

The Intelligent Dashboard

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NEED & INDUSTRIAL RELEVANCE

Massive data are collected everywhere – cheaply and ubiquitously
(+) can support science, medicine, business, etc. in decision making
(-) are often multivariate and heterogeneous, hard to manage manually

(+) automated analytics and machine learning can come to the rescue
(-) there are limits in mimicking human creativity and pattern recognition

→ need to Incorporate human domain knowledge into the analytics

Adding visual interaction tools can bring the human analyst into the loop
(+) many tools and visual paradigms have been proposed and developed
(-) it often difficult for analysts to pick the best tool for the task and data
(-) this can lead to unsatisfactory analytics results
(-) it also does not make the best use of the data

Our framework addresses this urgent need

APPROACH (RESEARCH METHODS)

We propose to support visual analytics with methods gleaned from machine learning (ML) and artificial intelligence (AI)

Our framework will construct a set of rules that can

- predict, propose, and generate a sequence of visualizations that offer the best prospect of increasing the analyst's insight when interacting with them

The rules can be

- explicit (formulated in probabilistic logic)
- implicit (encoded in a deep neural network)

We will obtain these rules by

- methodically characterizing the various visual analytics tools and paradigms by a formal taxonomy and machine learning (ML)
- methodically characterizing data by a formal taxonomy and ML
- study the behavior of users and their insight while interacting with data via a set of appropriate computational ML-based logging tools

PROJECT GOALS

Devise a novel framework that will automatically select the most appropriate visual analytics paradigm and instantiation for

- the data
- the analytics task and goal
- the role of the analyst in the organization or community
- the analyst's visual literacy
- the analyst's security clearance (if applicable)

DELIVERABLES/OUTCOMES

Deliverables will be

- the Intelligent Dashboard (ID) infrastructure & associated rule set
- the Knowledge Cache (KC) framework (*)
- a set of base visual analytics workflow implementation boosted by the proposed ID and KC documents with guidelines and manual

(*) The *Knowledge Cache* is a framework that will keep track of data aspects already studied

- it will provide additional context for the automated visualization generation process

OBJECTIVES

Promote and enforce best practices in visual analytics

Help users and the company to

- make the best use of the available data
- make the best use of the human analyst's innate qualities and expertise
- produce the most complete insight from the data

Supports well-known paradigms such as

- overview and detail-on-demand
- focus and context
- but do so within our new intelligent and narrative framework

IMPACT

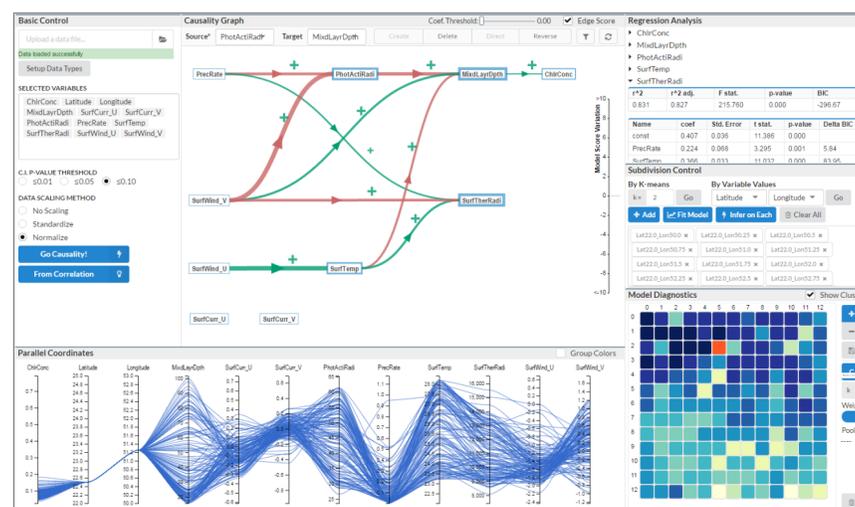
Using artificial intelligence to guide visual data analytics is a novel and promising research direction

- AI, ML, and deep learning have sufficiently matured to tackle this effort
- the team has ample experience in visual analytics, ML, and AI to deliver on the proposed framework

The proposed framework will help human analysts (and the associated company) to

- make the best use of the data underlying the company's business
- make the best use of the human analyst's expertise and talent
- create new and better synergies between human and machine
- produce the most insight from the data

The framework can also be a commercializable product by itself



Example: Dashboard of the PI's Visual Causality Analyst application