



**CGT 575/ASM 591**  
**Data Visualization Tools & Applications**  
 Spring 2023  
**Week 3 Lec 1**  
 Tuesday & Thursday  
 5:30 PM – 6:45 PM  
 KNOY 306

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## Introductions



Dr. Vetria L. Byrd, PhD  
Associate Professor  
Computer Graphics Technology



Dr. Dharmendra Saraswat, PhD  
Associate Professor of  
Agricultural & Biological  
Engineering



Aanis Ahmad  
PhD Candidate  
Electrical and Computer Engineering

Instructor	Office	Phone	Email	Office Hour *
Vetria Byrd, PhD	KNOY 371	(765) 494-6335	<a href="mailto:vbyrd@purdue.edu">vbyrd@purdue.edu</a>	Monday, 3:30 PM – 4:30 PM and by appointment
Dharmendra Saraswat, PhD	ABE 3041P	(765) 494-6335	<a href="mailto:saraswat@purdue.edu">saraswat@purdue.edu</a>	TBD and by appointment
Aanis Ahmad	ABE 3116	(765) 775-9103	<a href="mailto:ahmad31@purdue.edu">ahmad31@purdue.edu</a>	TBD and by appointment

\* Zoom meeting information provided in Brightspace

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# Announcements

## In the event of inclement weather

- A zoom link will be provided in Brightspace
- DO NOT email inquires regarding in-person class.
- An announcement will be posted to Brightspace by 4 PM if in-person class has moved to Zoom.

## This Week

### Homework

- Tableau Training Part VI (Yes, Part VI)

Thursday, January 26, 2023

- Introduction to Gephi
- See Resources Module in Brightspace for download link

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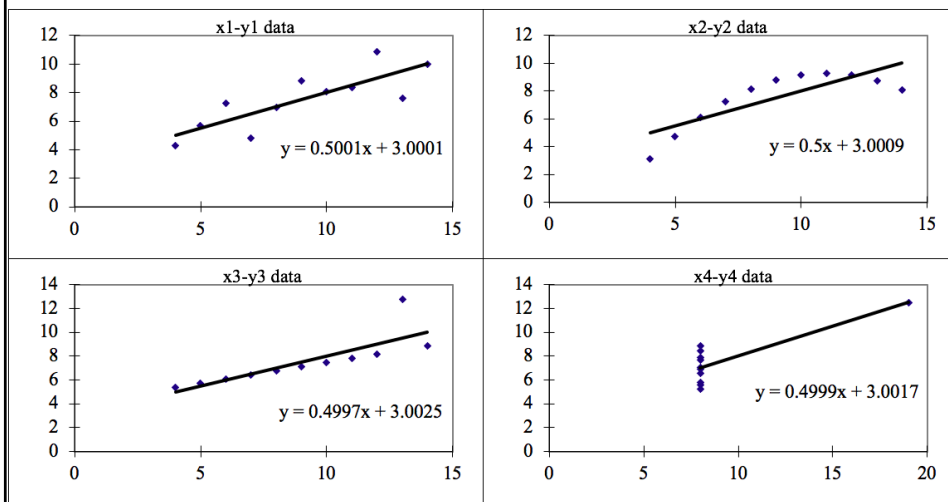
## Recap from Last week

- Anscombe's Quartet
- Tour through the visualization zoo.

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## Anscombe's Data



<https://towardsdatascience.com/importance-of-data-visualization-anscombes-quartet-way-a325148b9fd2>

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Describing Data

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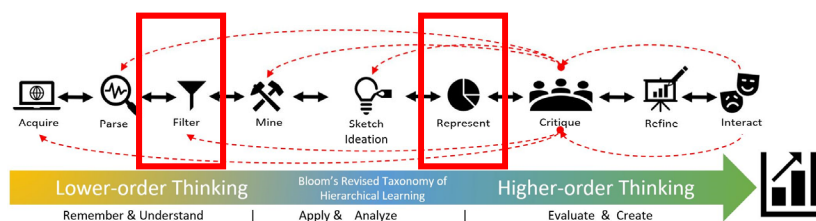
What was your take away from the Anscombe's Quartet Activity?

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Describing Data

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## Represent Stage

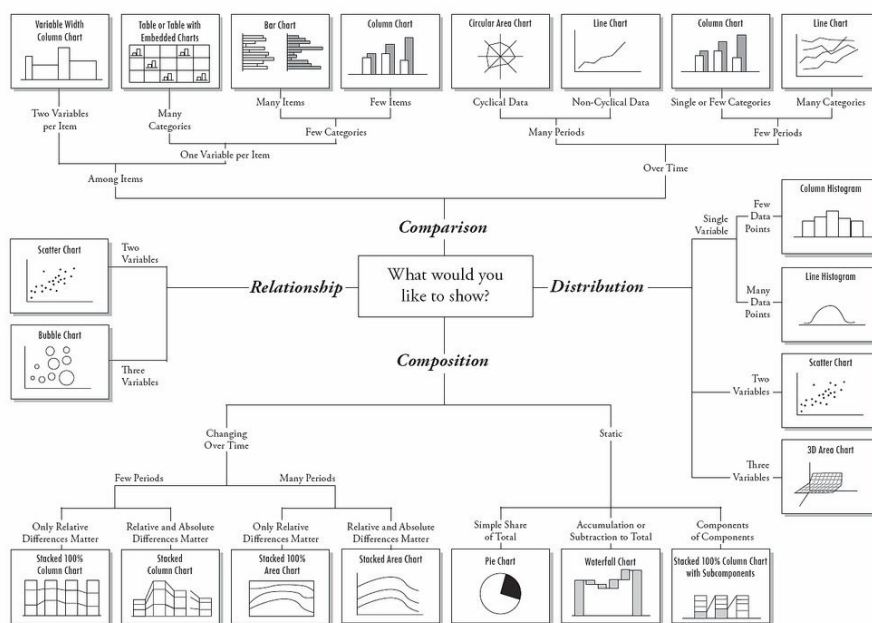


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## Chart Suggestions—A Thought-Starter



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# Beyond the Data Visualization Zoo

Read this paper

- Lengler, R., & Eppler, M. J. (2007, January). **Towards a periodic table of visualization methods for management.** In *IASTED Proceedings of the Conference on Graphics and Visualization in Engineering (GVE 2007)*, Clearwater, Florida, USA (Vol. 7, No. 8, p. 31).

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## Periodic Table of Visualization Methods



### Data Visualization

Visual representations of quantitative data in schematic form (either with or without axes)



### Strategy Visualization

The systematic use of complementary visual representations in the analysis, development, formulation, communication, and implementation of strategies in organizations.



### Information Visualization

The use of interactive visual representations of data to amplify cognition. This means that the data is transformed into an image, it is mapped to screen space. The image can be changed by users as they proceed working with it.



### Metaphor Visualization

Visual Metaphors position information graphically to organize and structure information. They also convey an insight about the represented information through the key characteristics of the metaphor that is employed.



### Concept Visualization

Methods to elaborate (mostly) qualitative concepts, ideas, plans, and analyses.



### Compound Visualization

The complementary use of different graphic representation formats in one single schema or frame.

Lengler, R., & Eppler, M. J. (2007, January). **Towards a periodic table of visualization methods for management.** In *IASTED Proceedings of the Conference on Graphics and Visualization in Engineering (GVE 2007)*, Clearwater, Florida, USA (Vol. 7, No. 8, p. 31).

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## Task and Interaction

**Overview** [ ✱ ], most visualization methods are good in providing an overview.

**Detail AND Overview** [ ✱ ], those methods adhere in one way or another to Shneiderman's visualization mantra *Overview first, zoom and filter, then details-on demand*[12].

**Detail** [ □ ], those methods are good in providing (additional) insights from single bits of data. *Detail* visualization methods are mostly used for reasoning with the *backward heuristic*, i.e. thinking backwards from the desired outcome to the present position [13, 24], thereby spelling out all the subproblems, e.g. Nassi-Shneiderman diagram.

Lengler, R., & Eppler, M. J. (2007, January). **Towards a periodic table of visualization methods for management.** In *IASTED Proceedings of the Conference on Graphics and Visualization in Engineering (GVE 2007)*, Clearwater, Florida, USA (Vol. 7, No. 8, p. 31).

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## Task and Interaction

**Cognitive Processes:** Visualization methods can help the user to articulate implicit knowledge (as in a visual metaphor) and to stimulate new thinking (like with a mindmap). Two simple and established categories to employ in this context are [e.g. 24]:

- **Convergent thinking** [ >< ] is a mode of critical thinking in which a person attempts to reduce complexity through analysis and synthesis.
- **Divergent thinking** [ <> ] is a mode of thinking in which a person generates many unique, creative responses to a question or problem.

Lengler, R., & Eppler, M. J. (2007, January). **Towards a periodic table of visualization methods for management.** In *IASTED Proceedings of the Conference on Graphics and Visualization in Engineering (GVE 2007)*, Clearwater, Florida, USA (Vol. 7, No. 8, p. 31).

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# Task and Interaction

**Represented Information:** The information to be represented has also been classified by various researchers [11, 12, 7, 14, 21], The most striking distinction for us is between

- **Structure** [in black], such as hierarchies or networks
- **Process** [in blue], either stepwise cyclical in time and/or continuous sequential.







































































































Lengler, R., & Eppler, M. J. (2007, January). Towards a periodic table of visualization methods for management. In *IASTED Proceedings of the Conference on Graphics and Visualization in Engineering (GVE 2007)*, Clearwater, Florida, USA (Vol. 7, No. 8, p. 31).

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# A PERIODIC TABLE OF VISUALIZATION METHODS

<div><b>€</b> continuum</div>	<div><b>Data Visualization</b> Visual representations of quantitative data in schematic form (either with or without axes)</div>																<div><b>Strategy Visualization</b> The systematic use of complementary visual representations in the analysis, development, formulation, communication, and implementation of strategies in organizations.</div>																<div><div><b>G</b> graphic facilitation</div></div>													
<div><div><b>Tb</b> table</div><div><b>Ga</b> cartesian coordinates</div></div>	<div><b>Information Visualization</b> The use of interactive visual representations of data to amplify cognition. This means that the data is transformed into an image, it is mapped to screen space. The image can be changed by users as they proceed working with it.</div>																<div><b>Metaphor Visualization</b> Visual Metaphors position information graphically to organize and structure information. They also convey an insight about the represented information through the key characteristics of the metaphor that is employed.</div>																													
<div><div><b>Pi</b> pie chart</div><div><b>L</b> line chart</div></div>	<div><b>Concept Visualization</b> Methods to elaborate (mostly) qualitative concepts, ideas, plans, and analyses.</div>																<div><b>Compound Visualization</b> The complementary use of different graphic representation formats in one single scheme or frame.</div>																													
<div><div><b>B</b> bar chart</div><div><b>Ac</b> area chart</div><div><b>R</b> radar chart</div><div><b>Pa</b> parallel coordinates</div><div><b>Hy</b> hyperbolic tree</div><div><b>Cy</b> cycle diagram</div><div><b>T</b> timeline</div><div><b>Ve</b> venn diagram</div><div><b>Mi</b> mindmap</div><div><b>Sq</b> square 3D representations</div><div><b>Cc</b> concentric circles</div><div><b>Ar</b> argument slide</div><div><b>Sw</b> swim lane diagram</div><div><b>Gc</b> gantt chart</div><div><b>Pm</b> perspectives diagram</div><div><b>D</b> dilemma diagram</div><div><b>Pr</b> parameter ruler</div><div><b>Kn</b> knowledge map</div></div>																																														
<div><div><b>Hi</b> histogram</div><div><b>Sc</b> scatterplot</div><div><b>Sa</b> satellite diagram</div><div><b>In</b> information lens</div><div><b>E</b> entity relationship diagram</div><div><b>Pt</b> petri net</div><div><b>Fi</b> flow chart</div><div><b>Cl</b> clustering</div><div><b>Lc</b> layer chart</div><div><b>Py</b> pyramid technique</div><div><b>Cc</b> cause-effect chains</div><div><b>Ti</b> tunnel map</div><div><b>Dt</b> decision tree</div><div><b>Cp</b> cym critical path method</div><div><b>Cf</b> concept map</div><div><b>Co</b> concept map</div><div><b>Ic</b> iceberg</div><div><b>Lm</b> learning map</div></div>																																														
<div><div><b>Tk</b> tasky box plot</div><div><b>Sp</b> spectrum</div><div><b>Da</b> data map</div><div><b>Tp</b> treemap</div><div><b>Cn</b> cone tree</div><div><b>Sy</b> system dyn./simulation</div><div><b>Df</b> data flow diagram</div><div><b>Se</b> semantic network</div><div><b>So</b> soft system modeling</div><div><b>Sn</b> sneaky map</div><div><b>Fo</b> force field diagram</div><div><b>Ib</b> iceberg diagram</div><div><b>Pr</b> process event chain</div><div><b>Pe</b> pert chart</div><div><b>Ev</b> evolutionary knowledge map</div><div><b>V</b> venn diagram</div><div><b>Hh</b> honeycomb chart</div><div><b>I</b> informal</div></div>																																														
<div><div><b>Cy</b> Process Visualization</div></div>	<div>NOTE: Depending on your location and connection speed it can take some time to load a pop-up picture.</div>																																<div><div><b>G</b> graphic facilitation</div></div>													
<div>© Ralph Lengler &amp; Martin J. Eppler, <a href="http://www.visual-literacy.org">www.visual-literacy.org</a></div>																																														
<div><div><b>Hy</b> Structure Visualization</div></div>	<div><div><b>Su</b> supply demand curve</div></div>	<div><div><b>Pc</b> performance charting</div></div>	<div><div><b>St</b> strategy map</div></div>	<div><div><b>Oc</b> organization chart</div></div>	<div><div><b>Ho</b> house of quality</div></div>	<div><div><b>Fd</b> feedback diagram</div></div>	<div><div><b>Ft</b> failure tree</div></div>	<div><div><b>Mq</b> magic quadrant</div></div>	<div><div><b>Ld</b> life-cycle diagram</div></div>	<div><div><b>Po</b> porter's five forces</div></div>	<div><div><b>S</b> s-cycle</div></div>	<div><div><b>Sm</b> stakeholder map</div></div>	<div><div><b>Is</b> ishikawa diagram</div></div>	<div><div><b>Tc</b> technology roadmap</div></div>																			<div><div><b>Ed</b> edgeworth box</div></div>	<div><div><b>Pf</b> portfolio diagram</div></div>	<div><div><b>Sg</b> strategic game board</div></div>	<div><div><b>Mz</b> mitchberg's organograph</div></div>	<div><div><b>Z</b> zwick's morphological box</div></div>	<div><div><b>Ad</b> affinity diagram</div></div>	<div><div><b>De</b> decision discovery diagram</div></div>	<div><div><b>Bm</b> bug matrix</div></div>	<div><div><b>Stc</b> strategy canvas</div></div>	<div><div><b>Vc</b> value chain</div></div>	<div><div><b>Hy</b> hype-cycle</div></div>	<div><div><b>Sr</b> stakeholder rating map</div></div>	<div><div><b>Ta</b> taps</div></div>	<div><div><b>Sd</b> spray diagram</div></div>
<div><div><b>Overview</b></div><div><b>Detail</b></div><div><b>Detail AND Overview</b></div><div><b>Divergent thinking</b></div><div><b>Convergent thinking</b></div></div>																																														



## Periodic Table of Visualization Methods

- You have been randomly assigned to one of the following groups
  - Data Visualization
  - Information Visualization
  - Strategy Visualization
  - Metaphor Visualization
  - Compound Visualization
- Each person in the group will choose a visualization method to present to the class.

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## Periodic Table of Visualization Methods

- Compound Visualization**
- Complementary use of different graphic representation formats in one single schema or frame.
  - Miriam Attal
  - Siqi Chen
  - Hubing Han

Lengler, R., & Eppler, M. J. (2007, January). Towards a periodic table of visualization methods for management. In *IASTED Proceedings of the Conference on Graphics and Visualization in Engineering (GVE 2007)*, Clearwater, Florida, USA (Vol. 7, No. 8, p. 31).

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## Periodic Table of Visualization Methods

### Data Visualization

- Visual representation of quantitative data in schematic form (either with or without axes)
- Pragatheiswar Giri
- Yuzhou Jiang
- Shih Yun Lin
- Shuning Yin

Lengler, R., & Eppler, M. J. (2007, January). **Towards a periodic table of visualization methods for management.** In *IASTED Proceedings of the Conference on Graphics and Visualization in Engineering (GVE 2007)*, Clearwater, Florida, USA (Vol. 7, No. 8, p. 31).

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## Periodic Table of Visualization Methods

### Information Visualization

- The use of interactive visual representation of data to amplify cognition. This means that the data is transformed into an image, it is mapped to screen space. The image can be changed by users as they proceed working with it.
- Michael Lee
- Isha Mahadalkar
- Glen Morris

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## Periodic Table of Visualization Methods

### Metaphor Visualization

- Visual Metaphors position information graphically to organize and structure information. They also convey an insight about the represented information through the key characteristics of the metaphor that is employed.

- Adeayo Adewumi
- Koushiki Pohit
- Adriana Watson

Lengler, R., & Eppler, M. J. (2007, January). *Towards a periodic table of visualization methods for management*. In *IASTED Proceedings of the Conference on Graphics and Visualization in Engineering (GVE 2007)*, Clearwater, Florida, USA (Vol. 7, No. 8, p. 31).

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## Periodic Table of Visualization Methods

### Strategy Visualization

- The systematic use of complementary visual representations in the analysis, development, formulation, and implementation of strategies in organizations.

- Chidubem Nuela Enebechi
- Yifei Hu
- Ernest Ofori-Mensah

Lengler, R., & Eppler, M. J. (2007, January). *Towards a periodic table of visualization methods for management*. In *IASTED Proceedings of the Conference on Graphics and Visualization in Engineering (GVE 2007)*, Clearwater, Florida, USA (Vol. 7, No. 8, p. 31).

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