An End-User Pipeline for Scraping and Visualizing Semi-Structured Data over the Web

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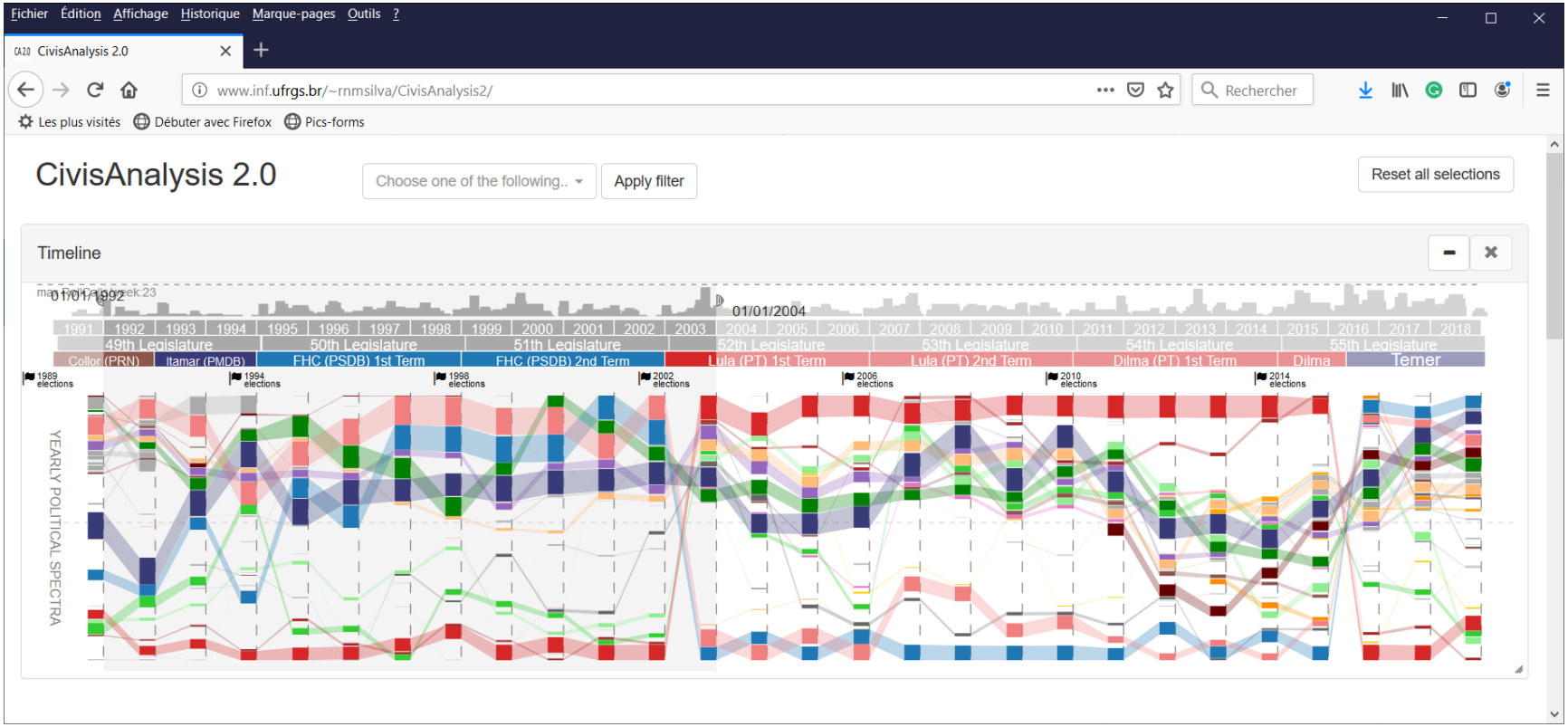
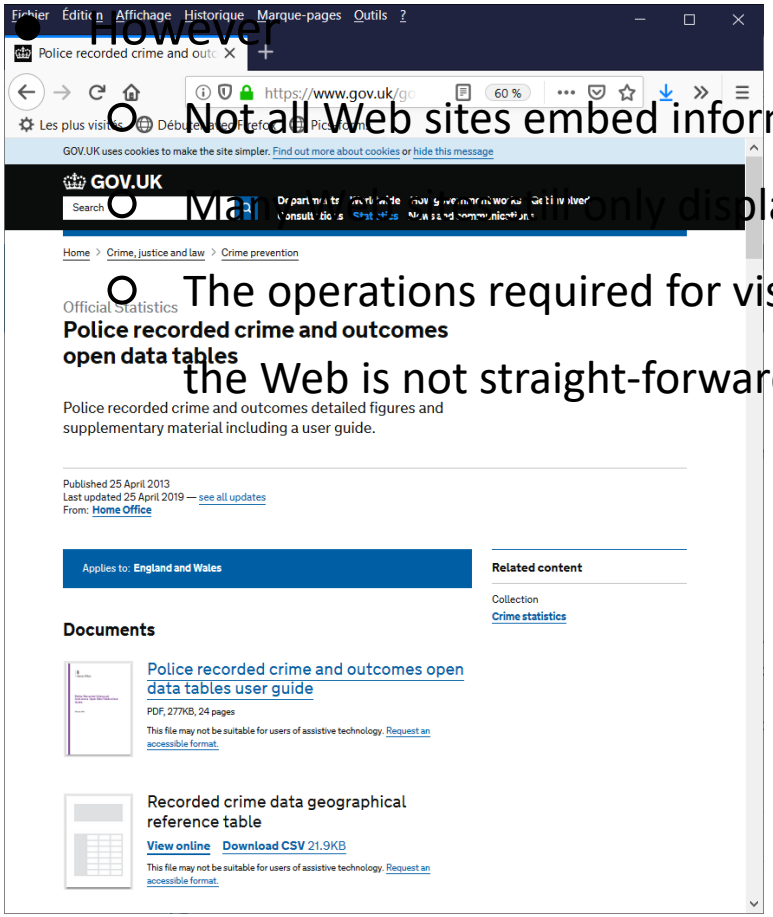
Motivation

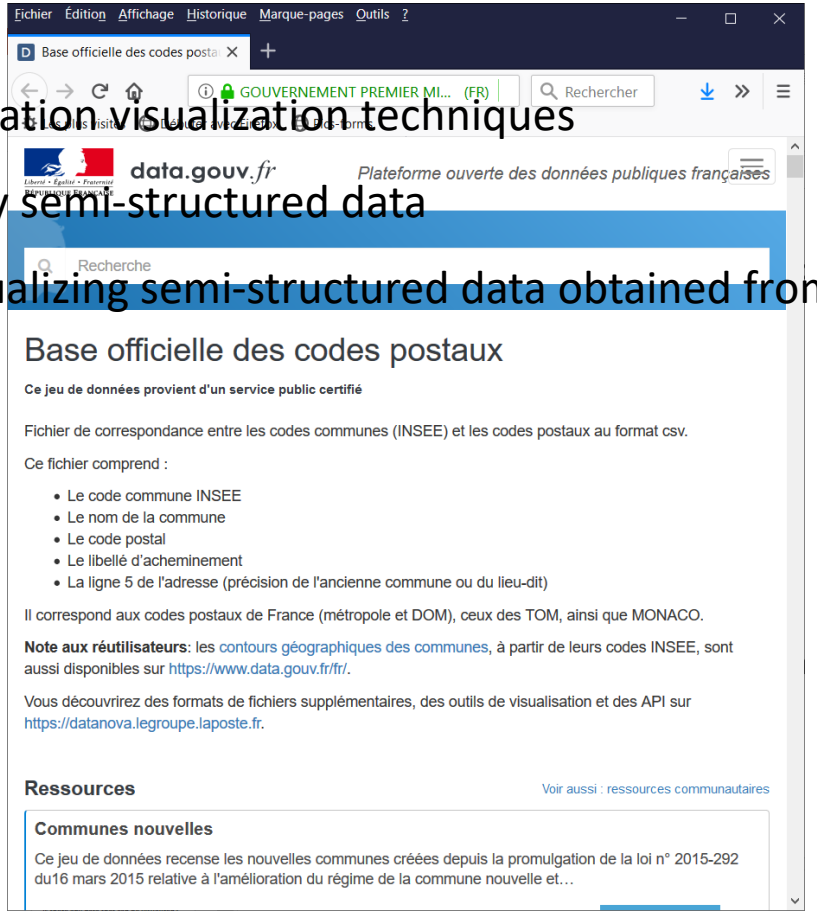
- Information visualization support the exploration and analysis of large datasets. Ex. Civil Analysis: http://www.inf.ufrgs.br/~rnmsilva/CivisAnalysis2/



Visualizing data over the web

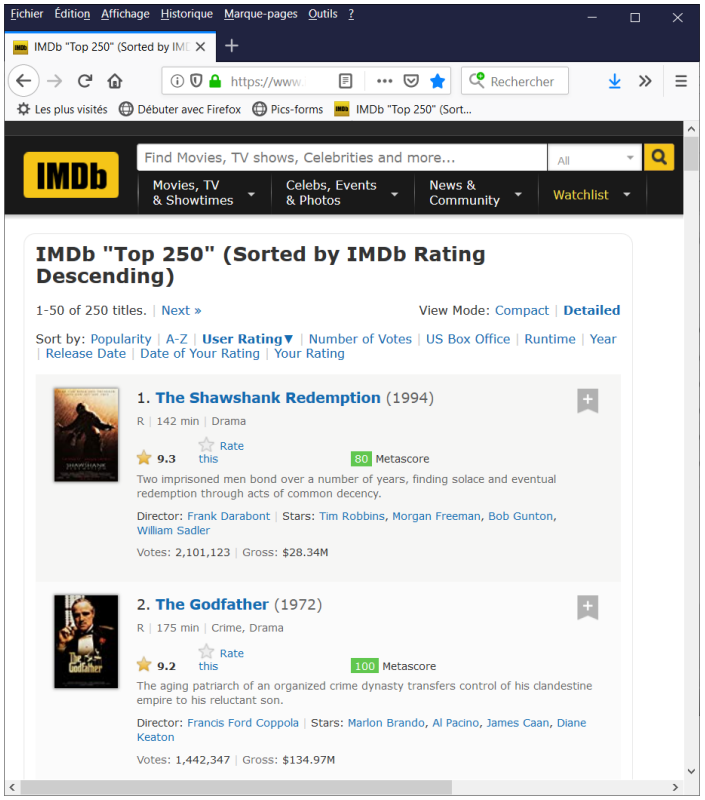
- The Web is a massive source of public datasets
- However
  - Not all Web sites embed information visualization techniques
  - Many only display semi-structured data
  - The operations required for visualizing semi-structured data obtained from the Web is not straight-forward

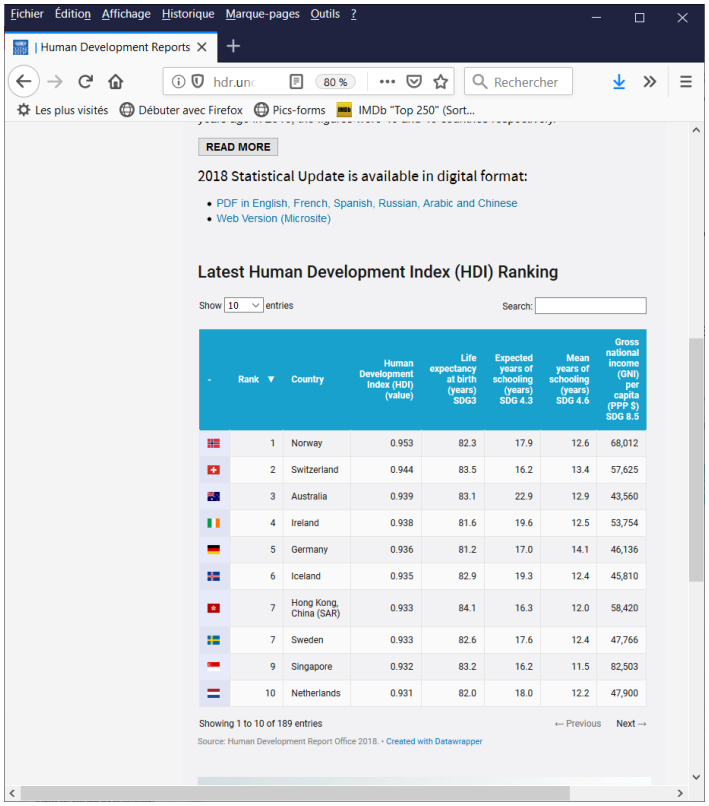




Research question

- How to apply visualization techniques over semi-structured data available on Web pages?





Preliminary study

- We analyzed a sample of sites that can match into a table dataset type
- Top 50 popular sites according to Alexa's ranking for Argentina with:
  - at least five homogeneous elements representing a dataset member with more than a single variable
- Variables were considered just if present in all occurrences of the dataset members
- HTML elements not containing textual raw-data were not taken into account

Preliminary results

- From the 50 sites, we kept only 42 sites for analysis. We discarded:
- 3 sites with content not suitable for all audiences
- 2 sites with the same domain
- 2 sites that were offline at the time of analyzing
- 1 site with a broken engine
- 10 did not present any data with a heterogeneous structure.

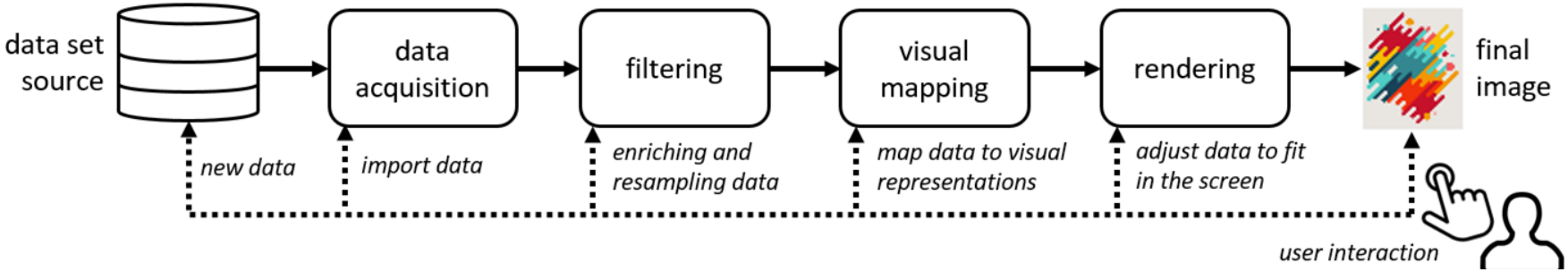
Dataset presentation	HTML Table	HTML list	HTML hierarchy
Dataset	table	ol/ul	div
Variables / Columns	thead >tr	-	-
Members / rows	tbody >tr	li	div / article
Datum / cell	td >*	*	*
Occurrences in the sample	2	8	22

How to go further ?
Our main contributions

- A pipeline allowing end-users to collect and visualize semi-structured data directly over the web site that publish the datasets
- Web Scraping: new extractors for semi-structured data
- Information Visualization: improving existing tools and visualization pipelines
- Web Augmentation: innovative strategies for web augmentation

- A support tool
- Preliminary evaluation of evaluate the validity and feasibility

Scrapping and visualizing pipeline

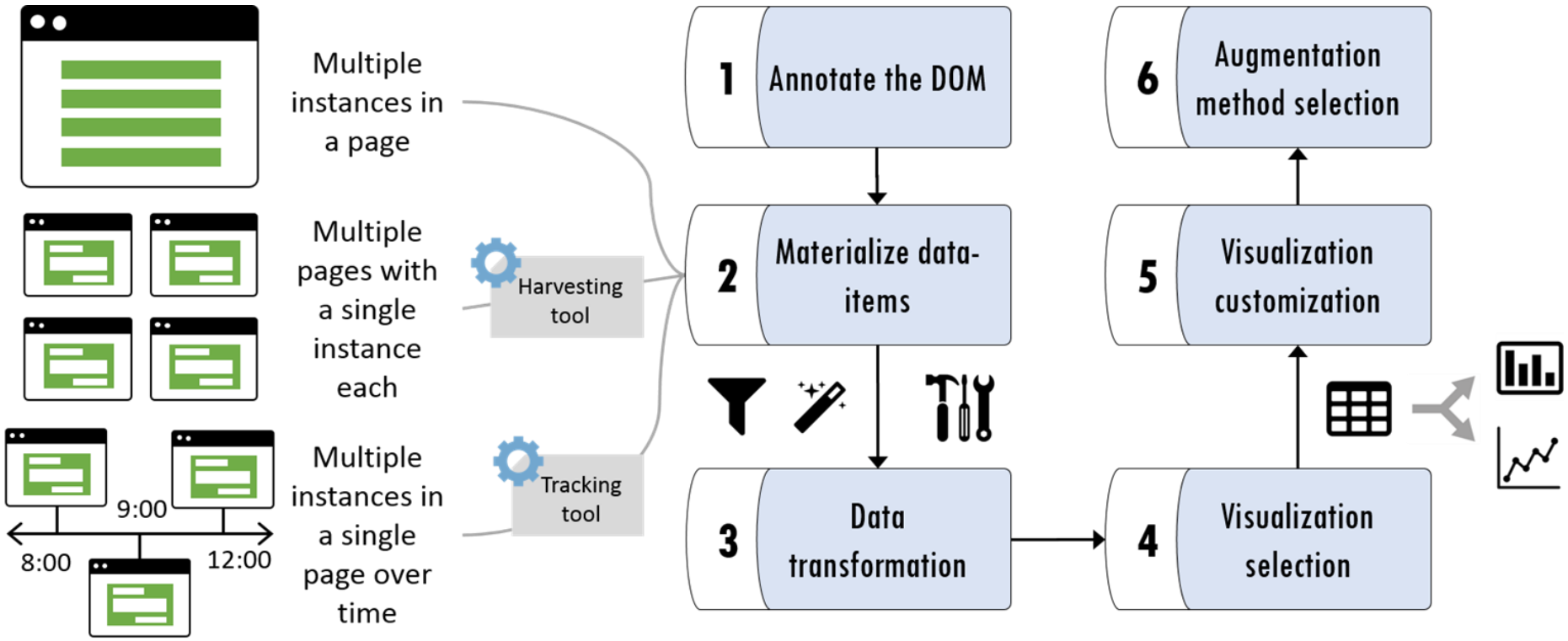


Basic premises

- Users –with no need for knowledge in low-level scraping– can abstract raw data on a Web page into a data model specification (DMS)
- Users choose and apply alternative visualizations for the DMS
- A repository of information visualization and augmentations do exist
- Open source: so that developers can extend the existing visualizations, so users can apply them on any existing and third-party Web page

Visualizing data from a ranking

Process to visualizing raw-data



demo

https://www.youtube.com/watch?v=tagToUHWx3c&list=PLHuNJBFXxaLBFgtbBCZ7kOUUFd-Z3aaJK&index=2

Validation of the approach

- HTML data structures that can be visualized without making data transformations
  - From the 50 popular sites according to Alexa's ranking, we discarded:
    - cases with no numerical variables
    - no repeated textual values or dates
    - We keep 22 sites
    - We took the two first sites from the sample matching each type of HTML structure
- The extractors were successfully tested in the 6 sites

Summary of contributions

- Underlying process for visualizing semi-structured data extracted from Web page
- Identification of suitable data structures
- Preliminary analysis of the potential of web sites that can benefit from the approach
- A tool suite including
  - Extractors
  - Basic information visualization tools
  - Interactive tools allowing users to tune the process

Future work

- Further analysis considering:
  - More extensive amount of Web sites
  - Looking for more data structures
  - User testing with the tools
- Integration of more complex data visualization tools such as graphs and multivariate data

Thanks for your attention

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