EDIS

THE UNIVERSITY OF CHICAGO

EDIS: Efficient Data Management for IoT and Data Streams

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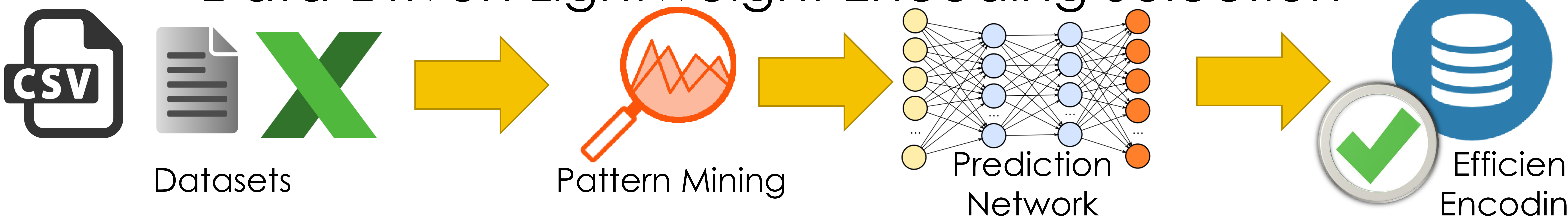
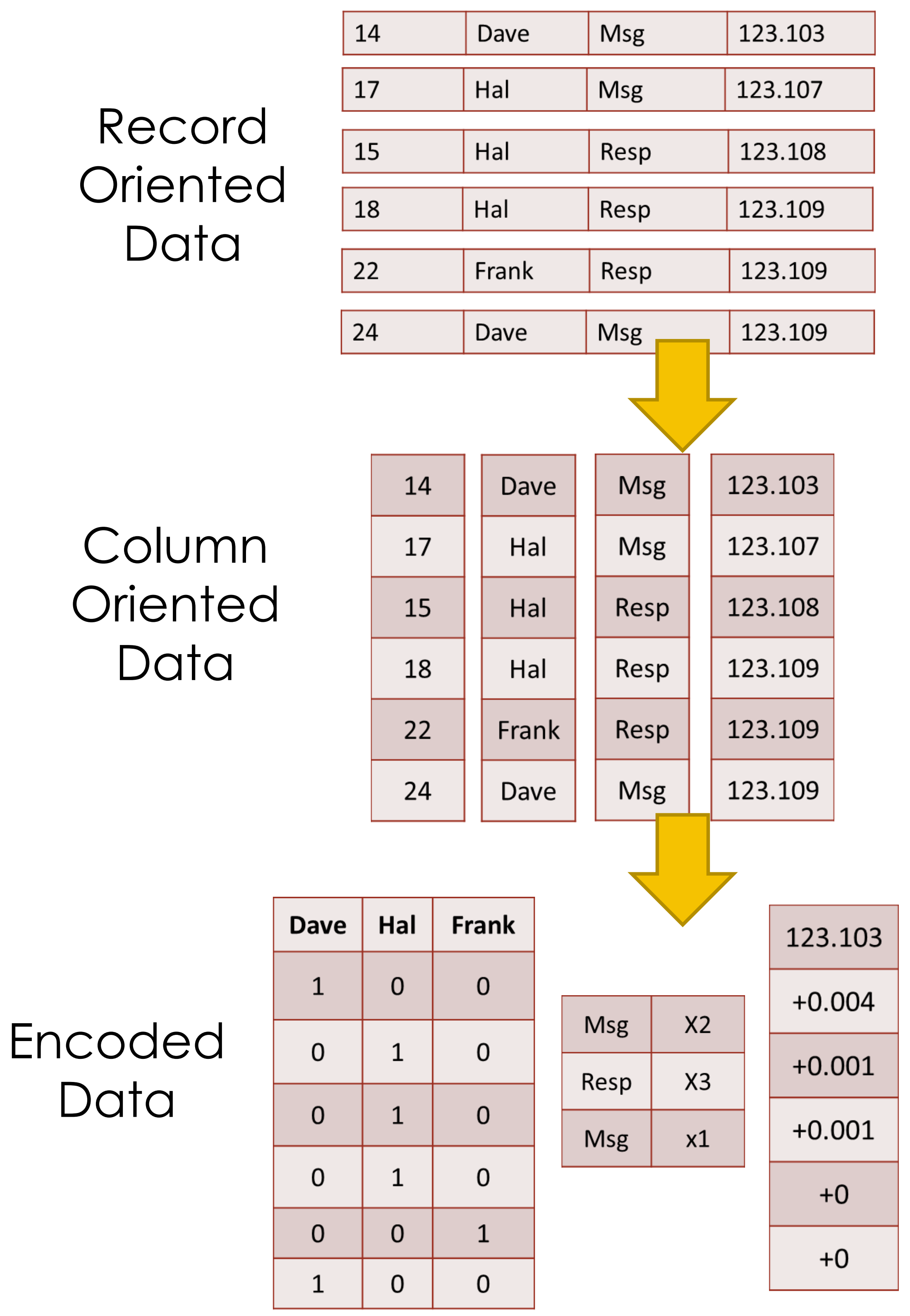
Data-Driven Lightweight Encoding Selection



Datasets → Pattern Mining → Prediction Network → Efficient Encoding

What is Encoding?

Space saving and query efficient data representation, which is used in Dremel, Carbon, Parquet, Vertica, etc.



Record Oriented Data

14	Dave	Msg	123.103
17	Hal	Msg	123.107
15	Hal	Resp	123.108
18	Hal	Resp	123.109
22	Frank	Resp	123.109
24	Dave	Msg	123.109

Column Oriented Data

14	Dave	Msg	123.103
17	Hal	Msg	123.107
15	Hal	Resp	123.108
18	Hal	Resp	123.109
22	Frank	Resp	123.109
24	Dave	Msg	123.109

Encoded Data

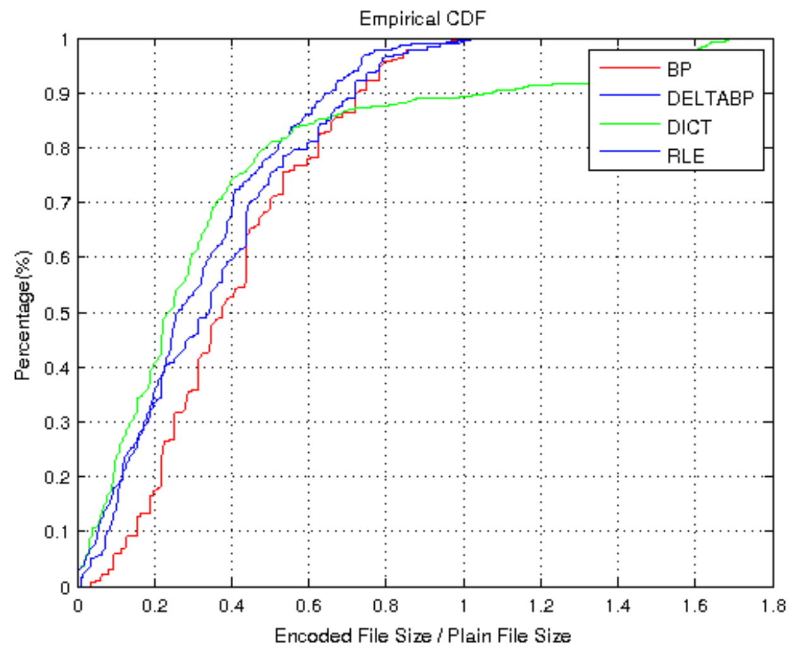
Dave	Hal	Frank
1	0	0
0	1	0
0	1	0
0	1	0
0	0	1
1	0	0

Msg	X2
Resp	X3
Msg	x1

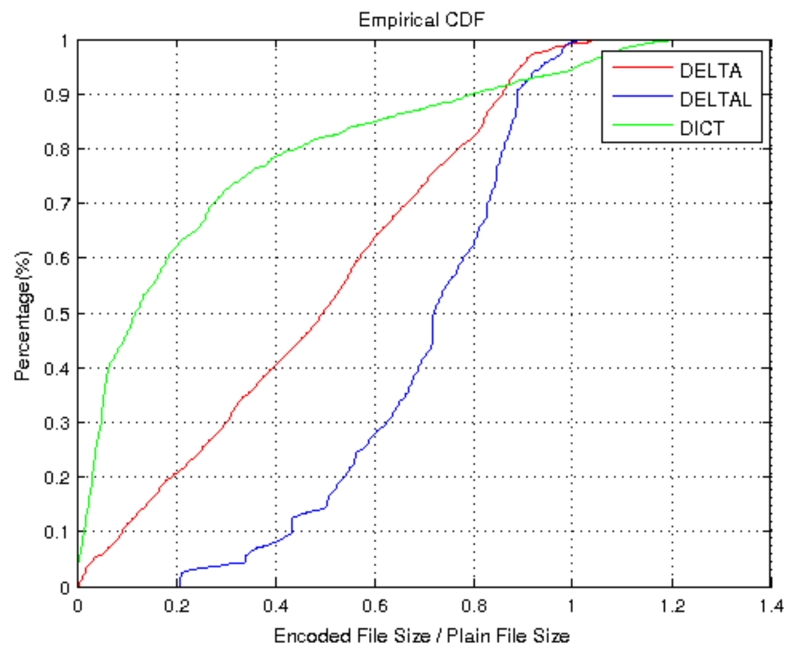
123.103
+0.004
+0.001
+0.001
+0
+0

Dataset Analysis

To study the efficacy of dataset encodings we have collected over 7,000 columns/attributes from 1,200 public datasets, and measure the time and space savings from different encodings and file formats.

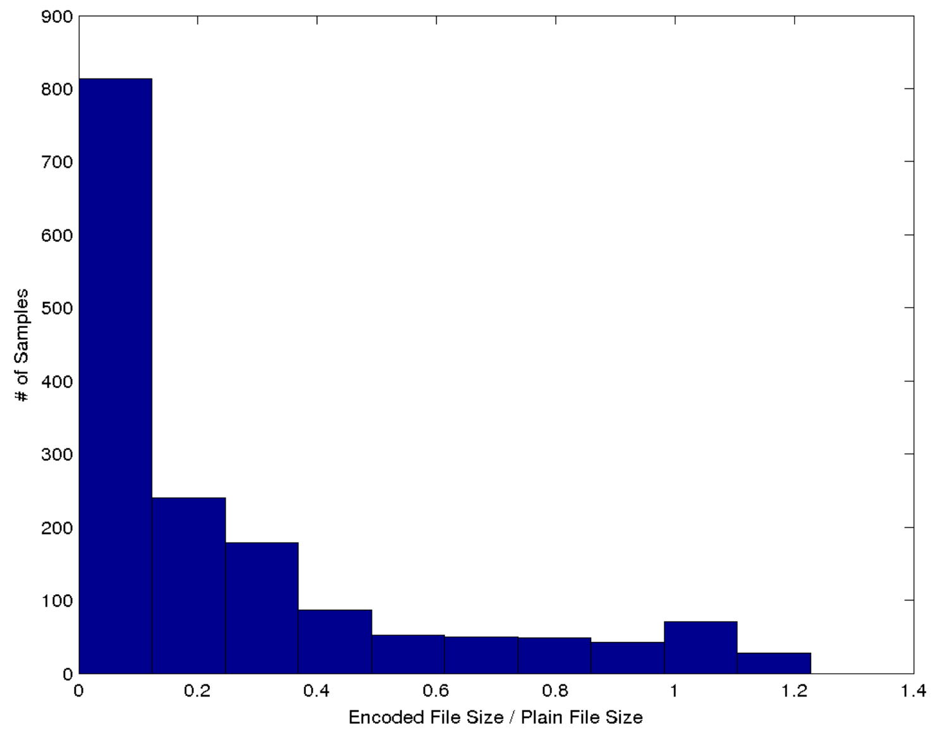


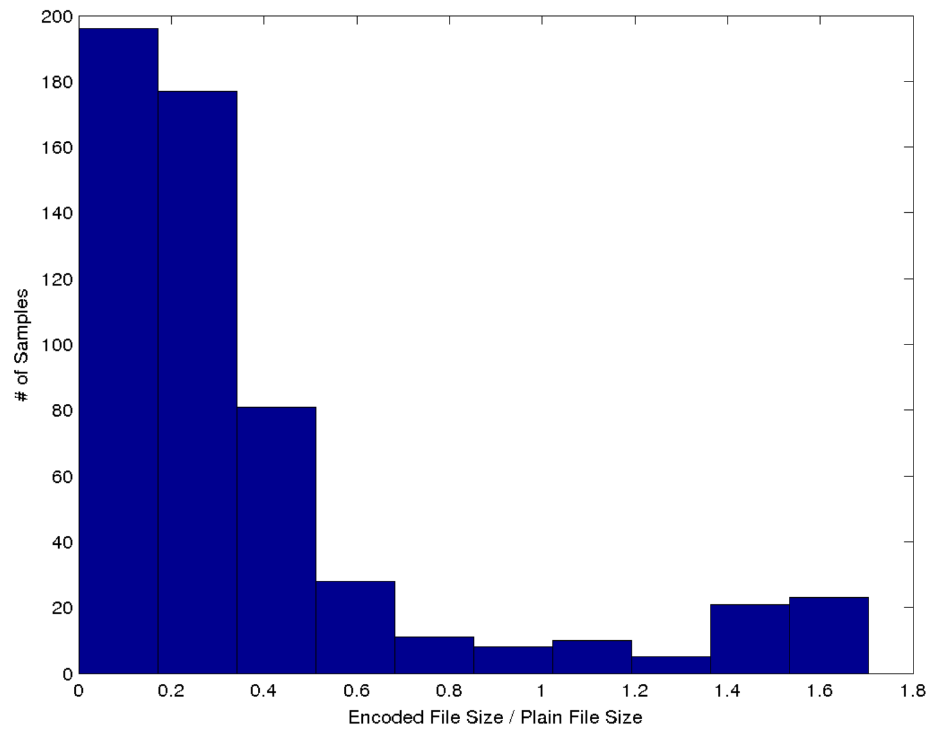
Compression Ratio for Integer Columns



Compression Ratio for String Columns

There is no single best encoding scheme.



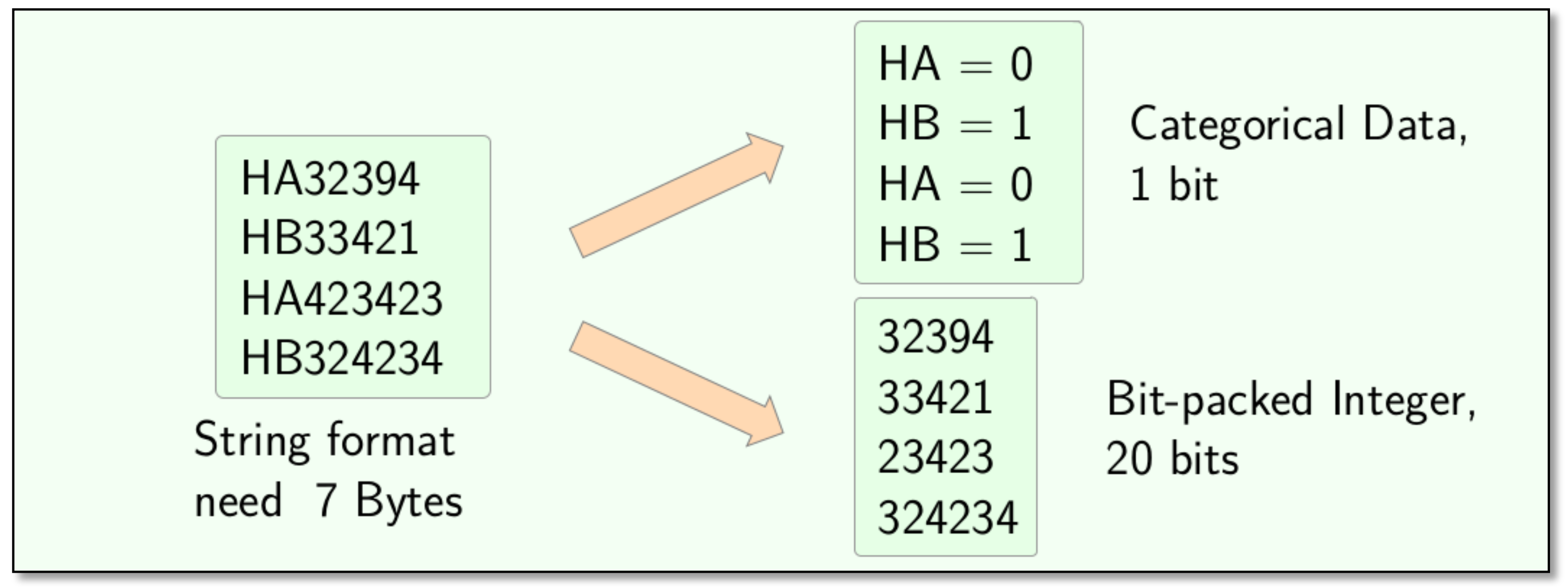


Dictionary Encoding is often adopted as default in many systems, however it performs sub-optimal in many cases

Automated one-pass encoding selector in progress

New Opportunities

Sub-attributes and embedded data does not encode well, can we identify this data and decompose attributes?



HA32394
HB33421
HA423423
HB324234

String format need 7 Bytes

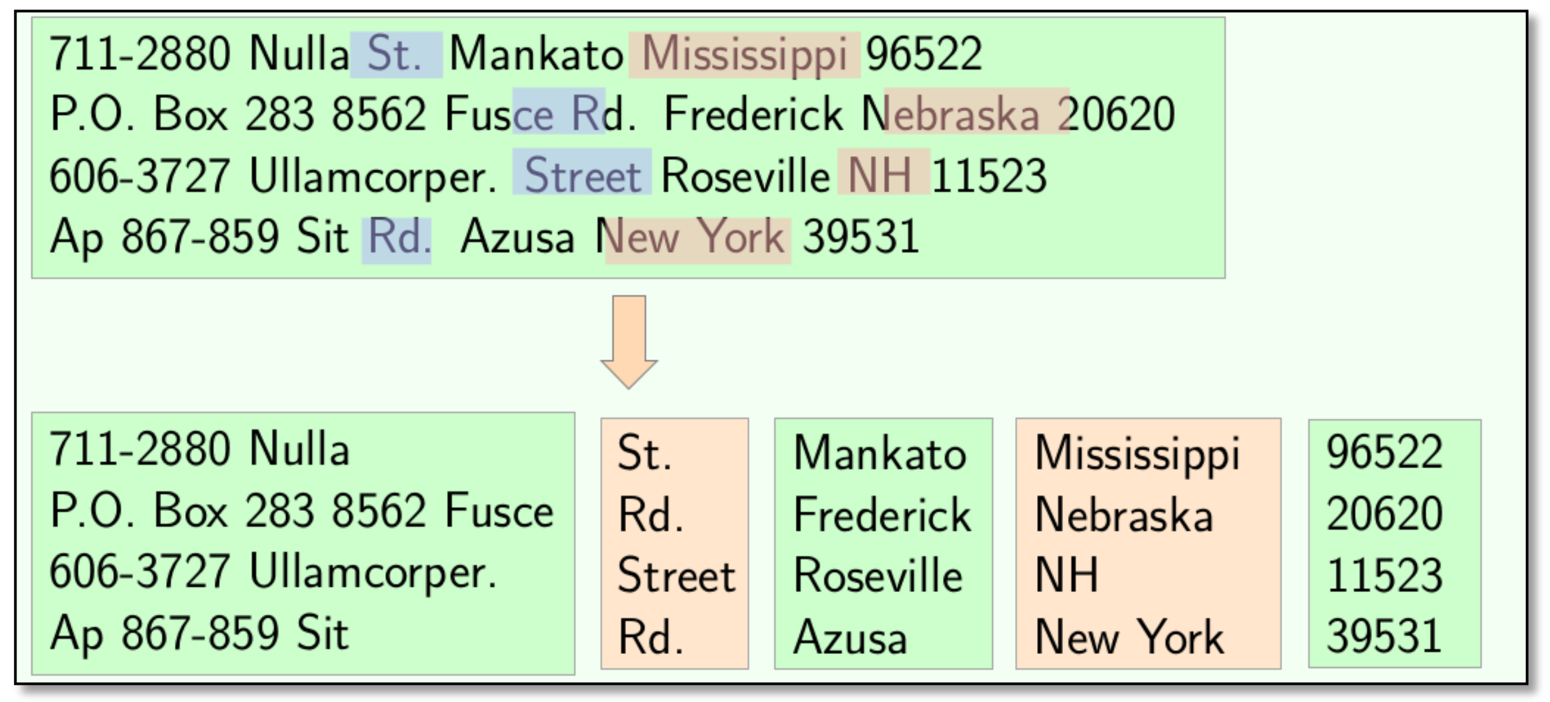
HA = 0
HB = 1
HA = 0
HB = 1

Categorical Data, 1 bit

32394
33421
23423
324234

Bit-packed Integer, 20 bits

Observing the pattern <STR><NUM> from dataset allowing us to separate them and apply more efficient encoding for each part



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Use NLP techniques to look for similar words in text and extract patterns