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SnoLyze – a SNOMED CT Expression Constraint Language Execution Engine in R

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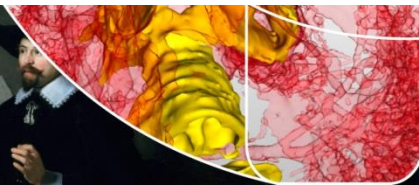


Background

- Question at April 2016 IHTSDO Business meeting: “How to analyse SNOMED-encoded data?”



**ELEMENTARY,
MY
DEAR
WATSON**



London, we have a problem



ANALYTICS

SNOMED CT

The global language of healthcare

London, we have a problem



Theory

Practice

Aim

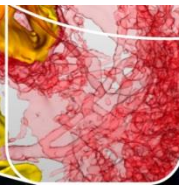
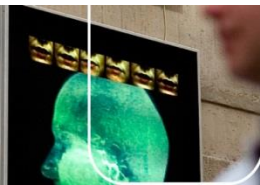
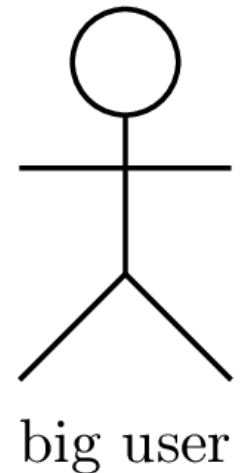
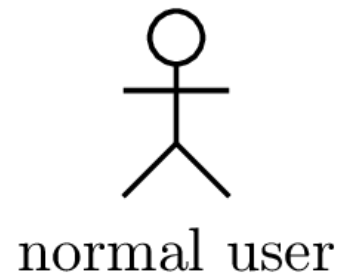


- Enable analysis of data that is encoded using SNOMED CT
- Integration with common analytics tooling
- Proof-of-concept with potential



Use Case

- Analysts / statisticians should be able to perform at least basic functions
 - All descendants of concept X
 - All concepts with attribute Y





Approach

- Develop a module for R
- What is R?
 - R is a **free** software environment for **statistical computing** and graphics
 - On UNIX platforms, Windows and MacOS
 - GNU (GPL) version 2



These 'R' the looks...

The image displays the RStudio integrated development environment (IDE) interface. The main window is titled "Untitled1*" and contains the following R code:

```
1 t <- 3+2
2 t
```

The console at the bottom left shows the execution of the code:

```
> t <- 3+2
> t
[1] 5
>
```

The Environment pane on the right shows the "Global Environment" with the variable "t" having the value 5.

The Package Manager pane at the bottom right shows a list of installed and available packages:

Name	Description	Version
<input checked="" type="checkbox"/> bit64	A S3 Class for Vectors of 64bit Integers	0.9-7
<input checked="" type="checkbox"/> bitops	Bitwise Operations	1.0-6
<input type="checkbox"/> boot	Bootstrap Functions (Originally by Angelo Canty for S)	1.3-20
<input type="checkbox"/> caTools	Tools: moving window statistics, GIF, Base64, ROC AUC, etc.	1.17.1
<input checked="" type="checkbox"/> CheckDigit	Calculate and verify check digits	0.1-1
<input type="checkbox"/> class	Functions for Classification	7.3-14
<input type="checkbox"/> cluster	"Finding Groups in Data": Cluster	2.0.6

Implementation – language

- Expression Constraint Language v1.2
 - Official SNOMED International specification
 - enables queries over SNOMED CT content to be expressed
 - could be embedded within record-based query languages (such as SQL) to represent the terminological aspects of these queries

[\[Expression Constraint Language - Specification and Guide\]](#)



Expression Constraint Language Examples

< descendantOf

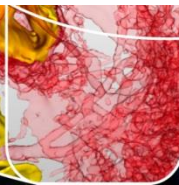
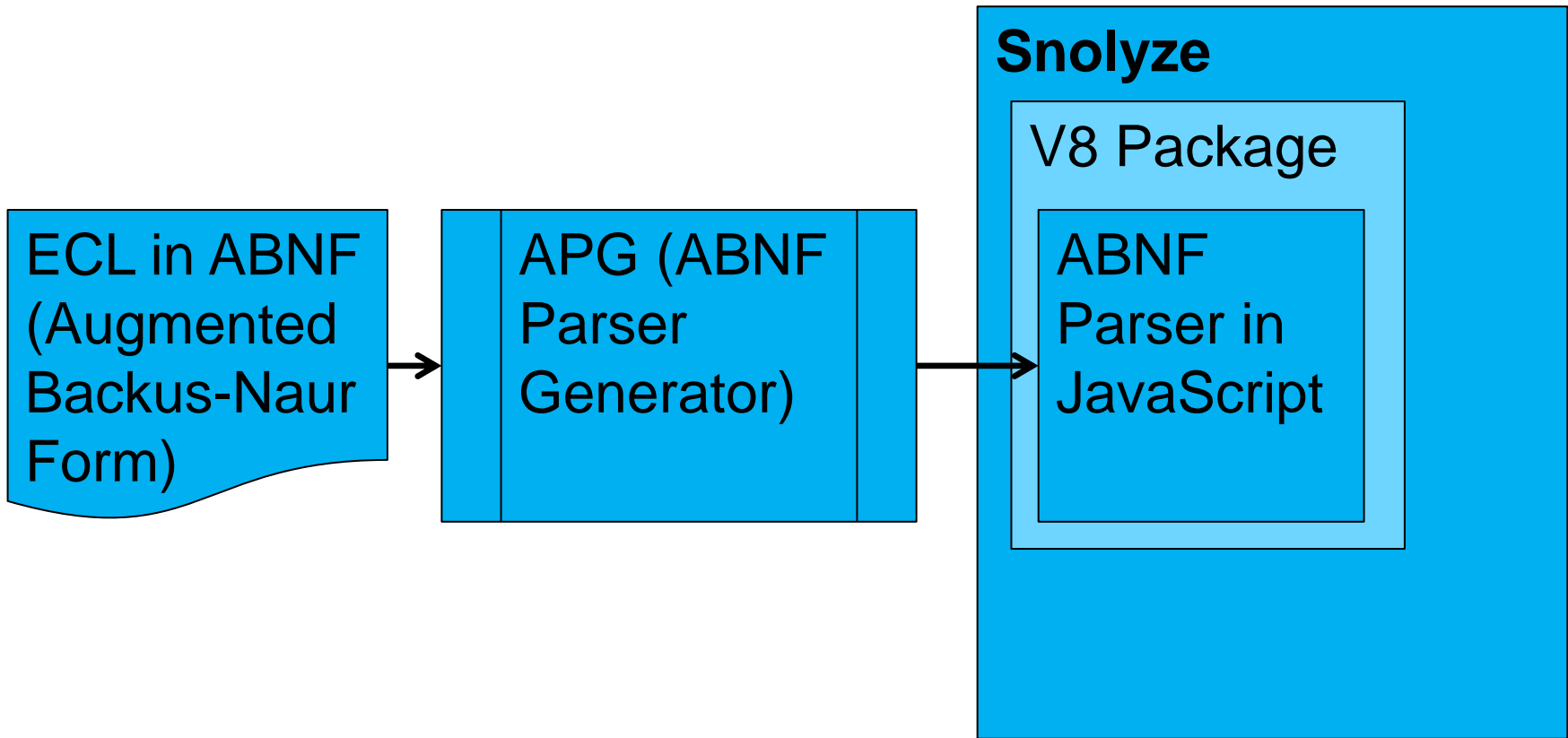
<< descendantOrSelfOf

<! childOf

- descendantOf 19829001 |Disorder of lung| :
116676008 |Associated morphology| =
descendantOrSelfOf 79654002 |Edema|
- << 19829001 |Disorder of lung| MINUS
<< 301867009 |Edema of trunk|



Implementation – technical



Implementation – functions

- `launch(relationship_snapshot, [trans_closure])`
 - Initialize SnoLyze
- `getTransitiveClosure()`
 - Calculate TC for the snapshot
- `execute(query)`
 - Run an ECL query, returns a vector of SNOMED IDs



Demo



Conclusion

- SnoLyze performs well for research practice
 - Generally within 0.05 s, up to 0.2 s
- Easy integration for performing queries on data encoded using SNOMED CT



The next challenge...

A silhouette of Sherlock Holmes, wearing his iconic deerstalker hat and smoking a pipe, is shown in profile against a dramatic sunset sky with orange and blue hues. The text is overlaid on the right side of the image.

“Data! Data! Data!”

he cried impatiently.

“I can’t make bricks
without clay!”

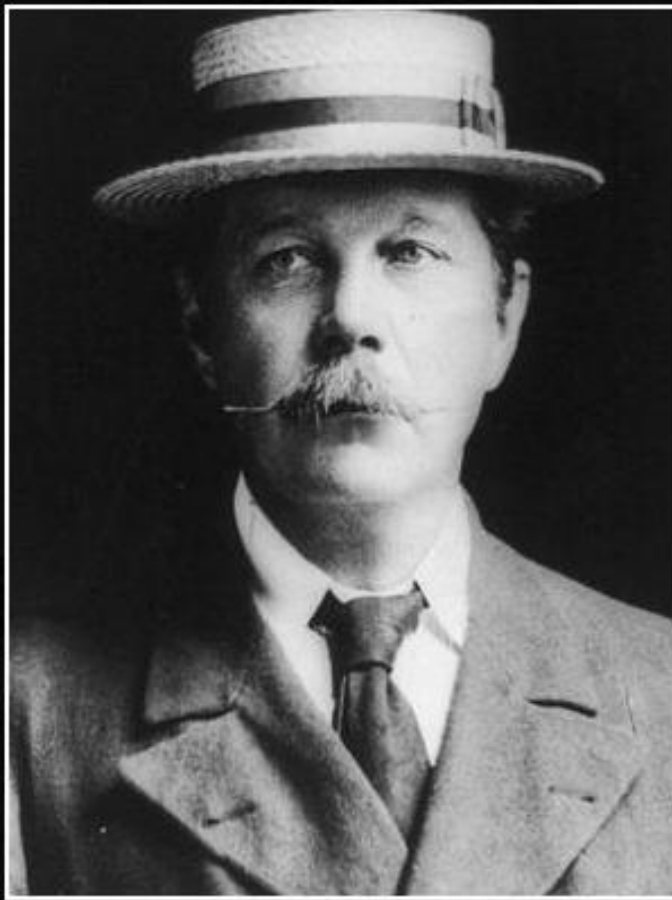
Sherlock Holmes, The Adventure in the Copper Beches

Acknowledgments

- Janice Watson, raising the question
- Sander Laverman, for closing the theory-practice bridge



Now it's your turn!



What one man can invent, another
can discover.

— *Arthur Conan Doyle* —

<https://github.com/slaverman/SnoLyze>

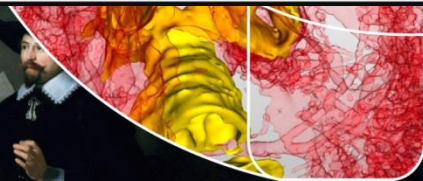
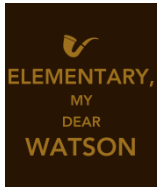


Image Credits



- <https://userscontent2.emaze.com/images/e6ba5ed2-f324-4d07-bfe2-e34f70f287f4/f39390d5e1a53d73bffbff4db4d5c07c.png>



- <http://vizts.com/london-bridge/>



- <http://www.360logica.com/blog/peek-proof-concept-poc/>



- <https://perso.ensta-paristech.fr/~kielbasi/tikzum/var/files/html/web-tikz-uml-userguidech3.html>



- <https://es.slideshare.net/manolofrias/introducing-a/2>



- <http://www.azquotes.com/picture-quotes/quote-what-one-man-can-invent-another-can-discover-arthur-conan-doyle-37-42-35.jpg>

