

# ARTG 5150 SUMMER 2019

## INFORMATION VISUALIZATION PRINCIPLES AND PRACTICES

COURSE OVERVIEW • MAY 2019  
INSTRUCTOR • PEDRO M. CRUZ

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## OVERVIEW

Introduces information visualization from theoretical and practical perspectives. Defines the information visualization domain and advances principles and methods for the effective visual representation of data. Contextualizes the field from a historical perspective. Presents the perceptual and cognitive tasks enabled by visualizations. Studies an extensive range of visualization models. Illustrates good and bad practices in visualization with real-world examples. Introduces computer programming in an information visualization context.

## LEARNING OUTCOMES

- Identify and describe the information visualization domain as an interdisciplinary field.
- Understand historically how information visualization emerged, and its historic and contemporary importance.
- Present a rationale for information design principles.
- Decode the perceptual theory behind the good construction of graphs.
- Identify and create functional goals in an information visualization context.
- Ideate interaction strategies for information visualization.
- Critique and assess a visualization.
- Know what type of visualizations exist and articulate their particularities.
- Classify a visualization as being of a specific type.
- Apply visualization models to specific datasets.
- Use a programming language, on a beginner level, to load, analyze, and visualize data.

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Module 0

Introductions and course structure.

Assignment: maps and perception.

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Module 1

What is visualization? From scientific to information visualization.

Definitions, approaches, conceptual models and processes.

Assignment: readings and essay.

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Module 2

Taxonomies in information visualization. An overview of two-dimensional plotting: e.g. bar charts, histograms, bullet graphs, density plots, violin plots, mosaic plots, area charts, line charts, stacked area charts, horizon charts, sparklines.

Quizzes.

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Module 3

Circular models to show proportions: pie charts, polar area charts, spie charts, donut charts, radial column and bar charts.

Assignment: the effectiveness of antibiotics and their visualization.

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Module 4

Multivariate visualizations and flows: parallel coordinates, radar charts, parallel sets, alluvial diagrams, sankey diagrams, and flow maps.

Assignment: exploring and designing alluvial diagrams for a demographic set.

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## Module 5

Hierarchical structures: trees, dendrograms, tree maps, icicle plots, voronoi tree maps, circular tree maps, and sunburst diagrams.

Assignment: exploring and designing sunburst diagrams for a demographic set.

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## Module 6

Workshop: loading large texts, lemma extraction, word aggregation, sorting data, and word count visualization.

Assignment: loading additional texts, filtering words, and modifying the visualization.

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## Module 7

Networks: arc diagrams, chord diagrams, node-link diagrams, force-directed layouts, hyperbolic trees, hive plots and adjacency matrixes.

Assignment: experimenting with network visualization by using node-link diagrams, arc diagrams, and chord diagrams.

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## Module 8

Workshop: implementing a force-direct layout for network visualization.

Assignment: exploration of physical and visual properties of a force-directed layout.

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## Module 9

Information design principles: graphical integrity, data-ink ratio, chartjunk, data density, and small multiples.

Assignment: identifying and critiquing bad design choices.

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## Module 10

Semiotics of graphics: information components, visual variables, classes of representation, and perceptual tasks in graphics.

Assignment: analyzing visual variables and perceptual tasks in graphics

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## Module 11

Tasks by data type in information visualization: overview, zoom, filter, details-on-demand, relate, history, and extract Validation approaches and strategies in information visualization visualization: technique-driven, user-driven, design-driven, and theoretically-driven.

Assignment: sketching a visualization and formulating and illustrating use cases for information-seeking tasks.