Data Science

Collection, Cleaning, and Analysis

Example of Ideal Data (for analysis)

Manufacturer	Name	CPU Frequency	L1 Cache Size	Volatile Memory Size
HP	Pavillion	3.2 GHz	512 KB	4 GB
Acer	Aspire	3.5 GHz	512 KB	4 GB
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- Uniformity (categories are all unique, consistent units, etc.)
- Lots (at least 100’s) of examples (rows) and lots of information (cols)

Standard Data Pipeline

Collection

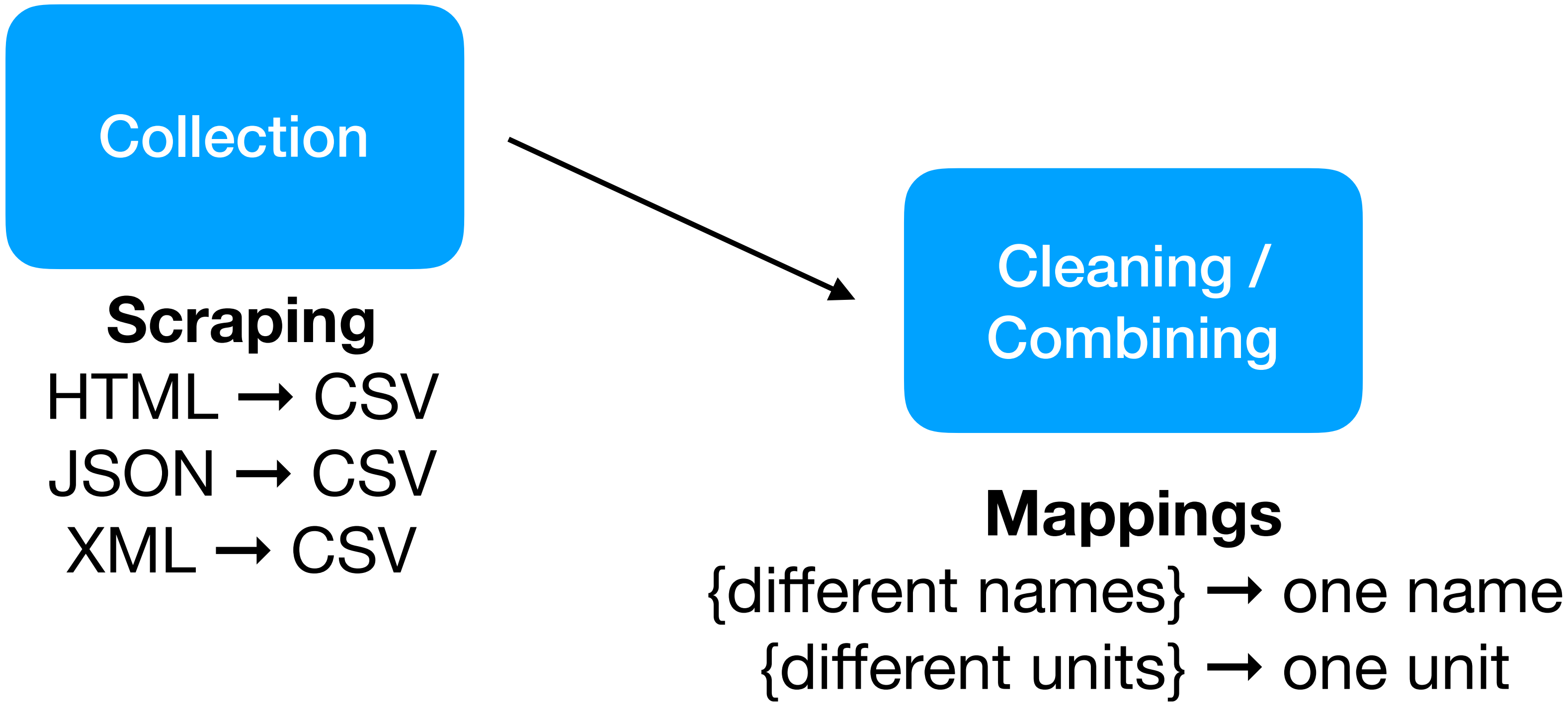
Scraping

HTML → CSV

JSON → CSV

XML → CSV

Standard Data Pipeline



Collection

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JSON ➞ CSV
XML ➞ CSV

Cleaning / Combining

Mappings
{different names} ➞ one name
{different units} ➞ one unit

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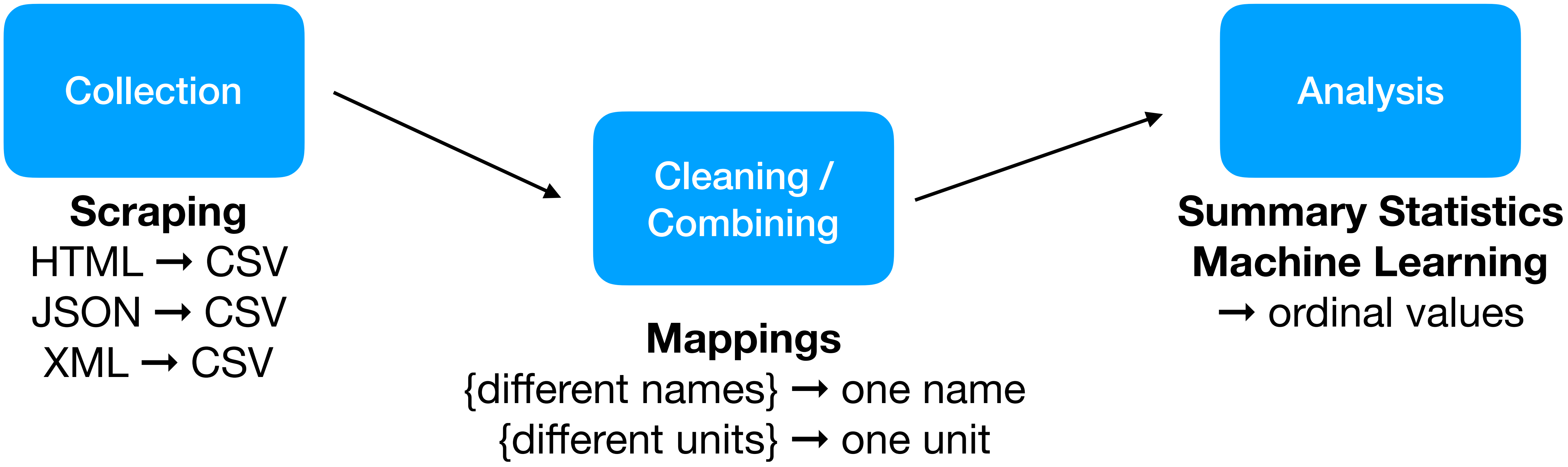

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Summary Statistics
Machine Learning
→ ordinal values

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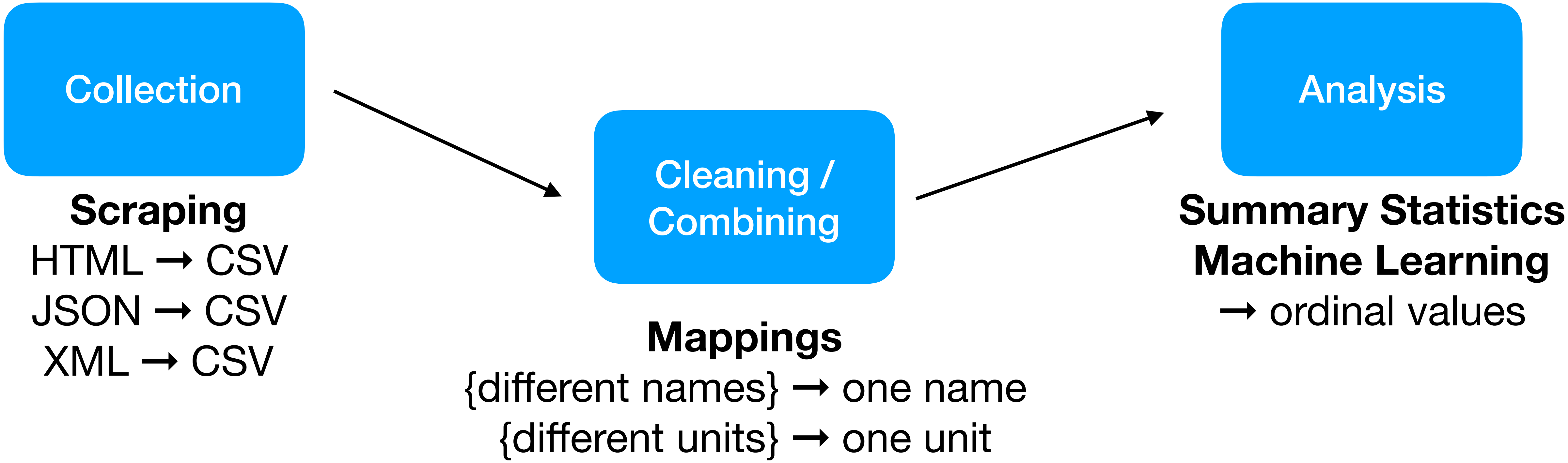

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Three important data collection and cleaning questions:

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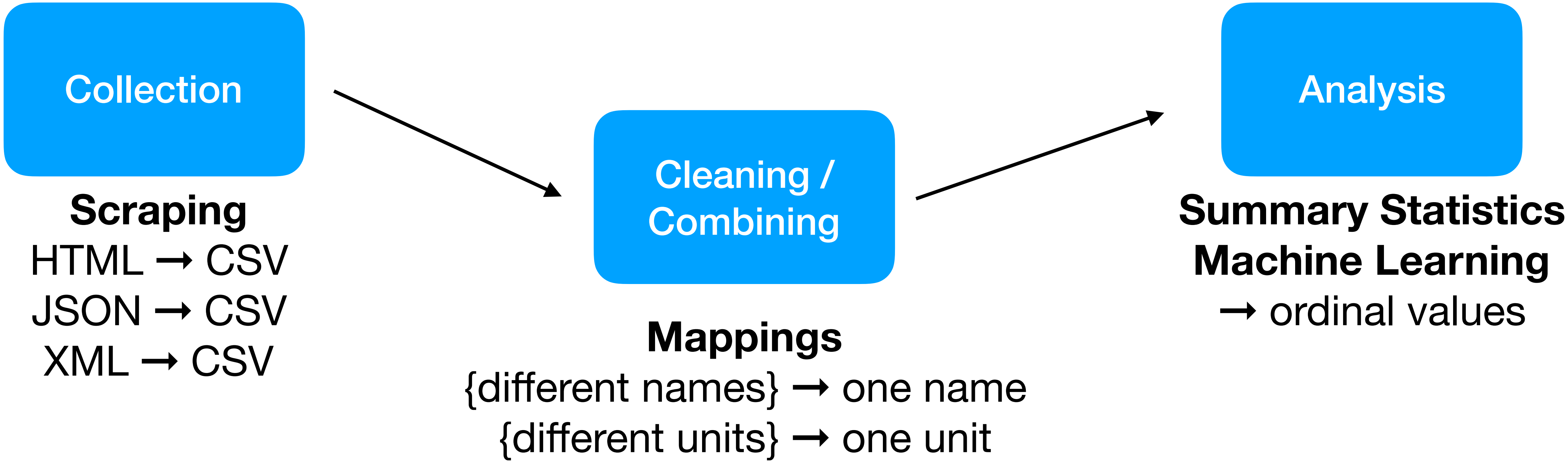

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– What are the sources that you got data from?

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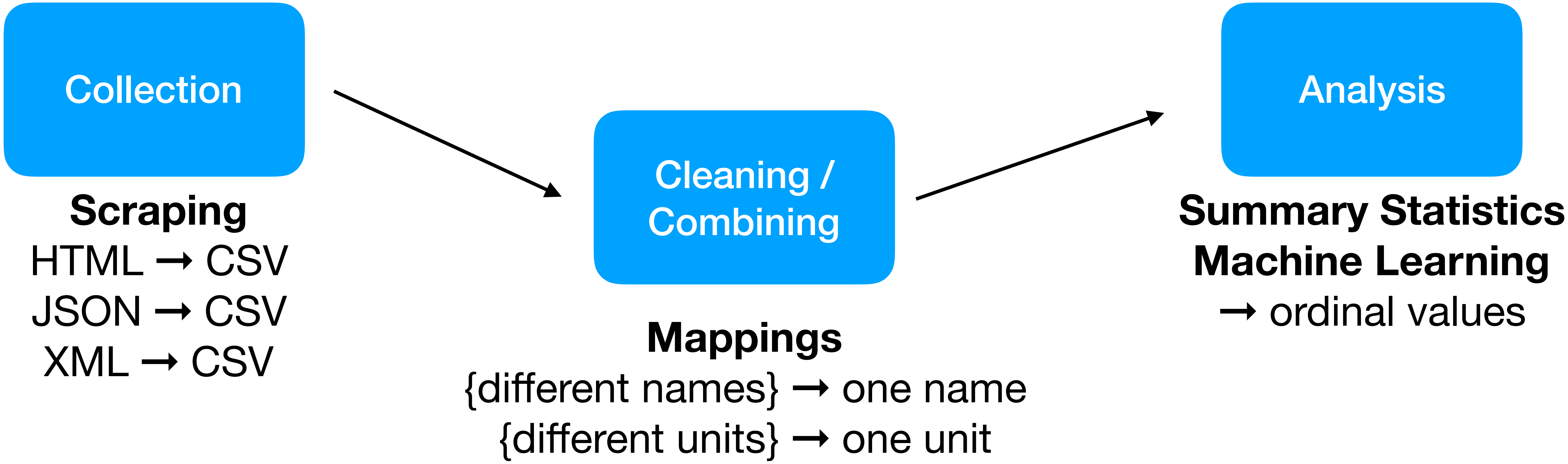

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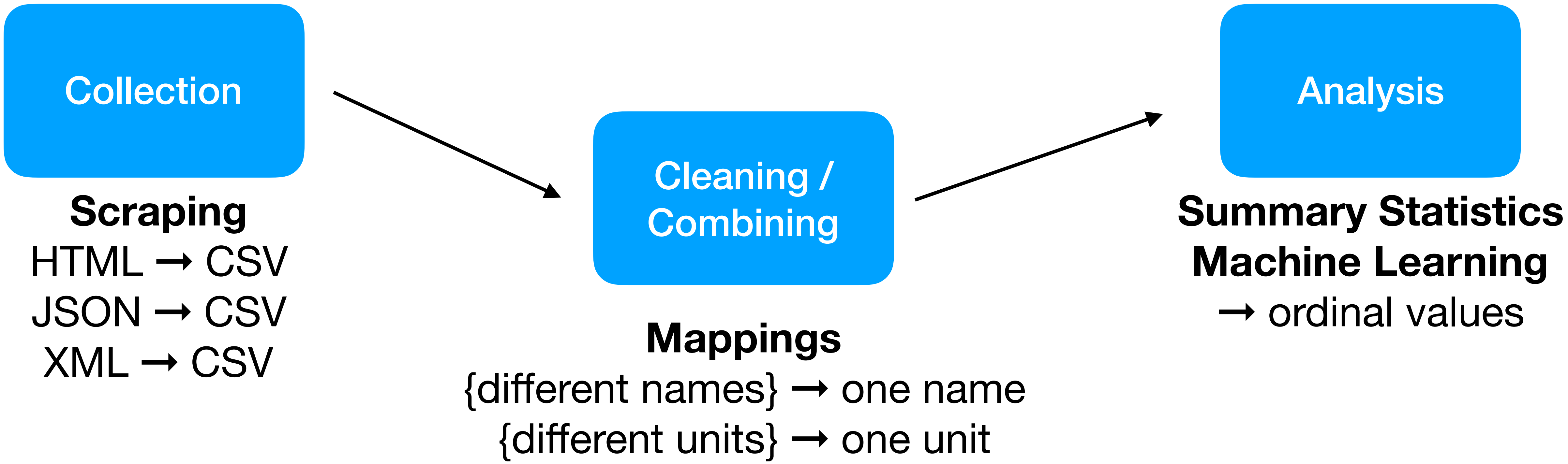

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Three important data collection and cleaning questions:

- What are the sources that you got data from?
- What data did you get from each of the sources?
- How did you merge that data (name cleaning, etc.)

Structure of Analysis Concepts

Why clean?

Data

Structure of Analysis Concepts

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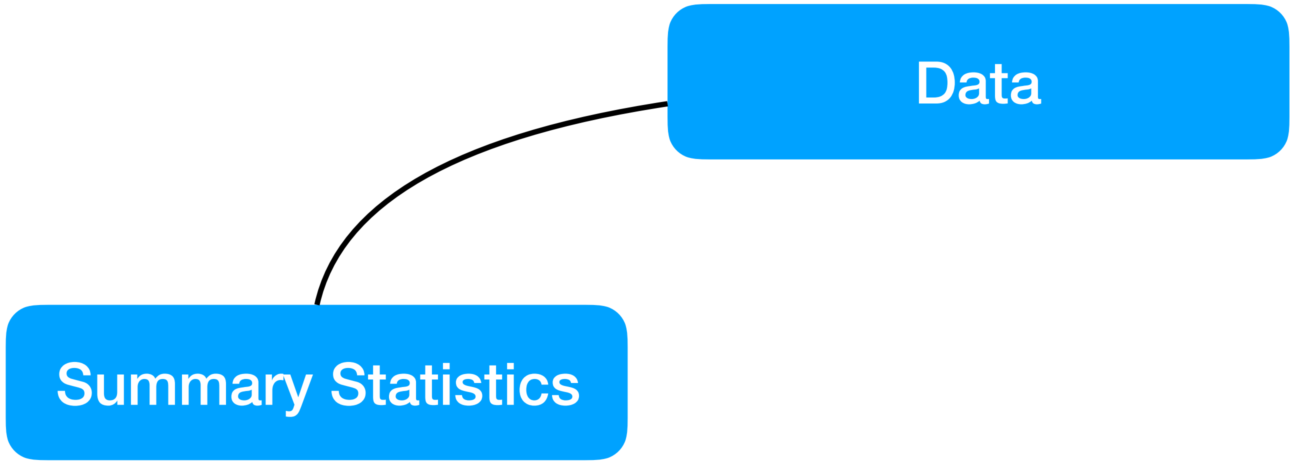

Data

Summary Statistics

Structure of Analysis Concepts

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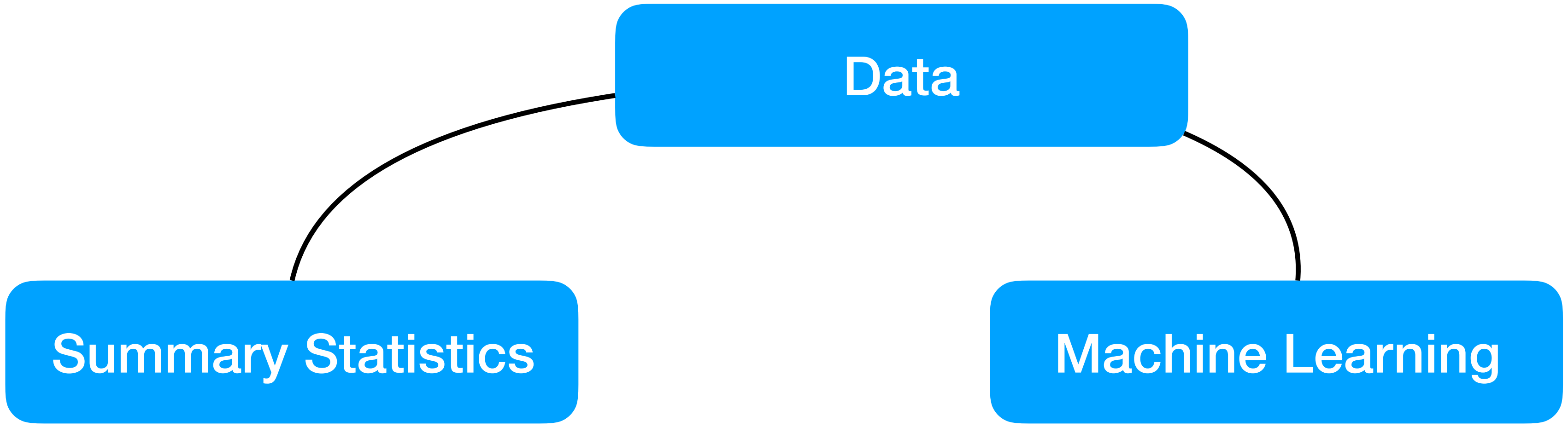

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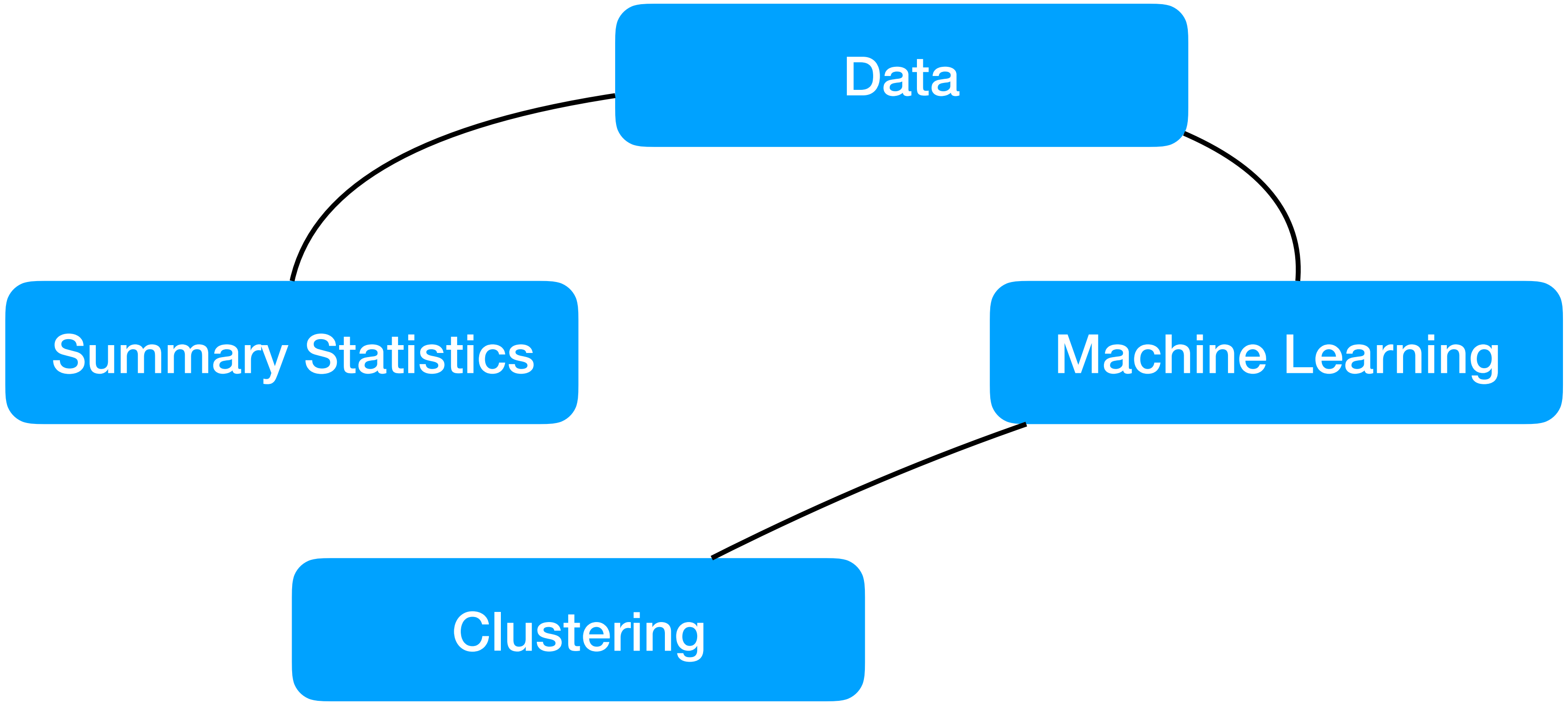

Data

Summary Statistics

Machine Learning

Clustering

Structure of Analysis Concepts

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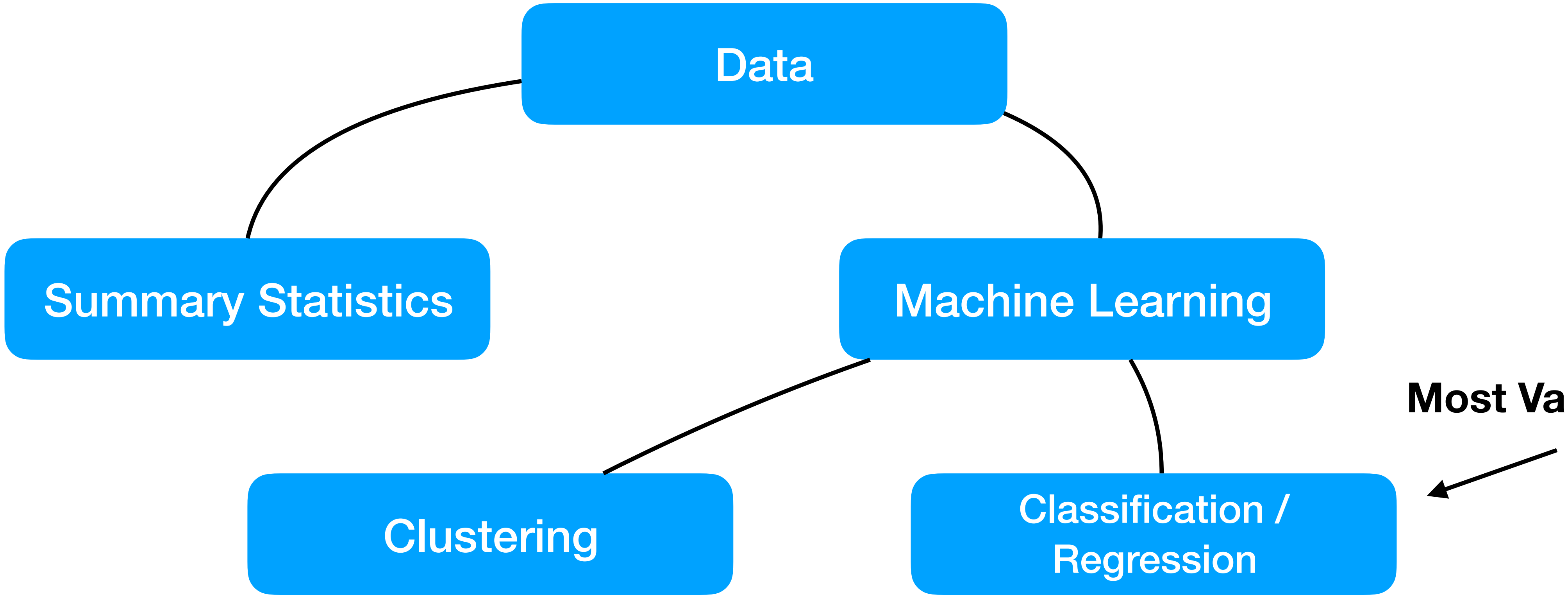

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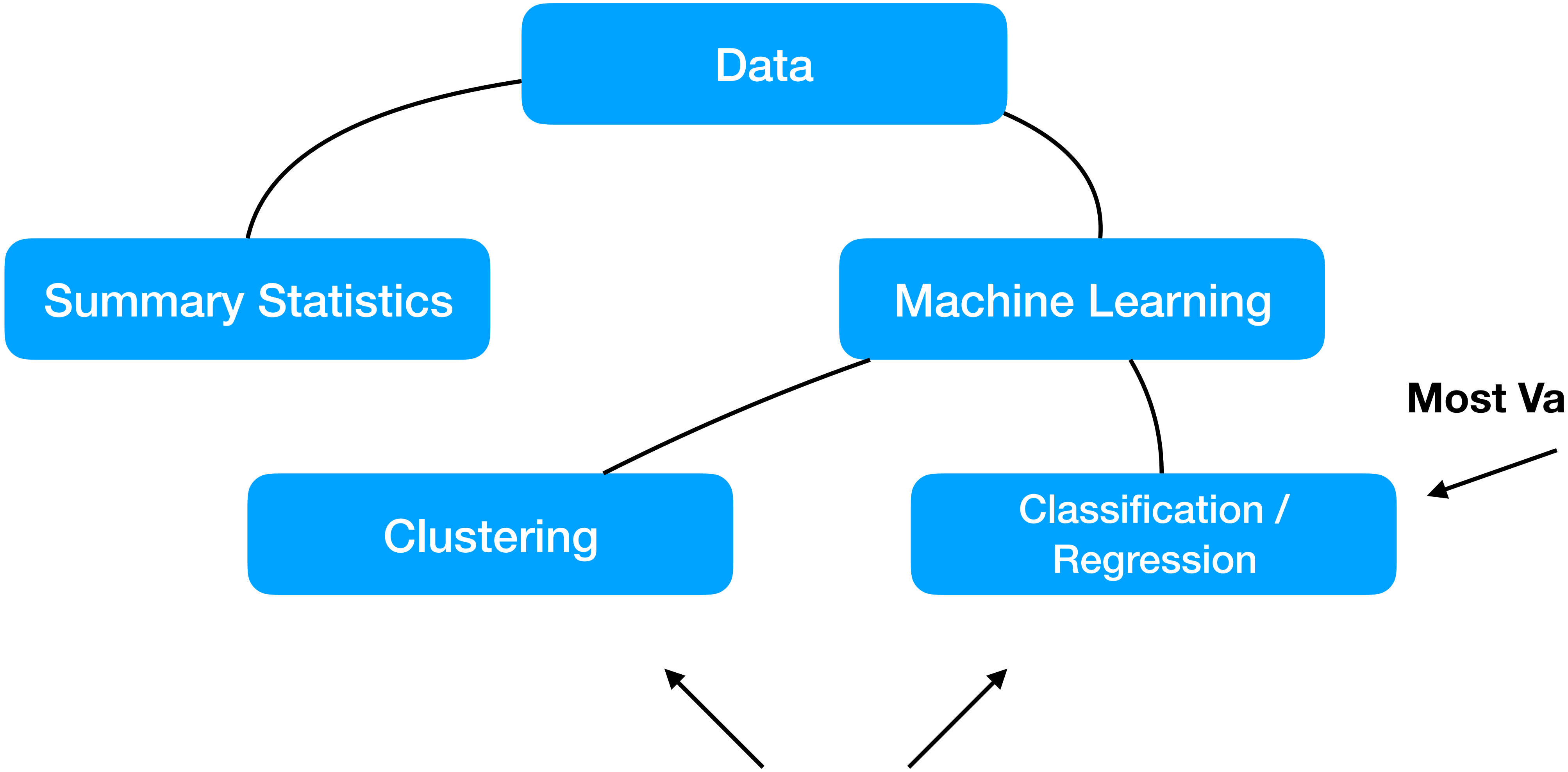

Data

Summary Statistics

Machine Learning

Clustering

Classification / Regression

Most VarSys work

(Usually) require real valued vectors!

VarSys Goals

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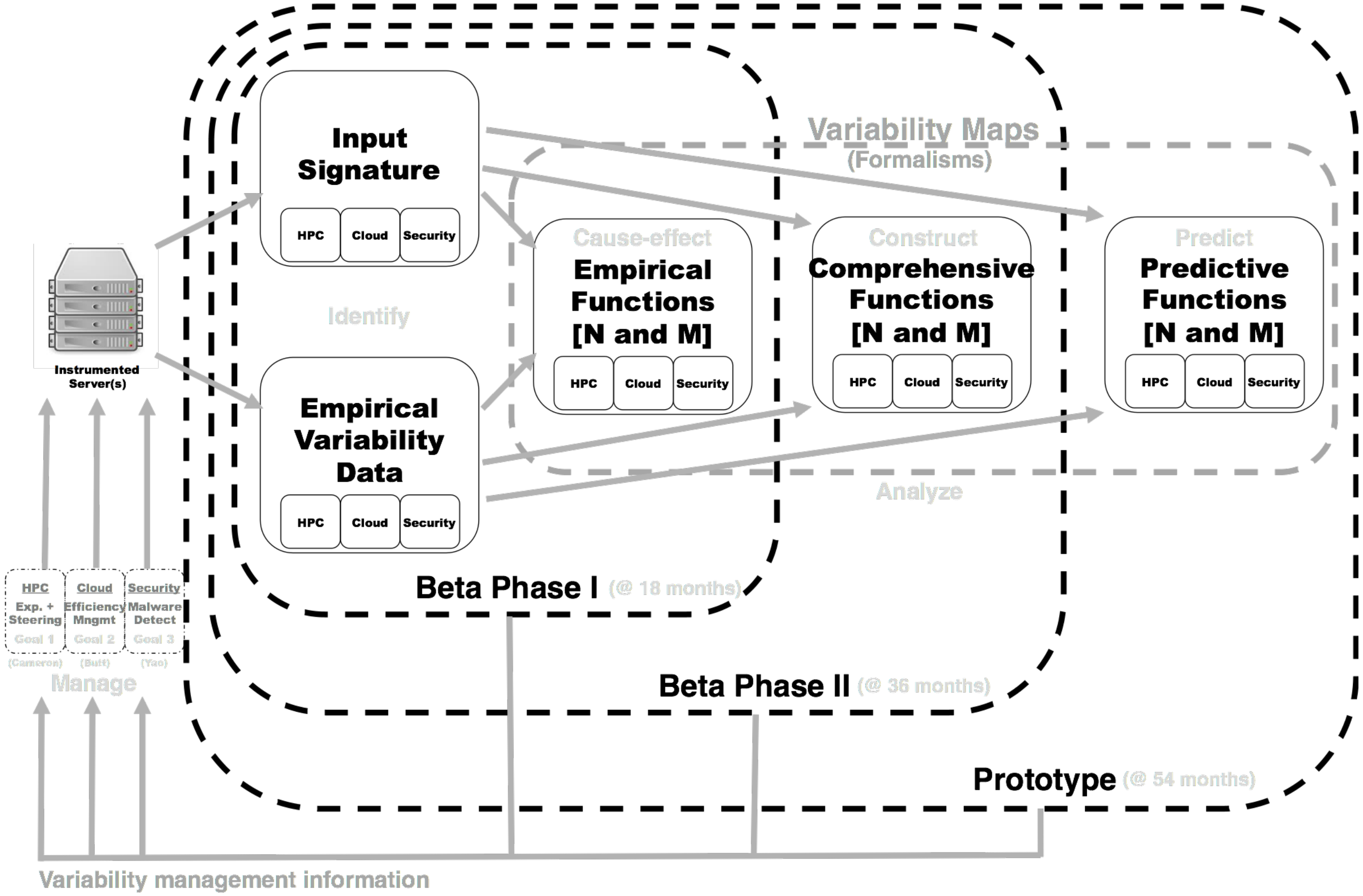
VarSys Software Framework Evolution



VarSys Data Collection & Cleaning

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I/O Zone

Measuring I/O throughput when reading and writing to disk (or HDD).

6 parameters: 3 ordinal – 3 categorical.

Predicting the distribution of I/O throughput at new parameterizations.

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CAT

Measuring the number of clock cycles required to check AES key bytes.

4 parameters, all ordinal.

Predicting the baseline time-model for new system parameterizations.

VarSys Analysis & Demo

Details of Analysis

Categorical values are mapped to a regular simplex.

Columns with only one unique value are ignored.

No missing values, if so, those rows with missing entries are ignored.

For >20K data points, Nearest Neighbor is the default algorithm.
(others are Voronoi, Delaunay, MLP, MARS, LSHEP, Decision Tree)