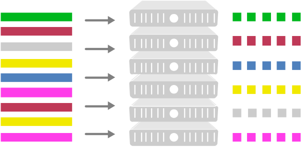
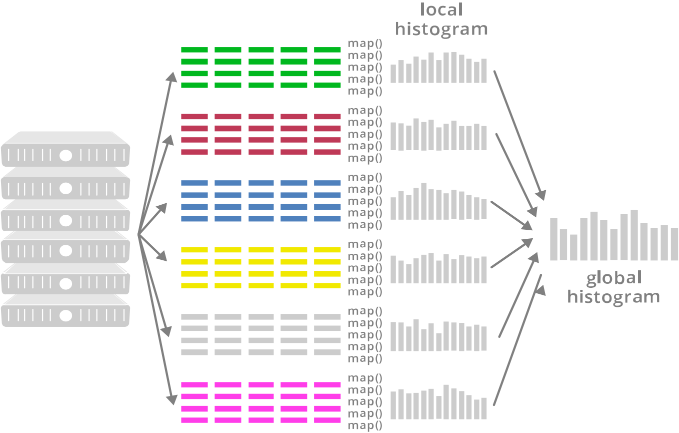
H_2O.ai

Parallel Data Ingest

Distributed Tree Building via Fine-Grain Map/Reduce to find optimal split points of data layer by layer




local histogram
map()
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map()
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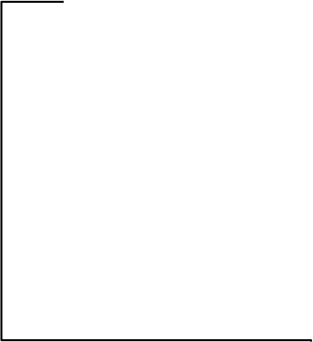
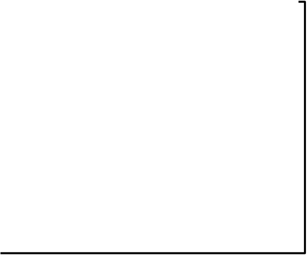
map()
map()
map()
global histogram

Start with root node and build layers of tree nodes **[ILLUSTRATION BELOW]**

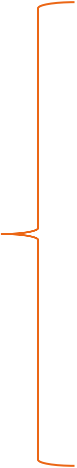
For each layer, repeat the following:

- **For a set of features, split the data at every possible split point**
- **Find the split that leads to best model improvement**
- **Use discretization to limit the number of potential splits**
  - **To find the split, local histograms are calculated on each node and then aggregated into a global histogram**
  - **From the global histogram, the best split column is chosen**





For each layer, iterate



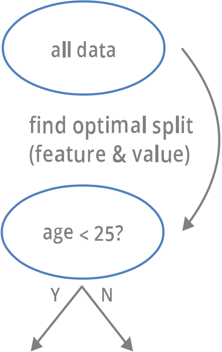
1

2

Data is stored in-memory on all cluster compute nodes

- **Rows are evenly distributed across the cluster**
- **Columns are stored separately and compressed**

Basis for fine-grain Map/Reduce for histogram calculation



all data

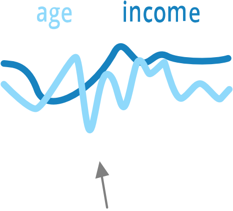
find optimal split
(feature & value)

age < 25?

Y

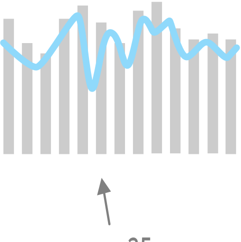
N

Analytical error landscape



best split: age 25

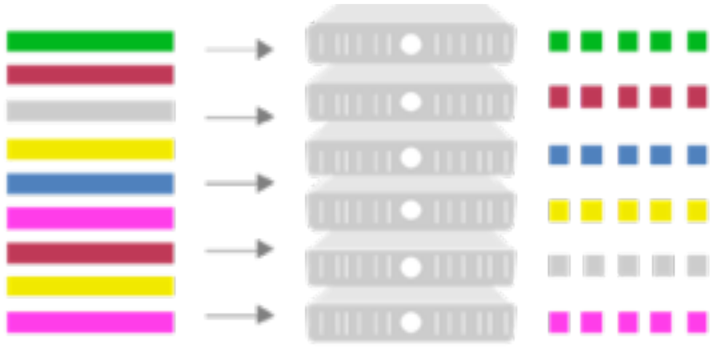
H2O: discretized into bins



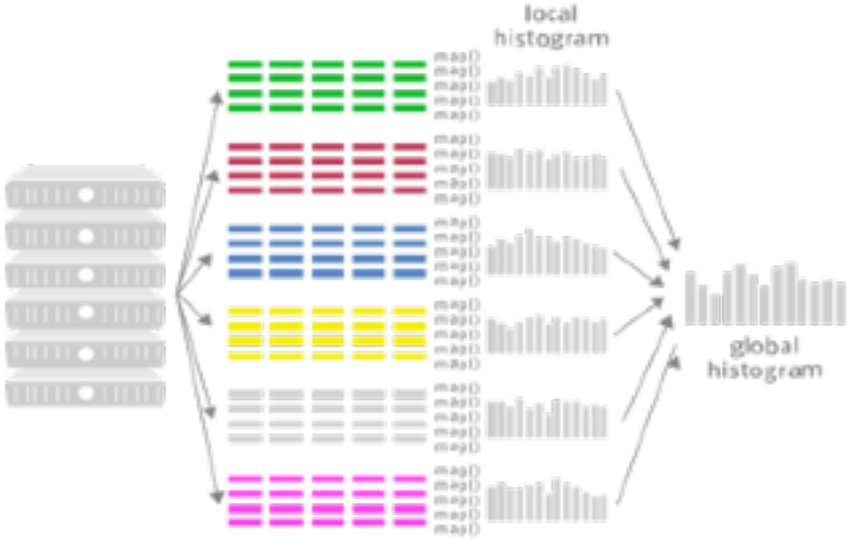
age 25

Scalable Implementation in H2O

Scalable Implementation in H2O



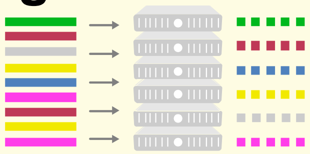
Parallel Parse into **Distributed Rows**



Fine Grain Map Reduce Illustration: Scalable Distributed Histogram Calculation for GBM

Scalable Implementation in H2O

1 Parallel Data Ingest



Data is stored in-memory on all cluster compute nodes

- Rows are evenly distributed across the cluster
- Columns are stored separately and compressed

Basis for fine-grain Map/Reduce for histogram calculation

2 Distributed Tree Building via Fine-Grain Map/Reduce to find optimal split points of data layer by layer

Start with root node and build layers of tree nodes [ILLUSTRATION BELOW]

For each layer, repeat the following:

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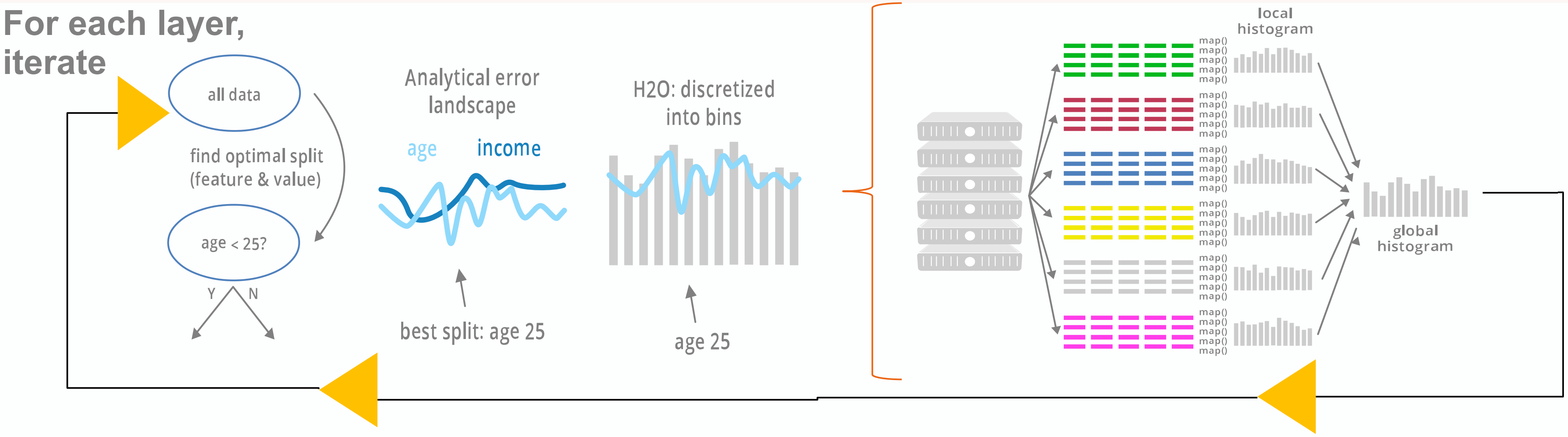

For each layer, iterate

all data
find optimal split (feature & value)
age < 25?
Y
N
Analytical error landscape
age
income
best split: age 25
H2O: discretized into bins
age 25
local histogram
map()
global histogram