# Web Information Extraction for eEnvironment

## We need help from domain experts!

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# Outline

- Introduction – signal data versus human produced data
  - Information processing top down versus bottom up
  - Web and the environment, Web Information Extraction
- Our extraction framework
  - Web → Text → Linguistics → Structured Data
  - Extraction rules – Linguistic tree patterns
- Learning of our tool
  - **Human** learning and **Machine** learning
- Examples of extracted data
- Conclusion
  - We are interested in cooperation!

# The Environment and Information on the Web

sensors/monitoring versus human created information

top down (egov) versus bottom up processing

World

Real existence of

Dangers to the Environment

Partially Reflected on the Web

WWW

Extraction

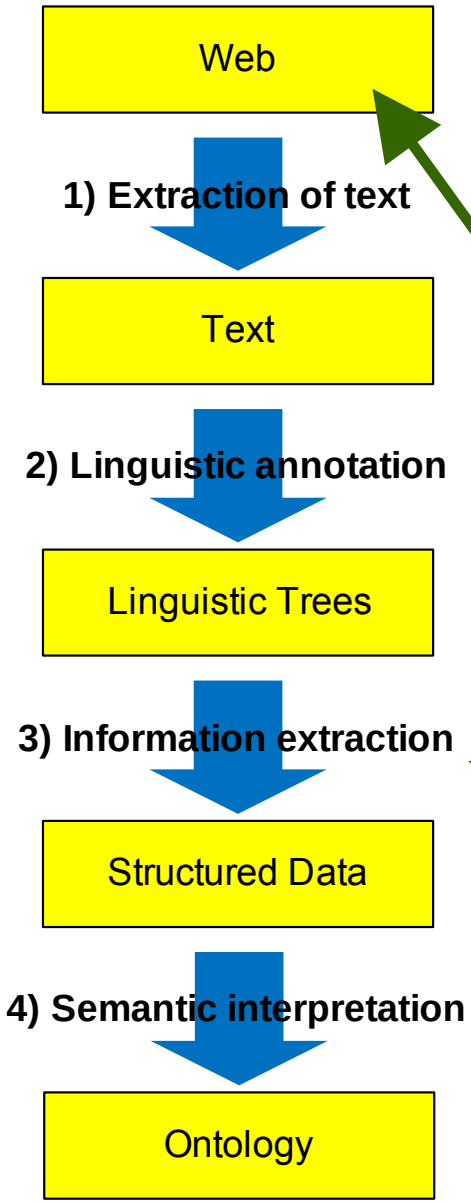
Web Information Extraction Tool

Partial Evidence of Dangers

# Our Web Information Extraction Framework

- Motivated by the Semantic Web
  - Transformation of **human** understandable resources to **machine** understandable ones
- Information extraction form **texts** (from the Web)
  - Supported by **linguistic tools** (PDT, Netgraph, …)
- Machine learning of the extraction procedure
  - Human annotated **training set** needed
- Structured (and semantic) **extraction output**
  - Structured output: XML or Ontology data structure
  - Automatically annotated web pages

# The Data Flow




Domain expert has to:

- Select relevant pages
- **Support learning procedure**

**Learning procedure produces rules for**

- Data extraction
- Data interpretation

# Example of processed web page


Relevant text

Information relevant to the environment

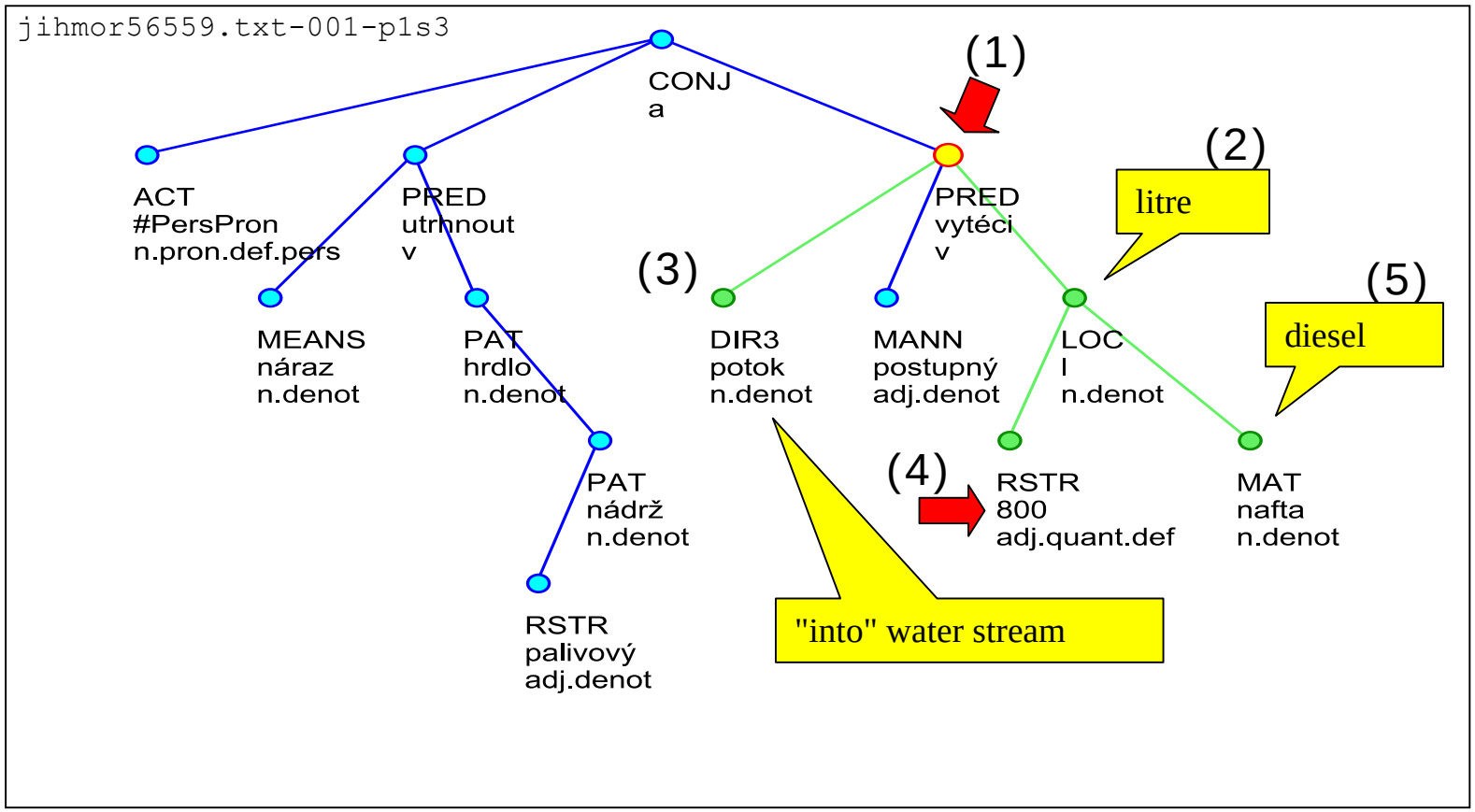
„Únik provozních kapalin nebyl zjištěn.“

“Outflow of Sealing liquid was not found out.”

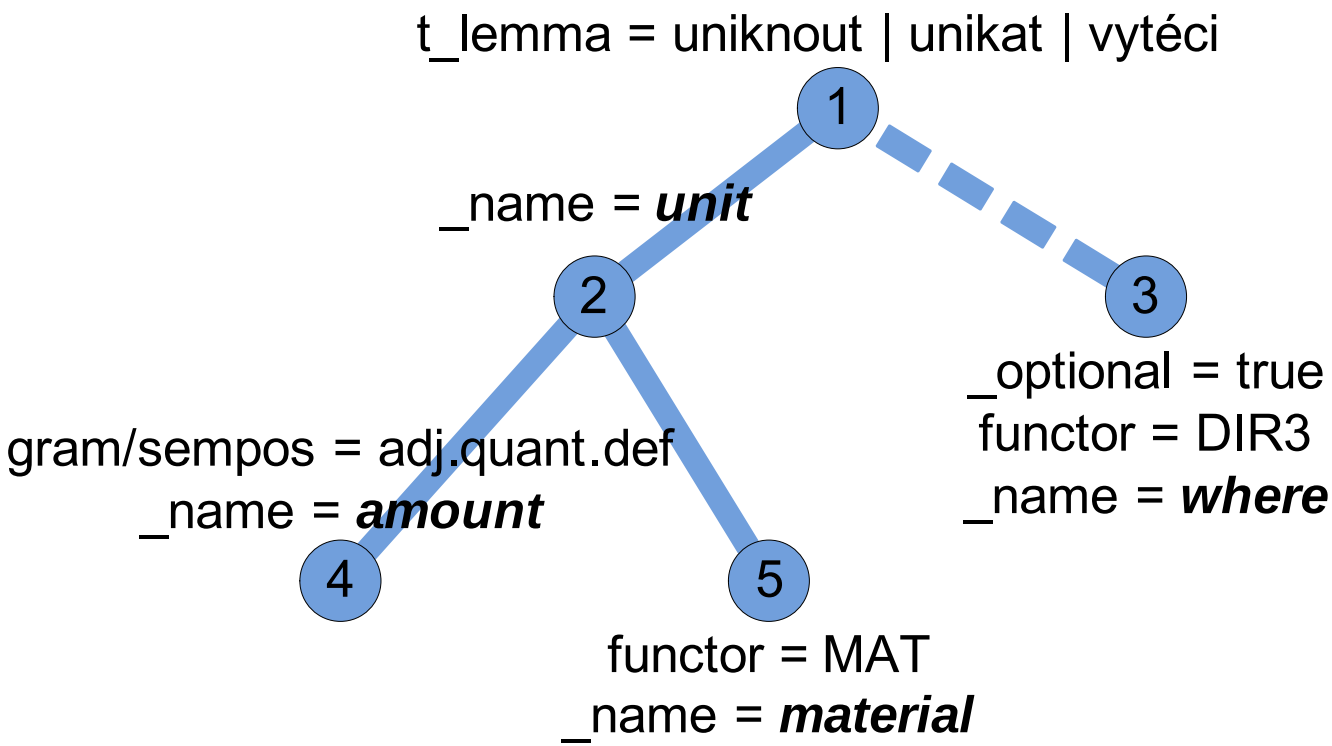
# Example of a linguistic tree

*"Due to the clash the throat of fuel tank tore off and 800 litres of oil (diesel) has run out to a stream."*

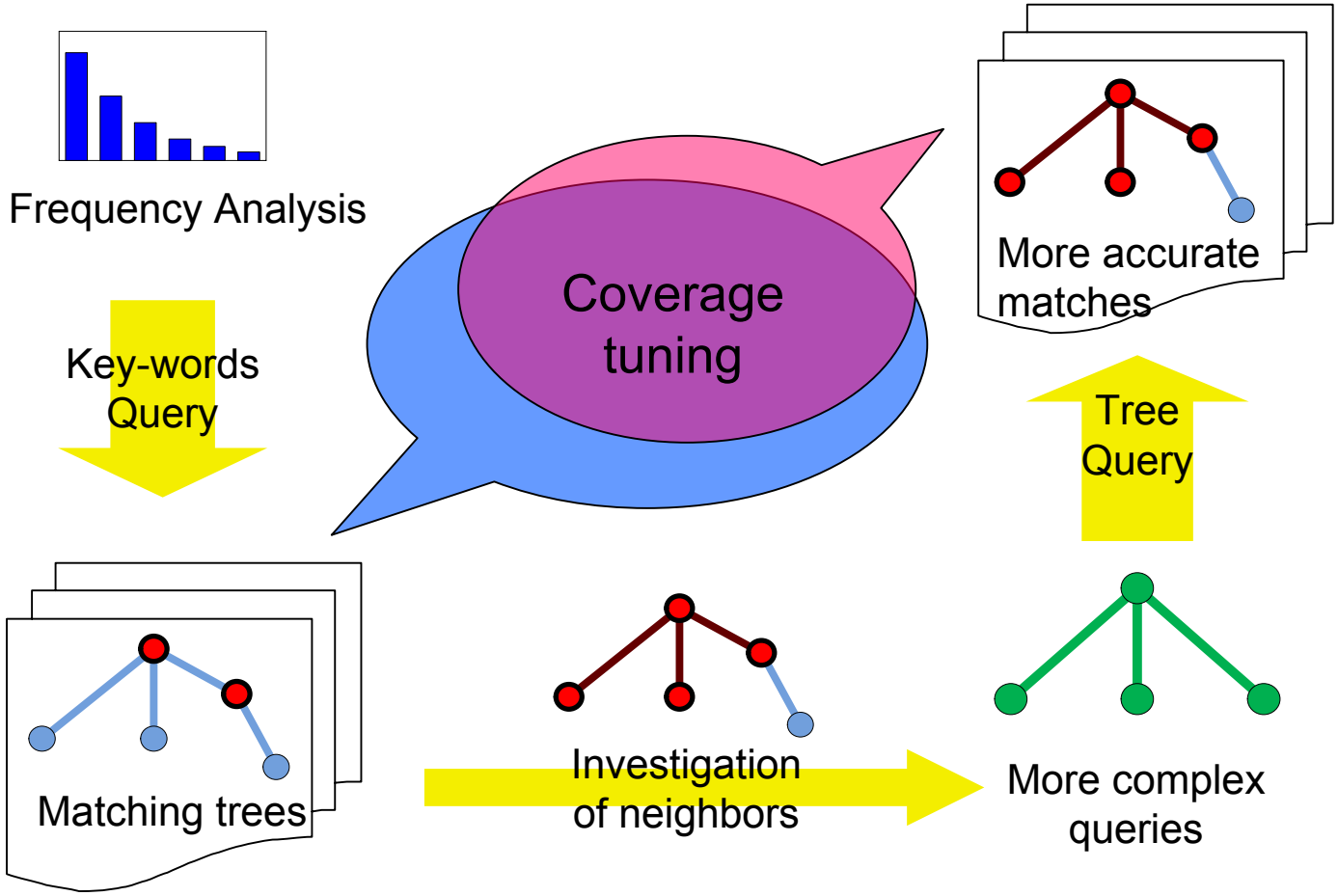
*"Nárazem se utrhl hrdlo palivové nádrže a do potoka postupně vyteklo na 800 litrů nafty."*



# Example of an extraction rule.

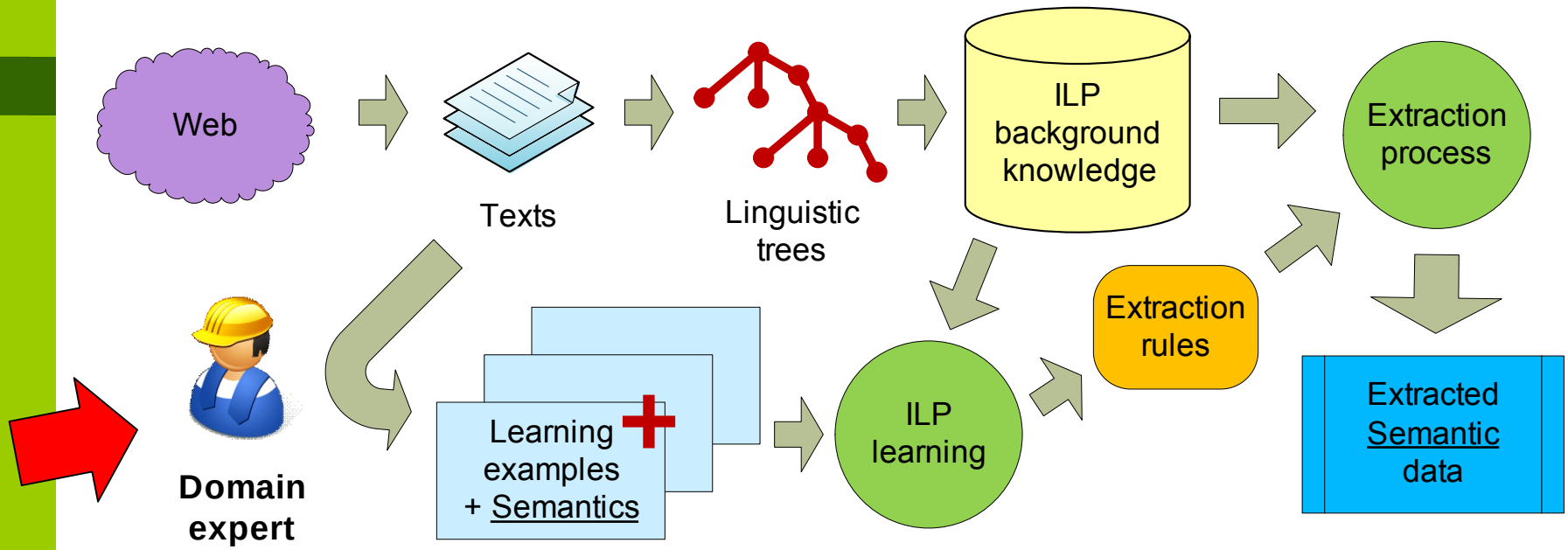


# Manual learning of extraction rules




- Needs **expert** in both: in the **domain** and in **linguistics**

# Machine learning of extraction rules




- Use of **Inductive Logic Programming**
- Learning examples
  - Marked directly in the text
  - Done by **domain expert**, no linguistic knowledge needed

# Experimental results (1)

```
<QueryMatches>
  <Match root_id="jihmor56559.txt-001-p1s3" match_string="15:0,16:4,22:1,23:2,27:3">
    <Sentence>Nárazem se utrhl hrdlo palivové nádrže a do potoka postupně vyteklo na
800 litrů nafty.</Sentence>
    <Data>
      <Value variable_name="amount" attribute_name="t_lemma">800</Value>
      <Value variable_name="unit" attribute_name="t_lemma">l</Value>
      <Value variable_name="material" attribute_name="t_lemma">nafta</Value>
      <Value variable_name="where" attribute_name="t_lemma">potok</Value>
    </Data>
  </Match>
  <Match root_id="jihmor68220.txt-001-p1s3" match_string="3:0,12:4,21:1,22:2,27:3">
    <Sentence>Z palivové nádrže vozidla uniklo do půdy v příkopu vedle silnice zhruba
350 litrů nafty, a proto byli o události informováni také pracovníci odboru životního
prostředí Městského úřadu ve Vyškově a České inspekce životního prostředí.</Sentence>
    <Data>
      <Value variable_name="amount" attribute_name="t_lemma">350</Value>
      <Value variable_name="unit" attribute_name="t_lemma">l</Value>
      <Value variable_name="material" attribute_name="t_lemma">nafta</Value>
      <Value variable_name="where" attribute_name="t_lemma">půda</Value>
    </Data>
  </Match>
...
```

litre

water stream

diesel

soil

# Experimental results (2)

```
...
<Match root_id="kralovehrad54765.txt-001-p6s5" match_string="1:0,7:1,8:2,13:3">
    <Sentence>Z kamionu uniklo zhruba 20 litrů látky.</Sentence>
    <Data>
      <Value variable_name="amount" attribute_name="t_lemma">20</Value>
      <Value variable_name="unit" attribute_name="t_lemma">l</Value>
      <Value variable_name="material" attribute_name="t_lemma">látka</Value>
    </Data>
  </Match>
  <Match root_id="moravslez50487.txt-001-p4s1" match_string="43:0,49:1,50:2,55:3">
    <Sentence>Hasiči po likvidaci požáru trávy asi na 25 metrech čtverečních ještě
uklízeli společně s pracovníky Správy silnic Moravskoslezského kraje zhruba 15 metrů
silnice, na kterou vyteklo asi 40 litrů hydraulického oleje.</Sentence>
    <Data>
      <Value variable_name="amount" attribute_name="t_lemma">40</Value>
      <Value variable_name="unit" attribute_name="t_lemma">l</Value>
      <Value variable_name="material" attribute_name="t_lemma">olej</Value>
    </Data>
  </Match>
</QueryMatches>
```

other material

gear oil

# What is interesting on the Web?

- For **environment specialists**?
- What information from the Web can help with the **evidence**, **inspection** and **care** for the environment?
- Perhaps our method can provide it!
- We are interested in **cooperation**!

# Concluding Appeal

- We need your help!
- Please **send us examples** of resources, content interesting for environmentalists!

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Thank you!