

MATLAB EXPO 2017

Machine Learning auf Big Data praktische Programmierkonzepte in MATLAB

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How big is big?

What does “Big Data” even mean?

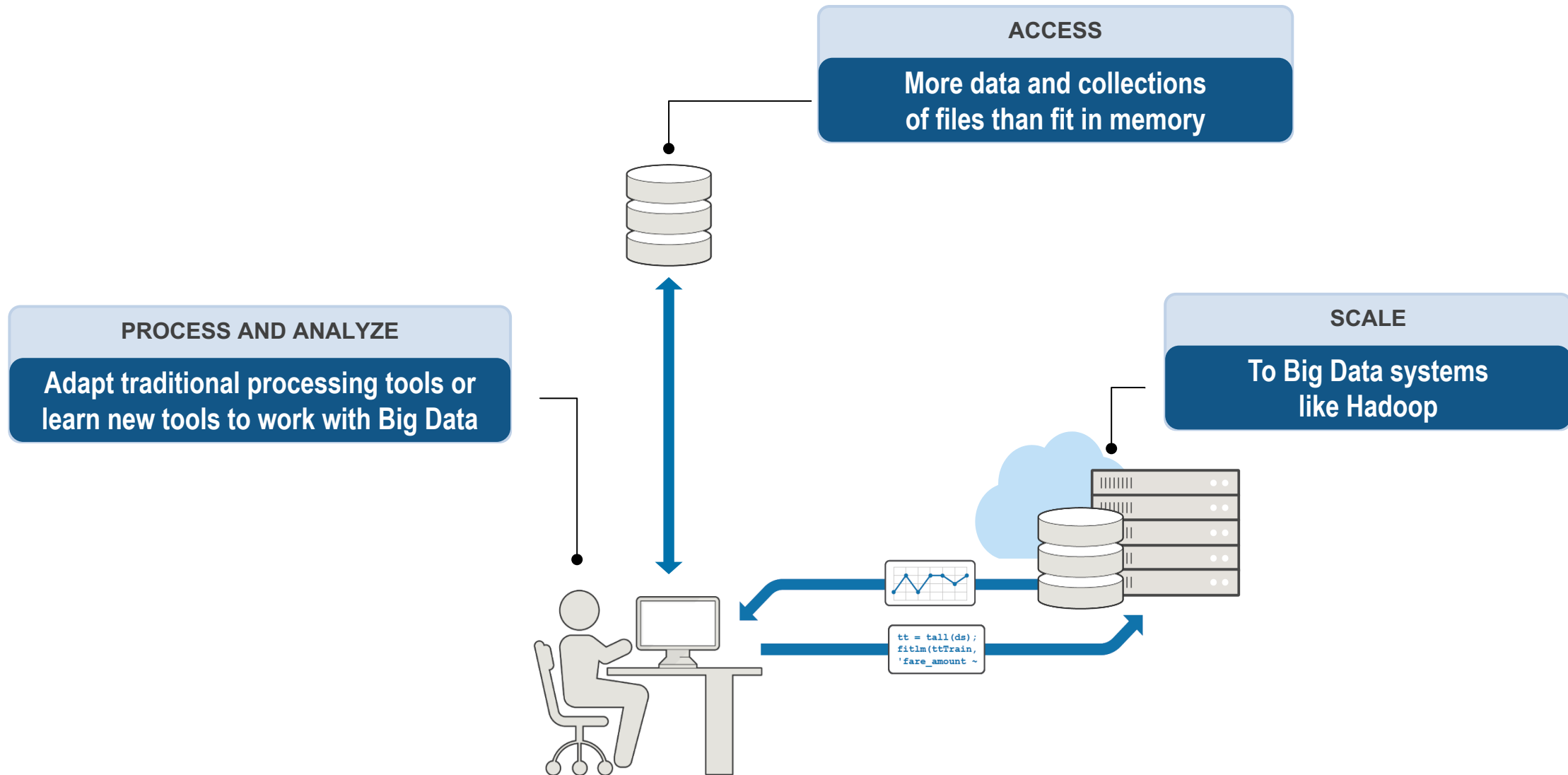
“Big data is a term for data sets that are so large or complex that traditional processing applications are inadequate to deal with them.”

So, what's the (big) problem?

- Traditional tools and approaches won't work
 - **Getting** the data is hard; **processing** it is even harder
 - Need to learn **new tools** and **new coding styles**
 - Have to rewrite algorithms, often at a lower level of abstraction
- Quality of your results can be impacted
 - e.g., by being forced to work on a subset of your data



Big Data workflow



Big solutions

Wouldn't it be nice if you could:

- Easily access data however it is stored
- Prototype algorithms quickly using small data sets
- Scale up to big data sets running on large clusters
- **Using the same intuitive MATLAB syntax you are used to**



tall arrays R2016b

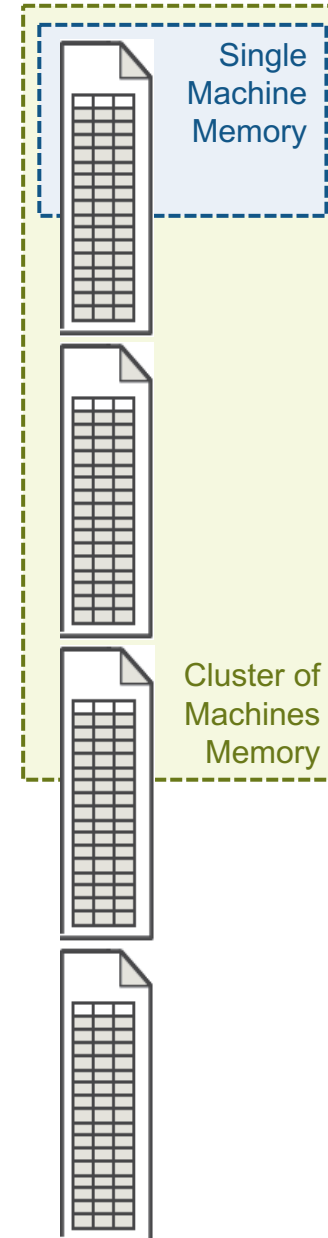


- For data that doesn't fit into memory
- Lots of observations (hence “tall”)
- Looks like a normal MATLAB array
 - Supports numeric types, tables, datetimes, strings, etc...
 - Supports basic math, stats, indexing, etc.
 - **Statistics and Machine Learning Toolbox** support (clustering, classification, etc.)



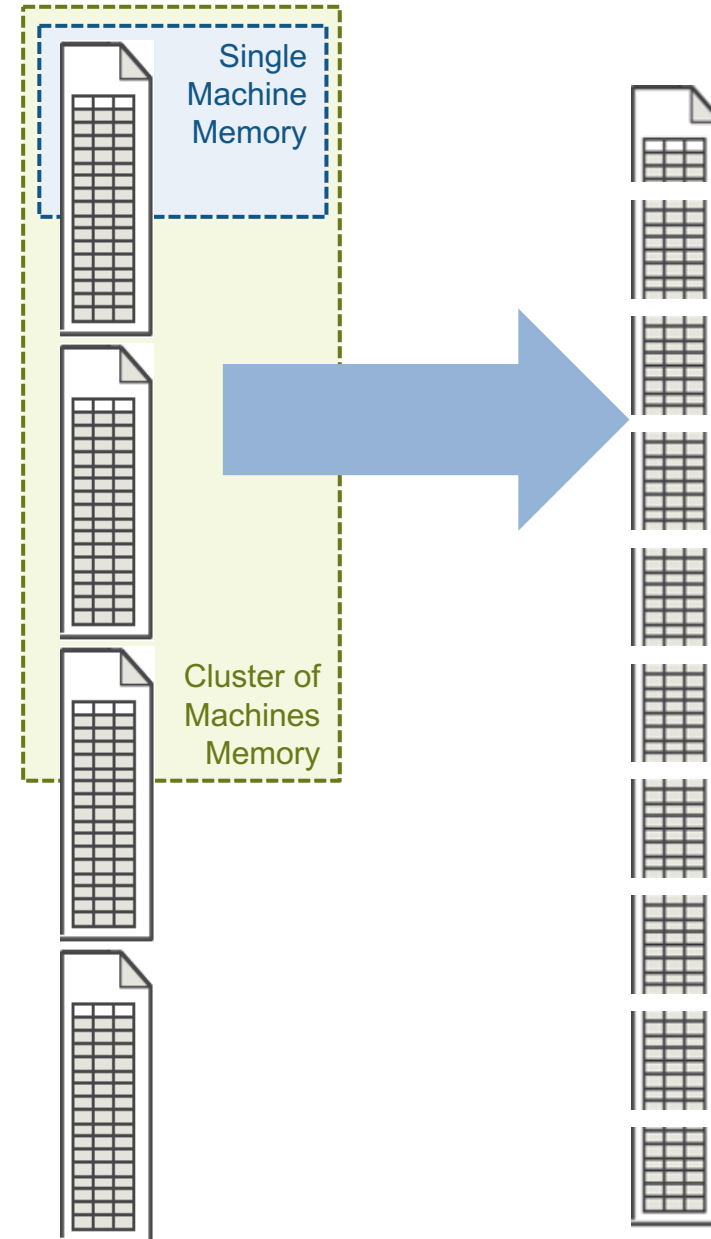
tall arrays R2016b

- Data is in one or more files
- Typically tabular data
- Files stacked vertically
- Data doesn't fit into memory (even cluster memory)



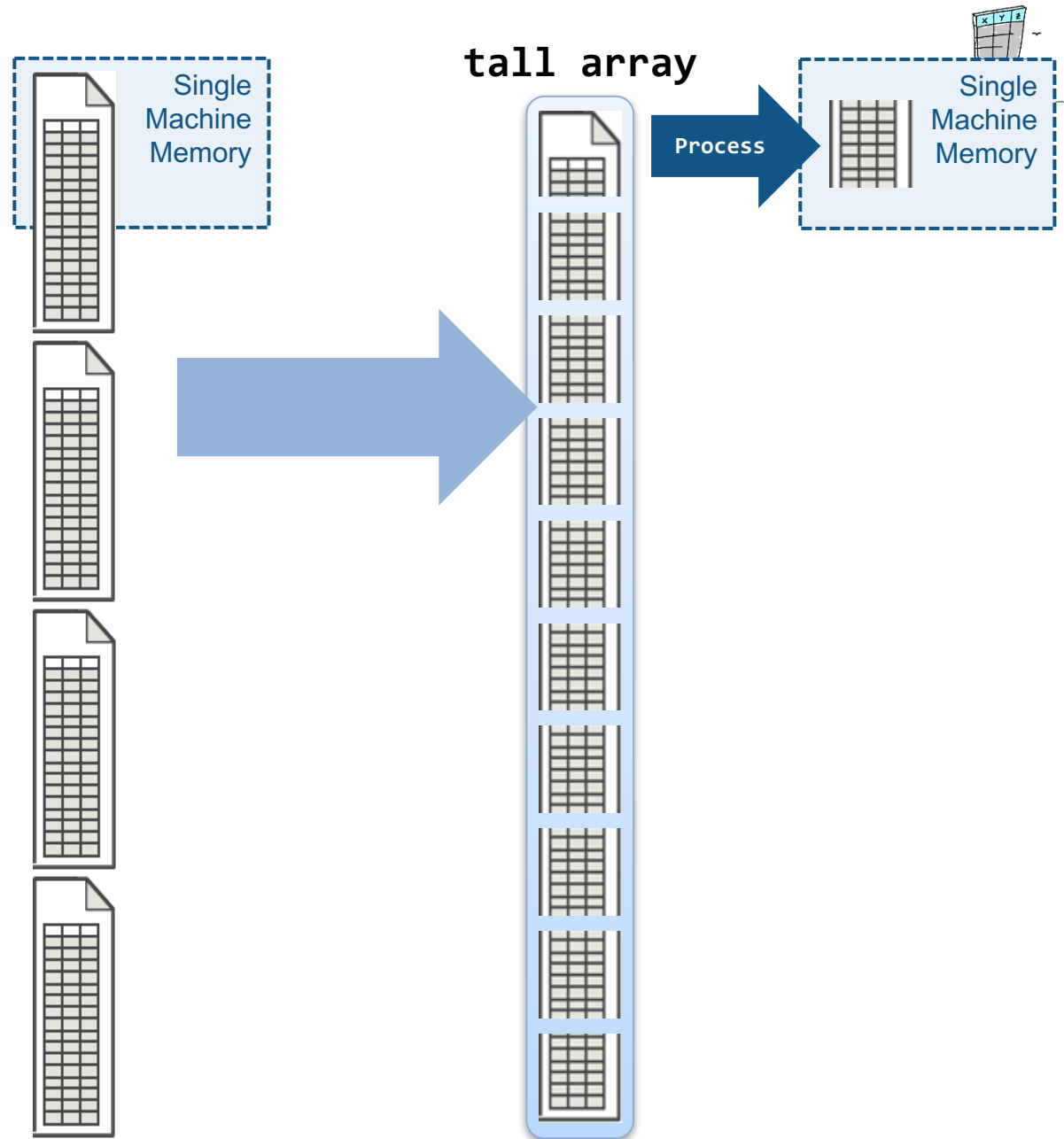
ta11 arrays R2016b

- Automatically breaks data up into small “chunks” that fit in memory



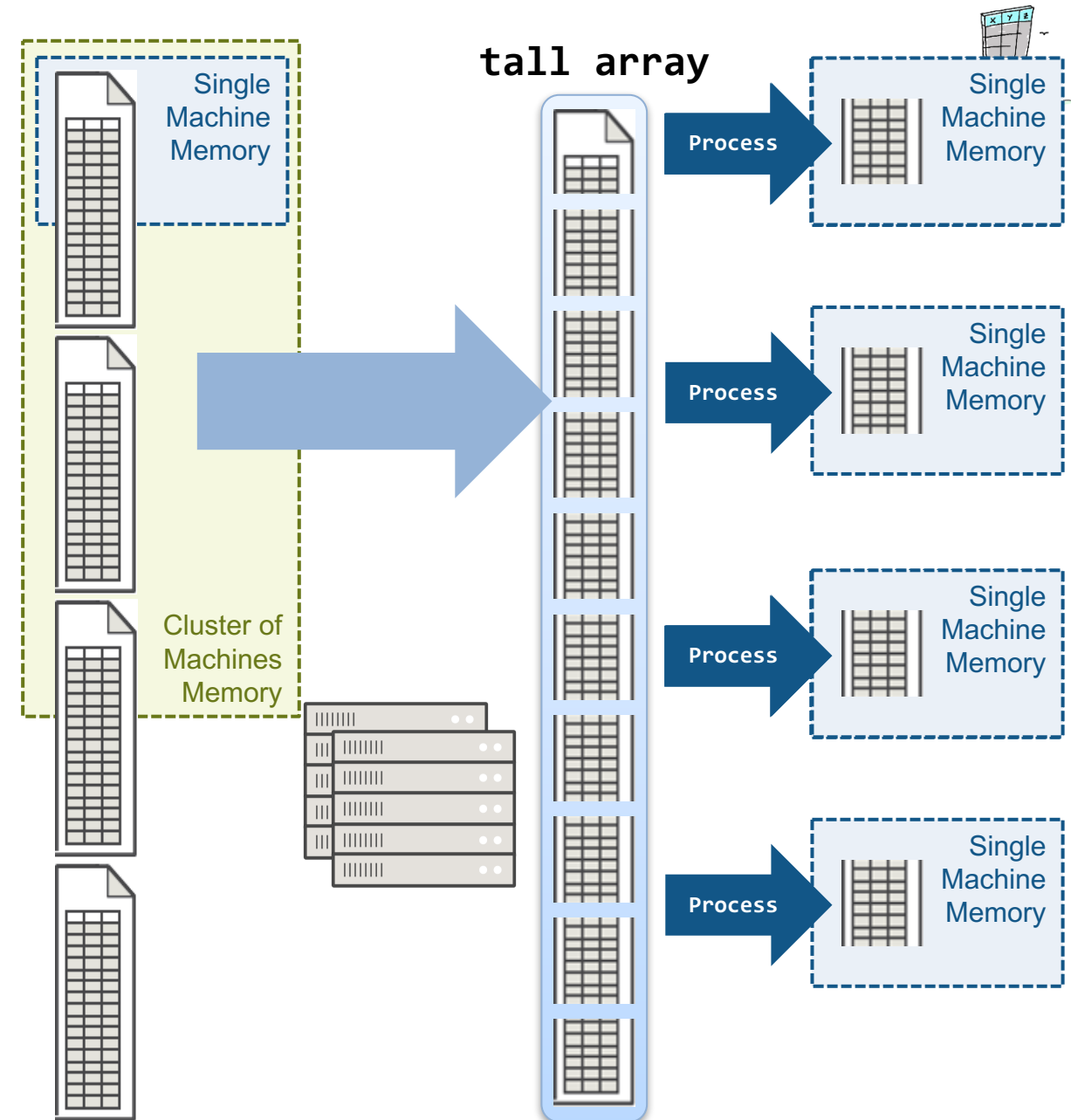
tall arrays R2016b

- “Chunk” processing is handled automatically
- Processing code for tall arrays is the same as ordinary arrays

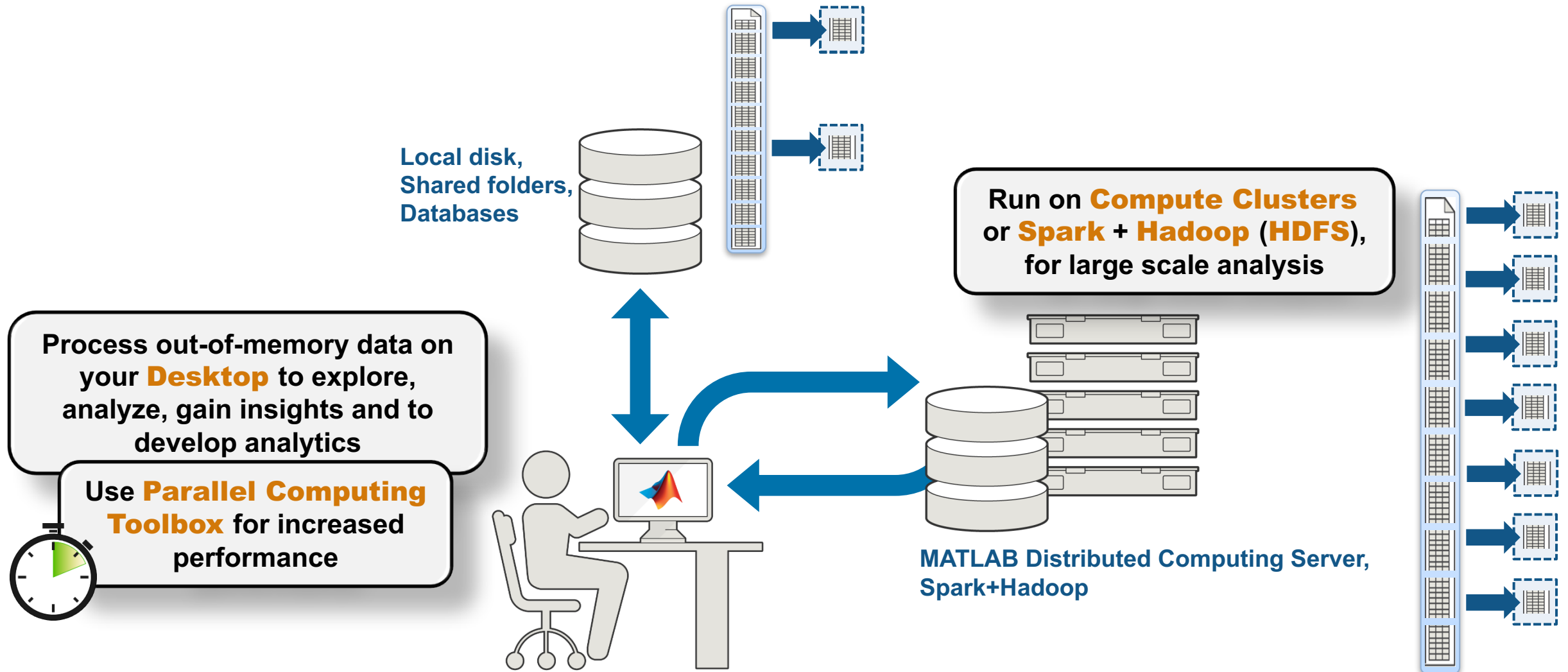


tall arrays R2016b

- With Parallel Computing Toolbox, process several “chunks” at once
- Can scale up to clusters with MATLAB Distributed Computing Server



Summary for tall arrays



Big Data Workflow With Tall Data Types

Access Data

- Text
- Spreadsheet (Excel)
- Database (SQL)
- Custom Reader

**Datastores for
common types of
structured data**



Tall Data Types

- table
- timetable (R2017a)
- cell
- double
- numeric
- cellstr
- datetime
- categorical

**Tall versions of
commonly used
MATLAB data types**



Exploration & Pre-processing

- Numeric functions
- Basic stats reductions
- Date/Time capabilities
- Categorical
- String processing
- Table wrangling
- Missing Data handling
- Summary visualizations:
 - Histogram/histogram2
 - Kernel density plot
 - Bin-scatter

**Hundreds of pre-built
functions**



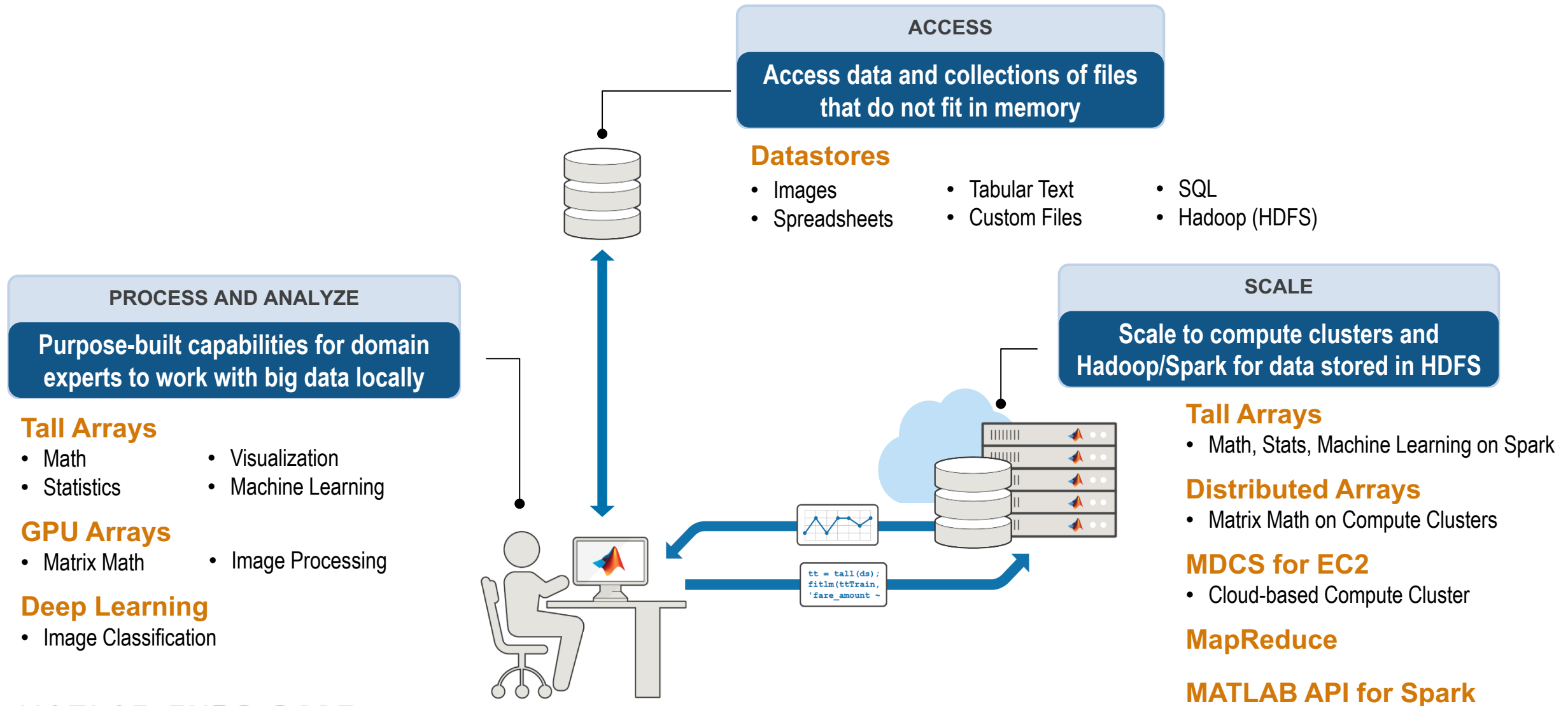
Machine Learning

- Linear Model
- Logistic Regression
- Discriminant analysis
- K-means
- PCA
- Random data sampling
- Summary statistics
- Decision trees (R2017a)

**Key statistics and
machine learning
algorithms**

MATLAB programming for data that does not fit into memory

Big Data capabilities in MATLAB



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Cloudera Versions	Partner Product Name	Partner Product Version	Interface Components	Supports Kerberos	Supports Apache Sentry
CDH5.7	MATLAB R2016B	R2016B	HDFS, MapReduce, Spark	Yes	Not applicable
CDH5.7	Statistics and ML Toolbox R2016B	R2016B	HDFS, MapReduce, Spark	Yes	Not applicable
CDH5.7	MATLAB Compiler R2016B	R2016B	HDFS, MapReduce, Spark	Yes	Not applicable
CDH5.7	MATLAB Distributed Computing Server R2016B	R2016B	HDFS, MapReduce, Spark	Yes	Not applicable
CDH5.4	MATLAB Compiler R2015b	R2015b	HDFS, MapReduce	Yes	Not applicable
CDH5.4	MATLAB R2015b	R2015b	HDFS, MapReduce	Yes	Not applicable
CDH5.4	MATLAB Distributed Computing Server R2015b	R2015b	HDFS, MapReduce	Yes	Not applicable

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Summary

- MATLAB makes it easy, convenient, and scalable to apply machine learning on big data
 - **Access** any kind of big data from any file system
 - Use tall arrays to **process and analyze** that data on your desktop, clusters, or on Hadoop/Spark

There's no need to learn big data programming or out-of-memory techniques -- simply use the same code and syntax you're already used to.

For more information

- Website:
<https://www.mathworks.com/solutions/big-data-matlab>
- Web search for:
“Big Data MATLAB”

