C²METADATA
Continuous Capture of Metadata

Design Motivation and Impact on the Database Community

Jie Song
Computer Science Engineering
University of Michigan

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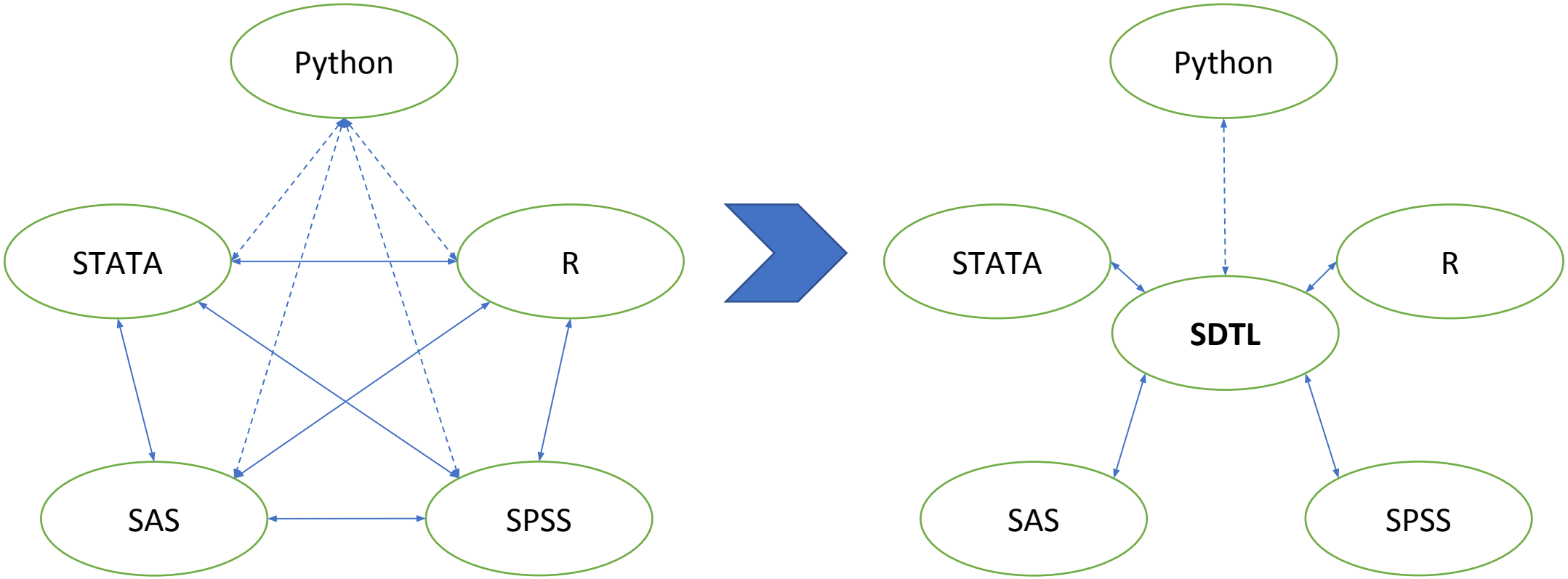
From Language Conversion To Data Transformation Conversion

- Inter-conversion between each of the languages are expensive, O(n^2)
- Bridge by an intermediate language, O(n)



From Language Conversion To Data Transformation Conversion

- Traditional general programming language conversion
  - A simple syntax replacing system
  - More recent works begin to consider different levels of conversion
    - E.g., convert code of a procedural language into a purely object oriented language
- Statistical programming languages
  - Simpler programming languages that are mostly procedural
  - R, Python are more general purpose while SPSS, STATA and SAS are limited
  - Focus on data transformation and analysis

From Language Conversion To Data Transformation Conversion

D1

V1	V2
2	3
1	4

V3=V2+1

D2

V1	V2	V3
2	3	4
1	4	5

Sort by V1

D3

V1	V2	V3
1	4	5
2	3	4

Rename V1 as Index

D4

Index	V2	V3
1	4	5
2	3	4

V4=Count(V1) groupby V1

D5

V1	V4
1	1
2	1

R: D1$V3=D1$V2+1 **Or**

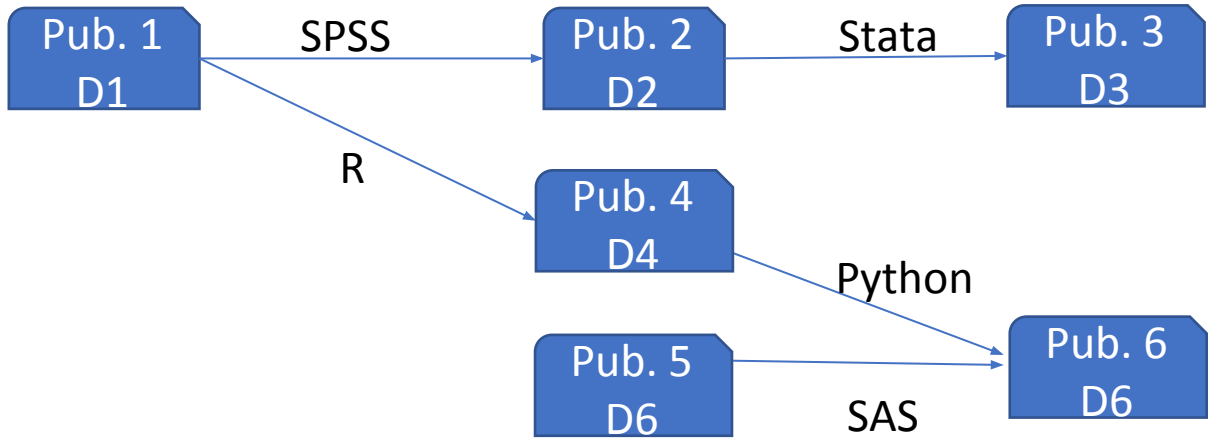
```
for (i in 1:nrow(D1))
  D1$V3[i] = D1$V2[i]+1
```

Stata: generate V3=V2+1

- Data transformation as a directed acyclic graph
  - Data as the node and transformation as the edge
- Semantic level conversion
  - Regardless of the underlying syntax used by hiding implementation details
  - From higher level, e.g. data set level, to lower level, e.g., column/row level, metadata level
- Graphical Visualization for better understanding
  - Intermediate result when processed with the raw data
  - Data lineage or provenance
  - Code association with transformations

The Future of C^2Metadata

- A systematic guideline for building converter that maps from a new statistical language to SDTL
  - Phrase-based statistical translation
- Promote research in
  - Data services, e.g. data sharing and data publication linage construction
  - Transformation code transfer and reuse
  - Data preparation such as
    - data exploration
    - data quality evaluation
    - data integration



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