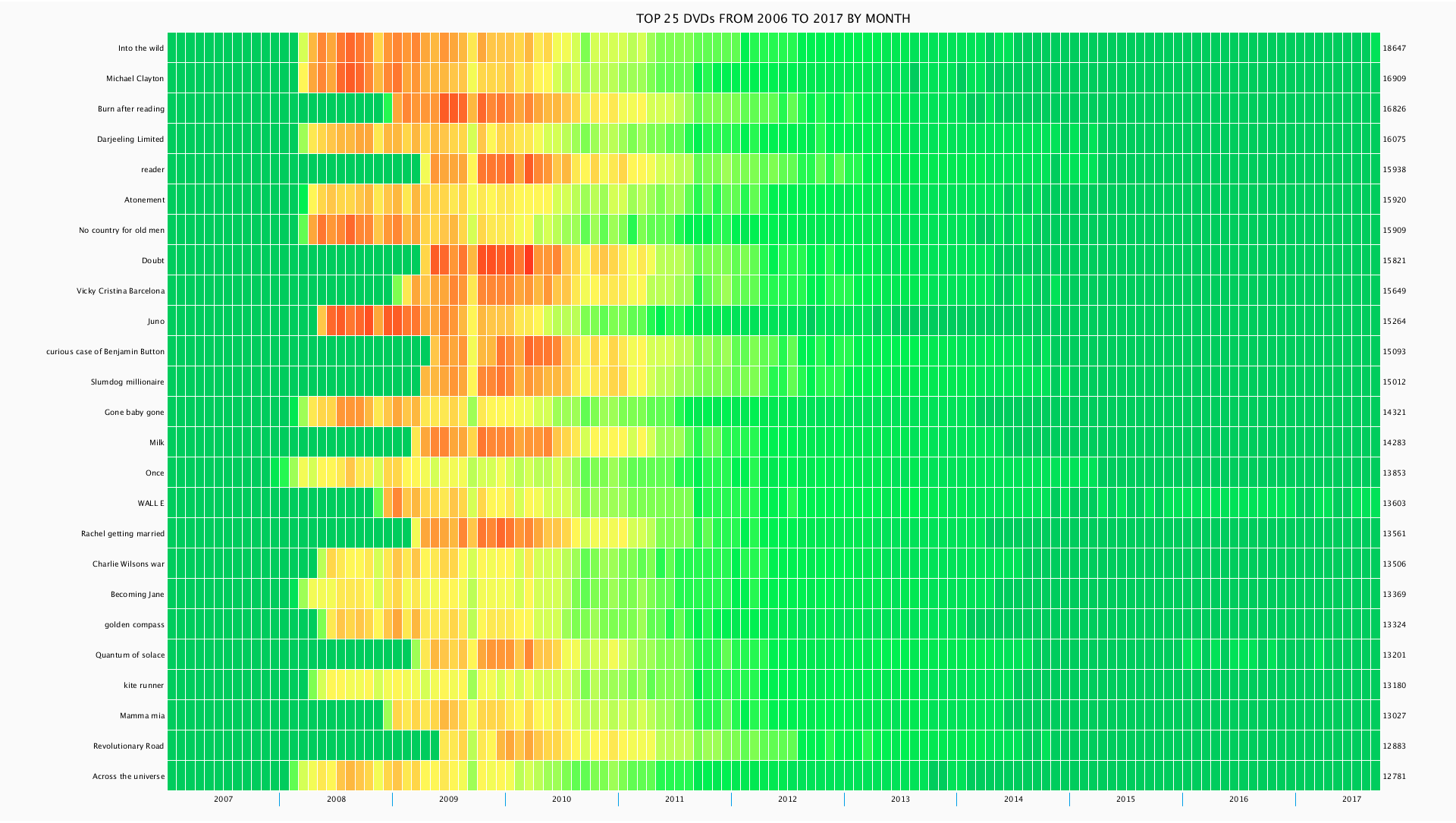
25 Top DVDs By Month from 2006-2017



25 Top DVDs By Month from 2006-2017



25 Top DVDs By Month from 2006-2017



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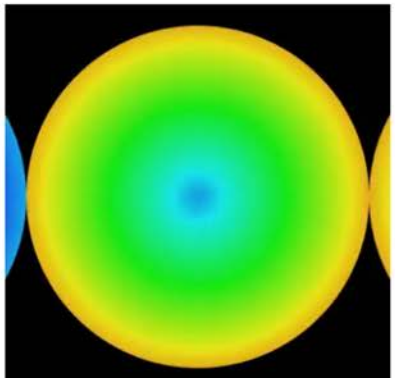
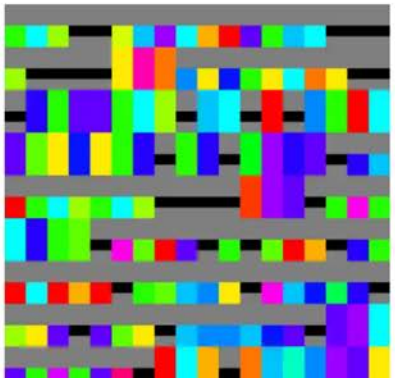
Examples


Next: Weihao to do live coding of the 2D graph…

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