An introduction to web scraping, IT and Legal aspects

ESTP course on Automated collection of online proces: sources, tools and methodological aspects

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THE CONTRACTOR IS ACTING UNDER A FRAMEWORK CONTRACT CONCLUDED WITH THE COMMISSION

Outline

- Introduction
- Web scraping and official statistics
- Examples at Statistics Netherlands
- How it works
- Challenges
- Legal
- Wrap up

Introduction (1)

- Web scraping is **automatically** retrieving (and processing) information from websites.
- Web scraping is as old as the internet itself. There would not be any **search engine** without web scraping.
- Web scrapers use the **same** internet techniques that browsers use to visit web sites.
- Web scrapers use the **structure** and **contents** of web pages to identify and scrape relevant information.

Introduction (2)

- There are many different flavours of web scraping, varying from
  - **harvesting** very **diverse** information from multiple sites to very dedicated scrapers focussed on particular items on a single site
  - **fully automatic** scrapers operating silently to programs that require user interaction (an assistant)
  - **one-time scraping** for a research project to scraping for use in production
- Web scraping has many names:
  - Crawlers, harvesting, spiders, bots, internet robots

Web scraping and official statistics

- Web sites contain **detailed** and **frequently updated** information that may be useful to official statistics.
- We can **enrich** the results of the traditional methods with automatically collected information.
- Web data may enable **new** types of **indicators** that are not feasible with traditional methods.
- The collection and analysis time is much **faster** than performing these tasks manually.

Administrative sources

- Tax, social security
- Municipalities/ Provinces
- Supermarkets
- …

Internet sources

- …
- Surveys **Less!!!**

Faster, better, more efficient

New indicators

New

14-06-2013	Exports shrinks
14-06-2013	Calendar
13-06-2013	Retail turnover 0.6 percent lower
13-06-2013	Large drop in turnover for car and motorcycle trade
10-06-2013	More than half of employees commute to work

Competitors?

PriceStats®

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Overview | US Series | Argentina Series | Social Responsibility

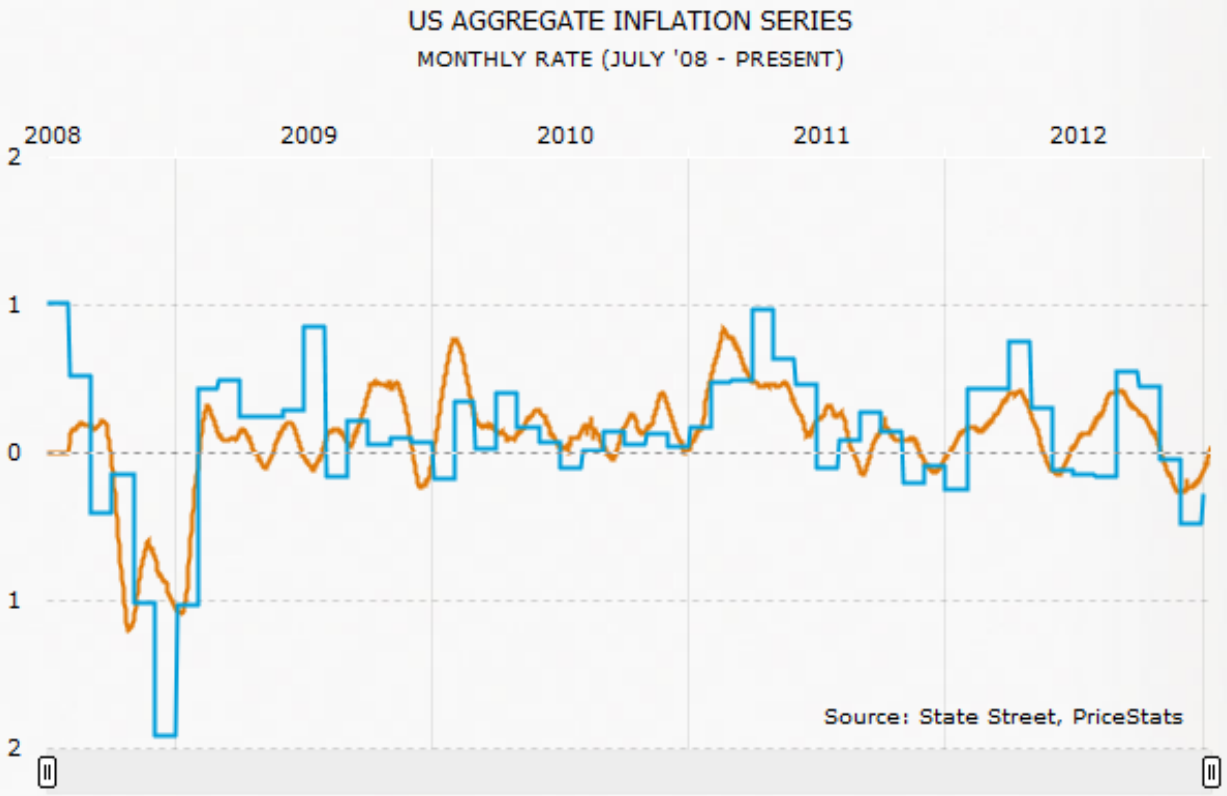
US INFLATION SERIES

PriceStats estimates aggregate inflation in the US using online prices. The objective of this series is to anticipate major changes in US inflation trends, but not to forecast monthly CPI announcements. At any point in time, our index can be different from the CPI. Our data anticipates changes in inflation trends not only because we observe prices sooner, but also because online prices tend to react to shocks more quickly.

Official CPI

PriceStats Index

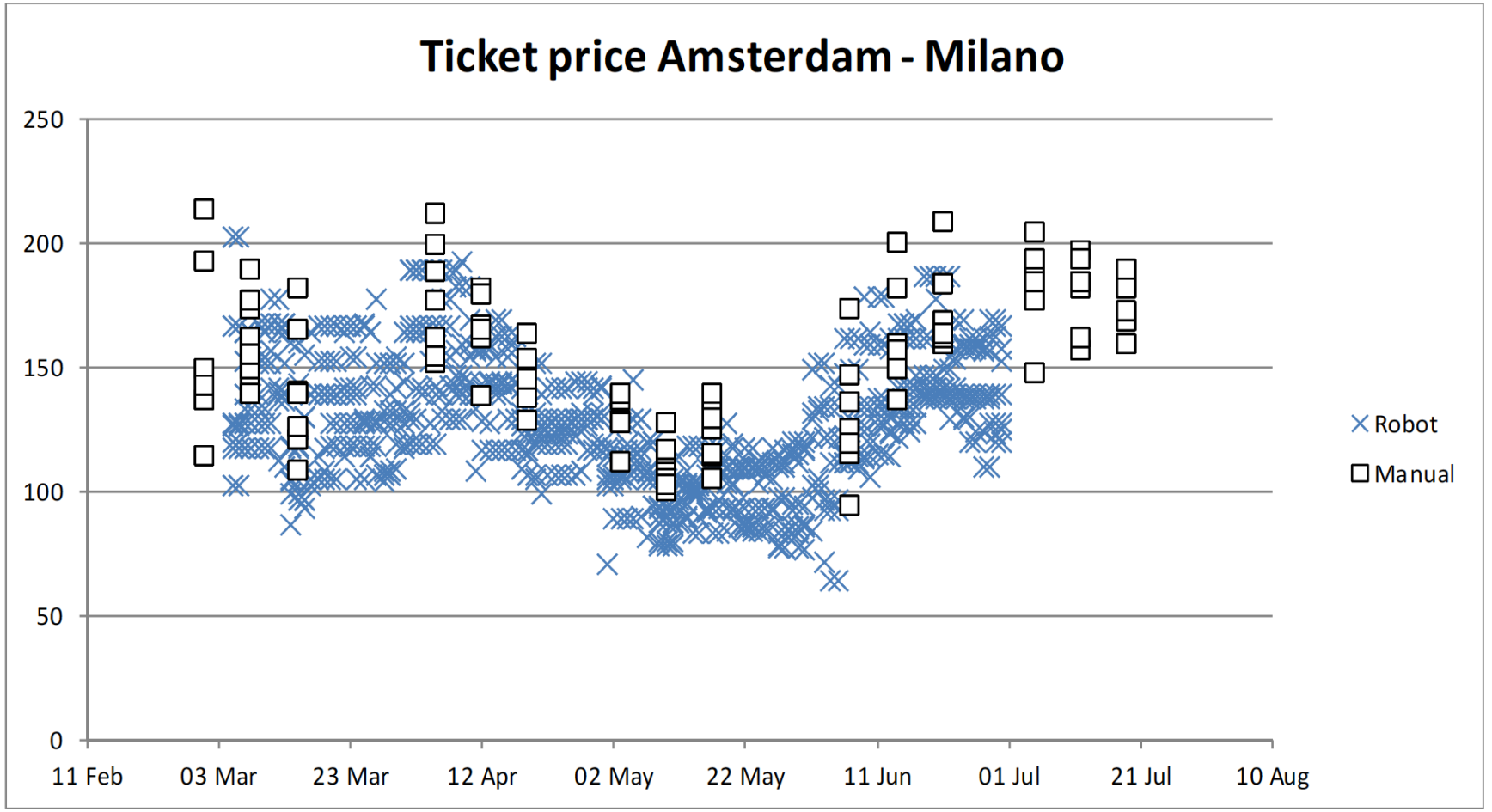
Visit State Street Research Portal to download the data.



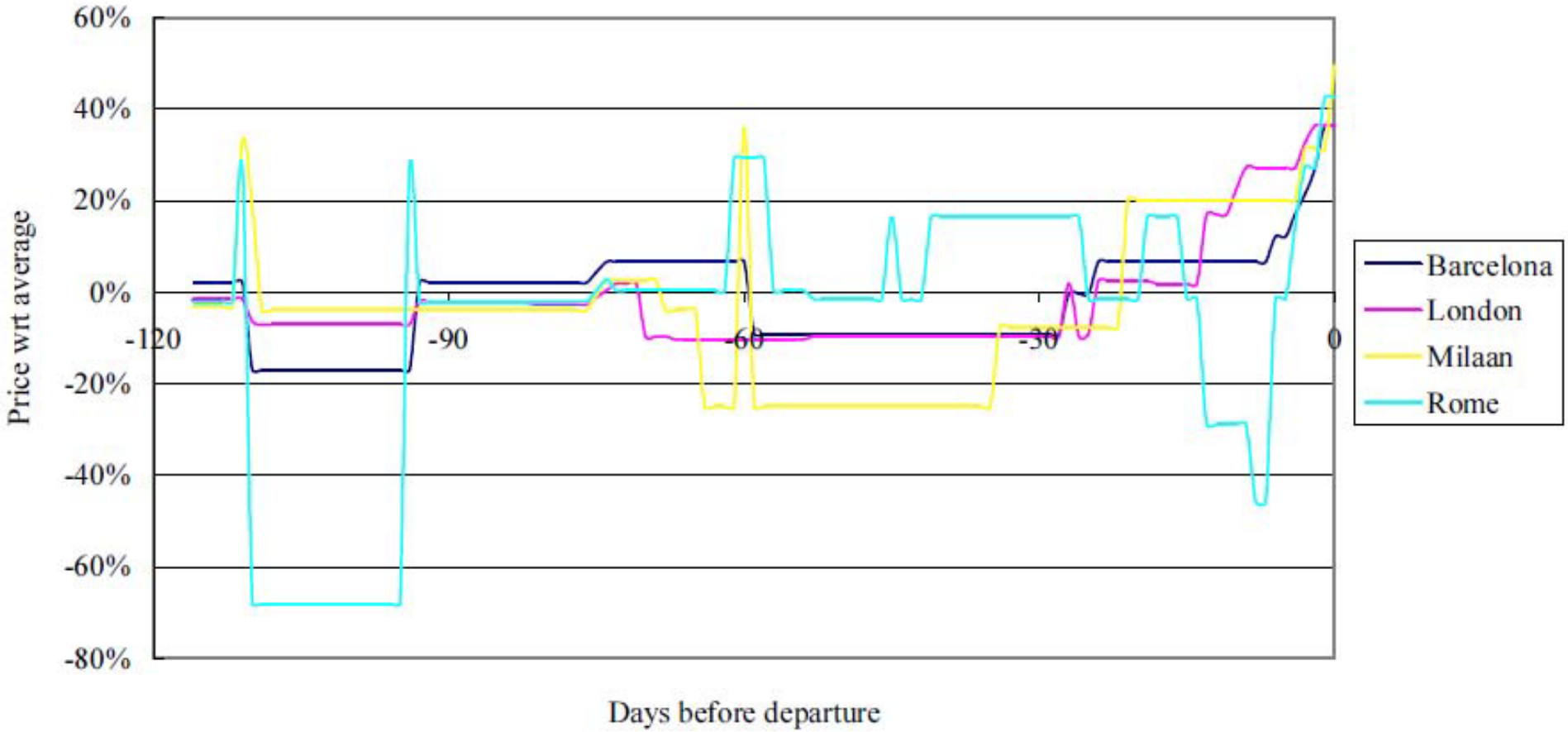
Internet sources

Some use cases

Prices of airline tickets
Real estate sites for housing statistics
Internet vacancies for job statistics
Social media sentiment for consumer confidence
Trade in second-hand goods as economic indicators
Use wikipedia for improving the business register
Internet prices for CPI



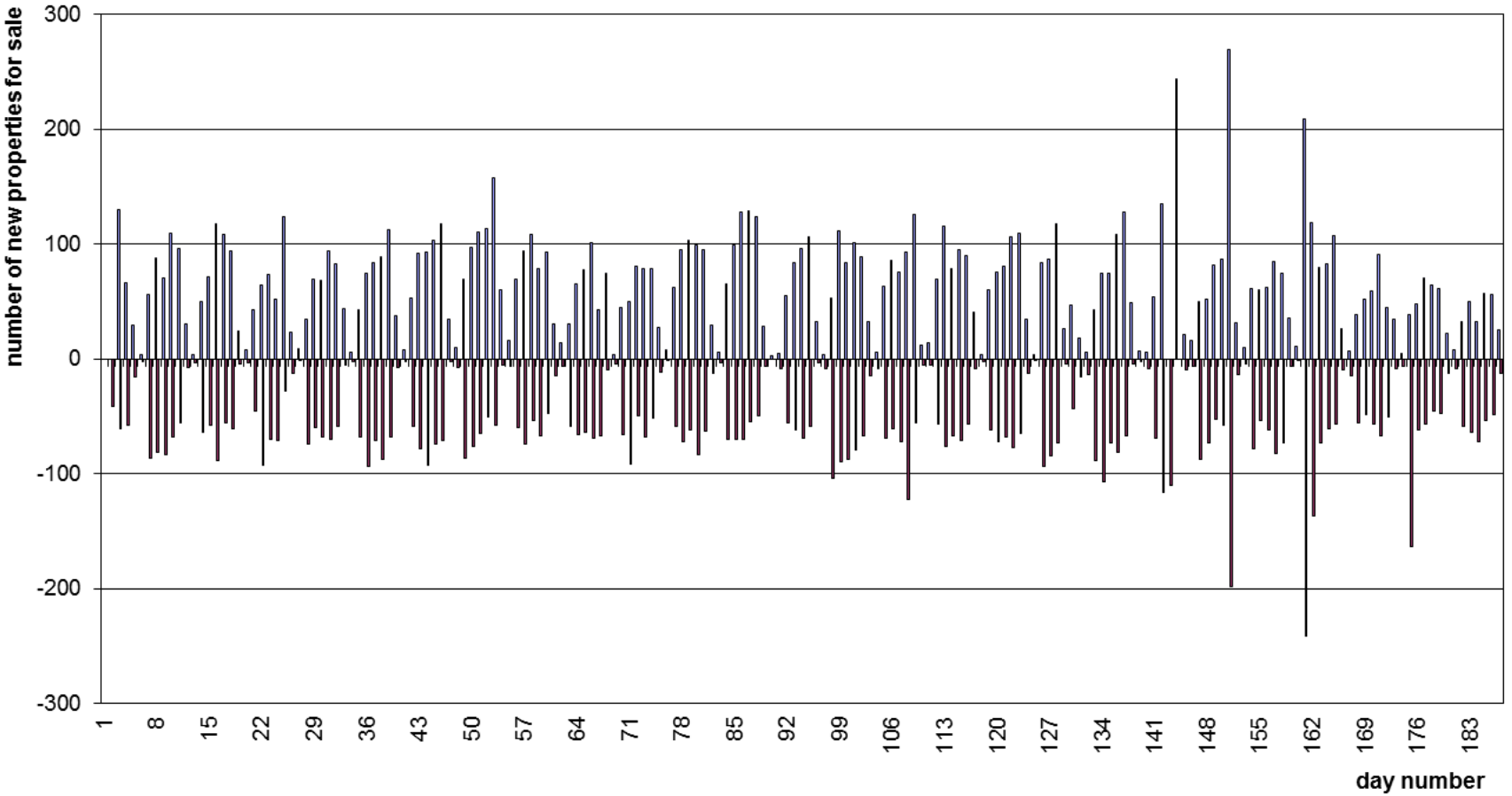
Ticket prices according to robot and manual collection from web sites



New Analysis: Volatility of flight prices of four destinations starting 116 days before departure.

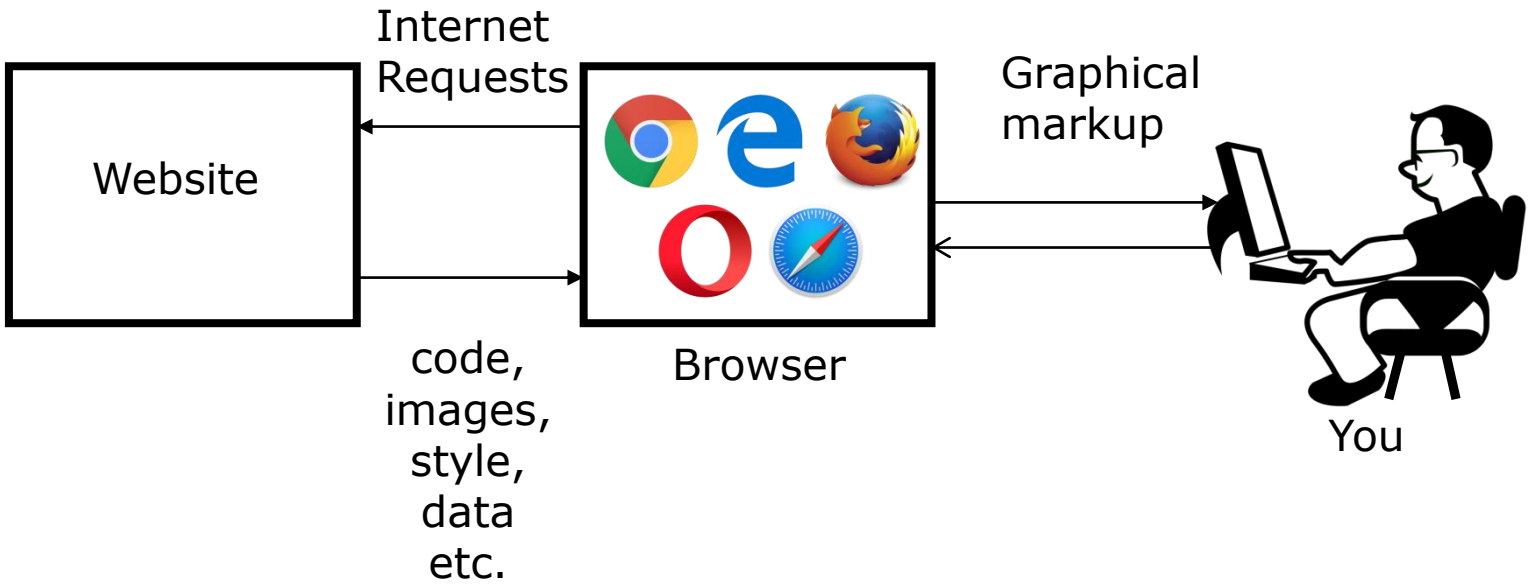
Tracking housing market (2011)

- **Identifying** the source web sites and **understanding** the characteristics of the data they provide was a challenge.
- We scraped 5 sites, about 250.000 observations / week, for 2 years
- Dutch property market statistics use results of the research using these robots.
- After research phase CBS obtained data **directly**

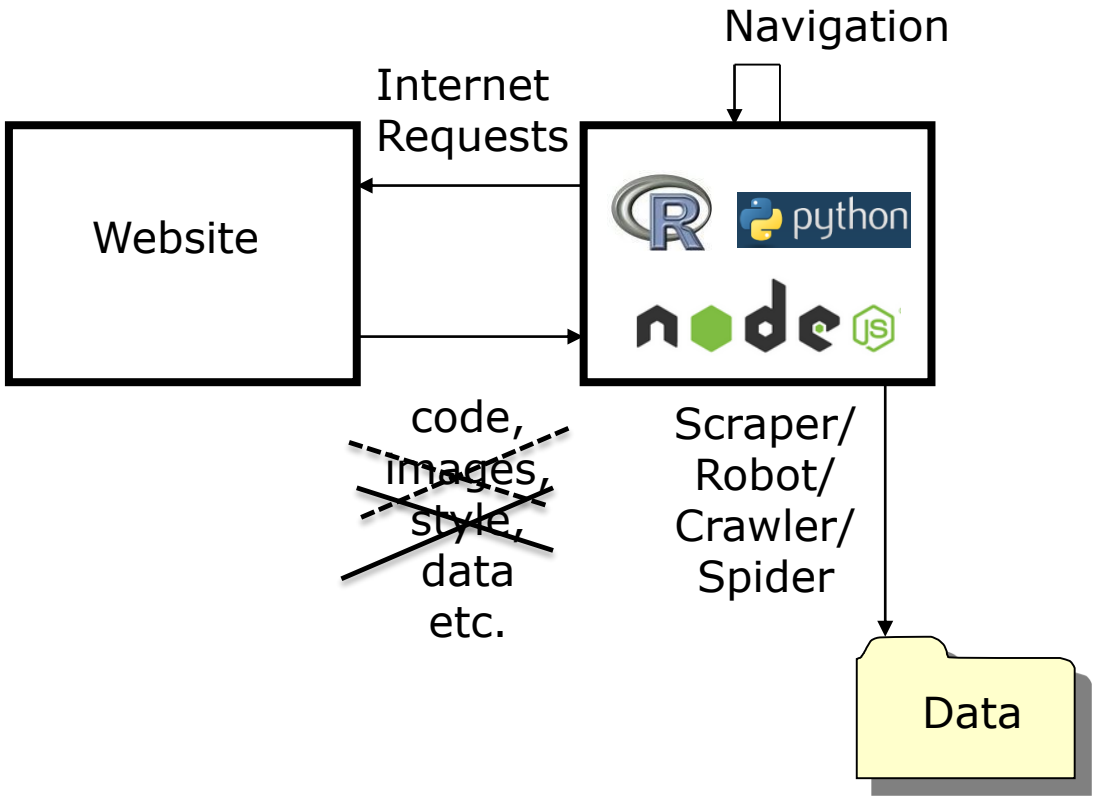


Volatility of the content of one of the housing websites.
Positive bars are properties added, negative are properties deleted.

How it works (1)

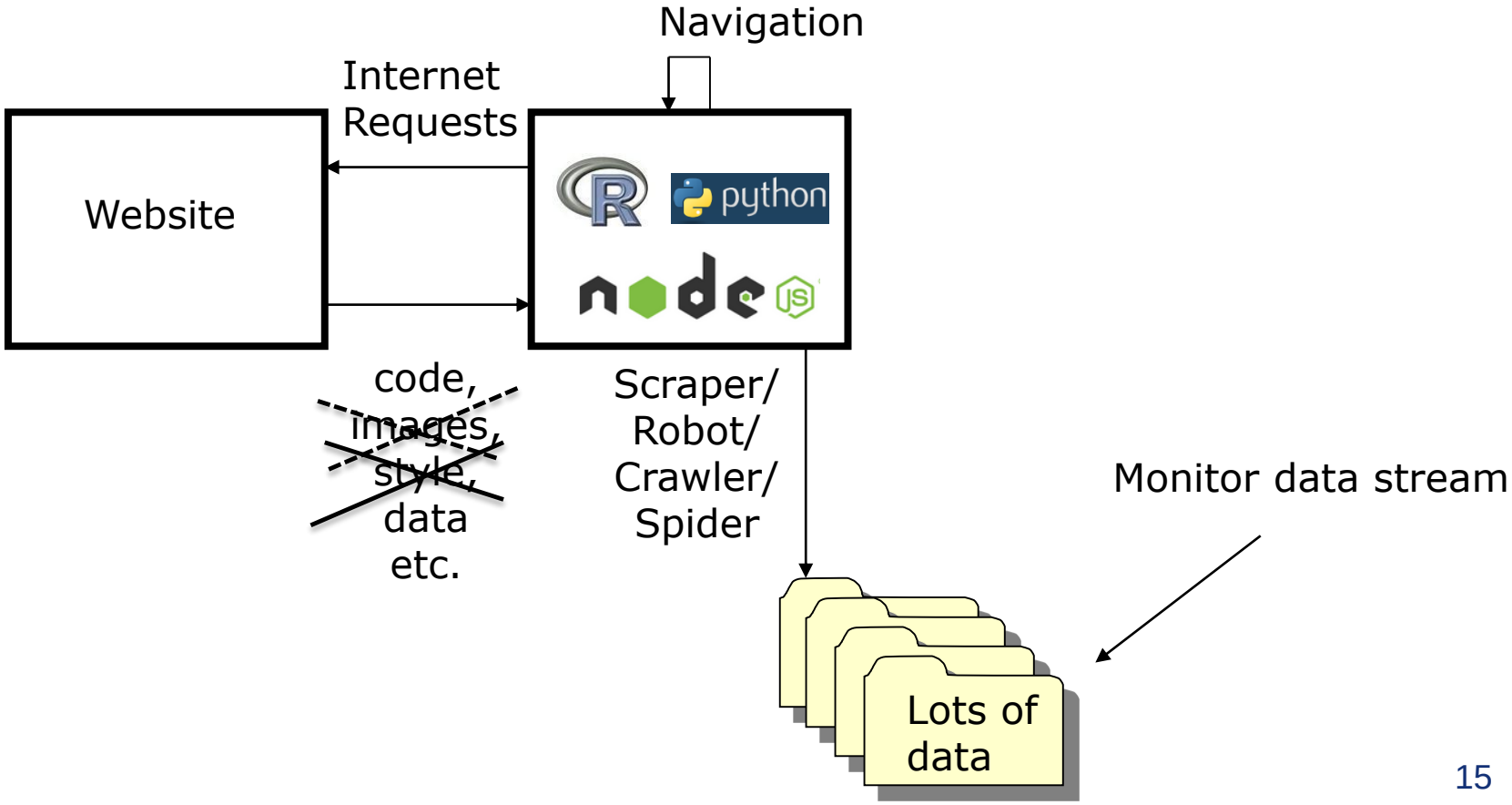


How it works (2)



How it works (3)

Demo of website communication



Challenges in web scraping (1)

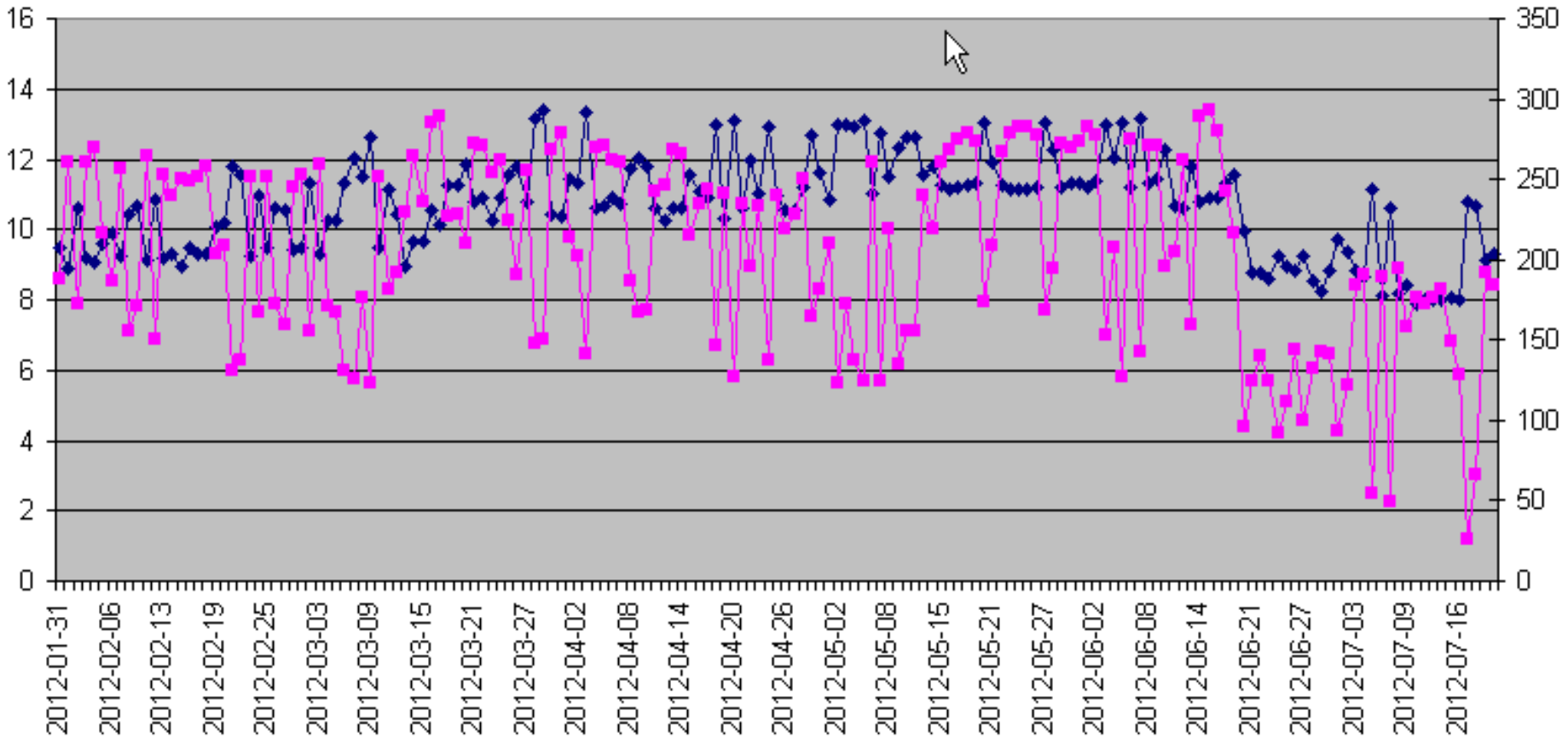
- Which data?
  - It is not always easy to know **which site** to scrape
  - It starts with detecting the most **up-to-date** and **complete** sources
  - The internet is full of **copies** of data
  - Which data is **relevant**, **reliable**?
  - Sometimes choose between scraping the **data owner** or an **aggregator** site
  - Can we get the data from the data owner **directly**, without scraping?
  - Advice: explore the data **flows among sites**

Challenges in web scraping (2)

- The internet is dynamic
  - Each web site has a particular **structure**, which may change frequently
  - The **technology** used on websites changes continuously (example: infinite scroll)
  - We can**not** scrape **yesterday's data**
  - Advise: try to build scrapers as **robust** as possible
- Data is volatile
  - Be aware of **changing data patterns** over time
  - Advise: **monitor** data frequently

Example of volatile data

Number of products per product category (right axis, red line) and the average price based on these products (left axis, blue line)



Challenges in web scraping (3)

- **Legal** issues and **relationship** web site owners
- When using internet data in production, how to organise your scraping **process**?
- Advice: **Manage** the collection process and transform collected data into a **standardized format** with **standardized meta data**.

Legal (1)

- Legislation for scraping may be **country specific**
  - Below is inspired by the Dutch situation
- From National Statistics Law:
  - Enterprises have to provide data to the NSI **on request**.
  - Scraping may **reduce** response burden
- Database legislation:
  - **Commercial re-use** of scraped intellectual property from internet sources is **forbidden**
  - NSI's usually use data **for official statistics** only

Legal (2)

- Privacy:
  - We **only** scrape **public sources** and process data within NSI's safe environment
- Netiquette (practical):
  - **identify** yourself (user-agent) www.whoishostingthis.com/tools/user-agent/
  - do **not overload** servers, use some idle time between requests, run crawlers at night / morning
  - respect the Robots Exclusion Protocol also known as the robots.txt
  - DEMO: www.cbs.nl/robots.txt
  - **Inform** website owners if feasible

Legal (3)

U.S. judge says LinkedIn cannot block startup from public profile data

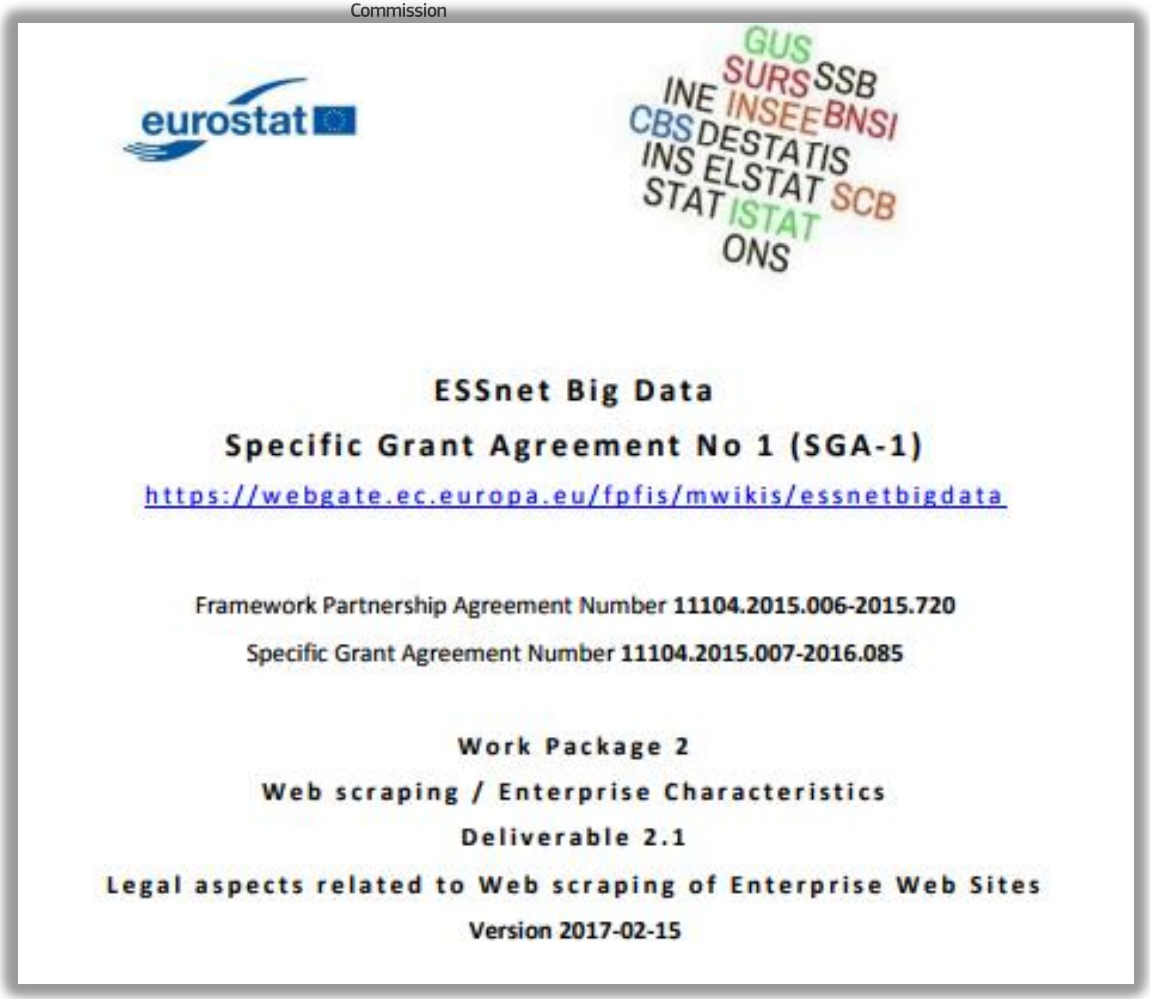
Salvador Rodriguez 3 MIN READ

LinkedIn can't block scrapers from monitoring user activity

August 14th 2017:

- The world is still struggling with legal aspects on scraping
- Who owns public community data? The community (LinkIn users) or the community provider (MS)?
- Keep an eye on what is happening for an official statistics interpretation

Legal (4)



eurostat

GUS SURS SSB INE INSEE BNSI CBS DESTATIS INS ELSTAT SCB STAT ISTAT ONS

ESSnet Big Data

Specific Grant Agreement No 1 (SGA-1)

https://webgate.ec.europa.eu/fpfis/mwikis/essnetbigdata

Framework Partnership Agreement Number **11104.2015.006-2015.720**

Specific Grant Agreement Number **11104.2015.007-2016.085**

Work Package 2

Web scraping / Enterprise Characteristics

Deliverable 2.1

Legal aspects related to Web scraping of Enterprise Web Sites

Version 2017-02-15

https://webgate.ec.europa.eu/fpfis/mwikis/essnetbigdata/images/a/a0/WP2_Deliverable_2_1_15_02_2017.pdf

Wrap up

- We have explained the **basics** of web scraping, retrieving information from the internet
- Web scraping has many different **flavours**, we have seen a few
- Web scraping is **useful** for official statistics in different ways, not only as primary source
- There are still **challenges** in scraping, data processing and also **legal** issues

Thanks!

Any comment or question?

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