BIG DATA

Olá!

Felipe

Dr. Finanças - EAESP - FGV
Me. Estatística - UFSCar
Me. Eng Prod. - USP São Carlos
Adm - USP Ribeirão Preto

tumenas@ufba.br

makro — Trainee - 2006

Itaú — McKinsey Fellow Analyst - 2008

RISKOFFICE — Consultor de Riscos - 2011

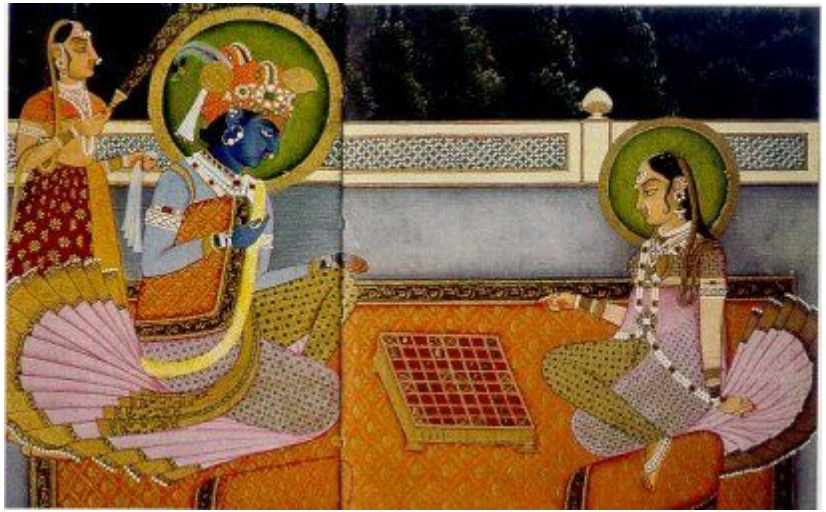
EY — Consultor Sênior - 2015

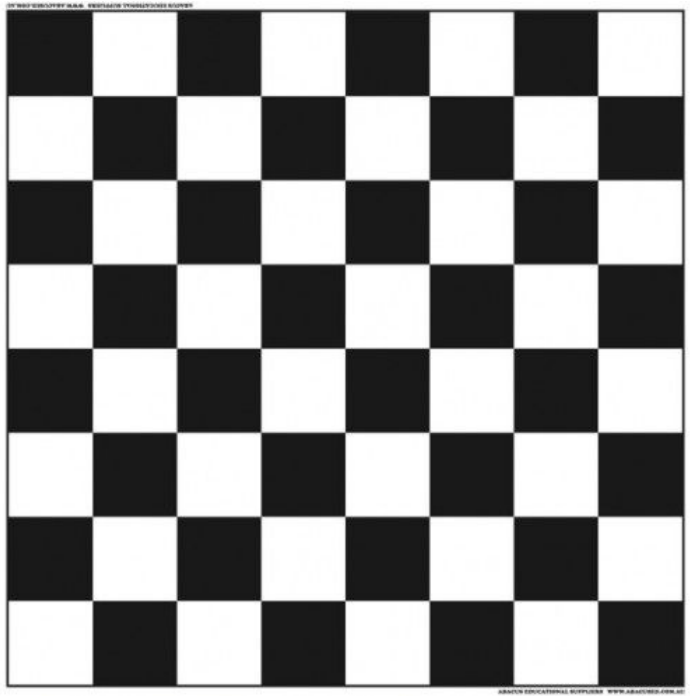
BNP PARIBAS CARDIF — Gerente de Big Data e Monitoramento de Riscos - 2016 (2018)

AGENDA

Dia 1 - Visão Geral e Hadoop

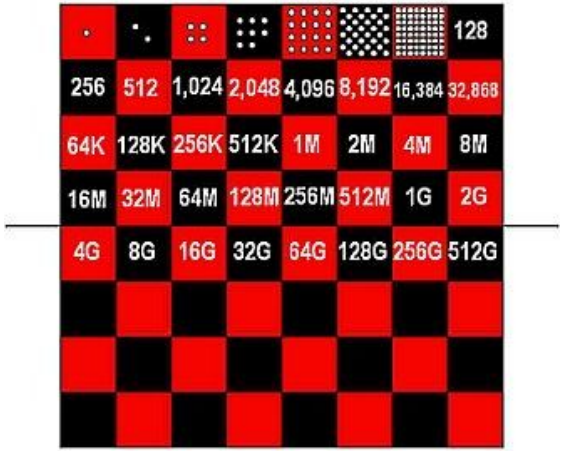
Dia 2 - Spark, Parquet, MongoDB





QUAL O VOLUME DE ARROZ?

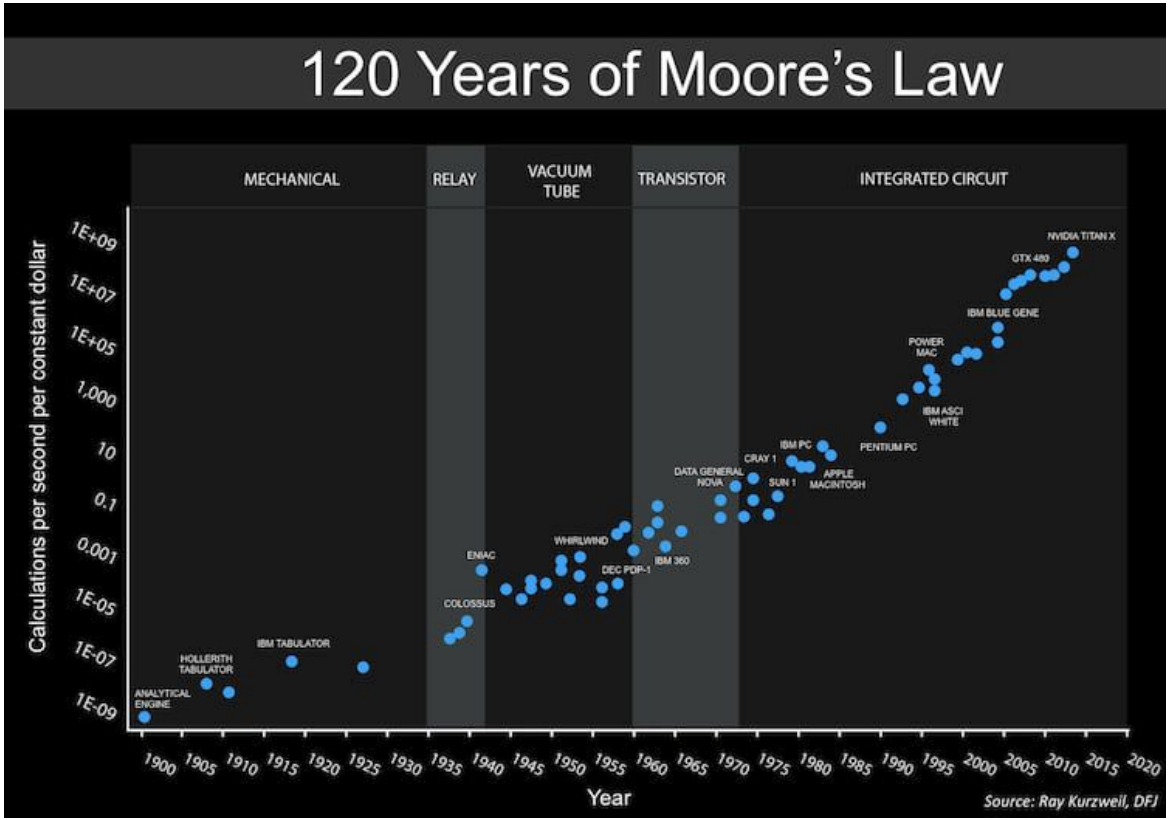
QUAL O VOLUME DE ARROZ?



210 bilhões de toneladas de arroz

http://www.singularitysymposium.com/exponential-growth.html

LEI DE MOORE



Gordon Moore (Intel): A cada 2 anos o número de transistores em um processador é dobrado

LEI DE MOORE

nature electronics

Perspective | Published: 08 January 2018

Science and research policy at the end of Moore's law

Hassan N. Khan, David A. Hounshell & Erica R. H. Fuchs

Nature Electronics **1**, 14–21 (2018) | Download Citation

A Publisher Correction to this article was published on 05 February 2018

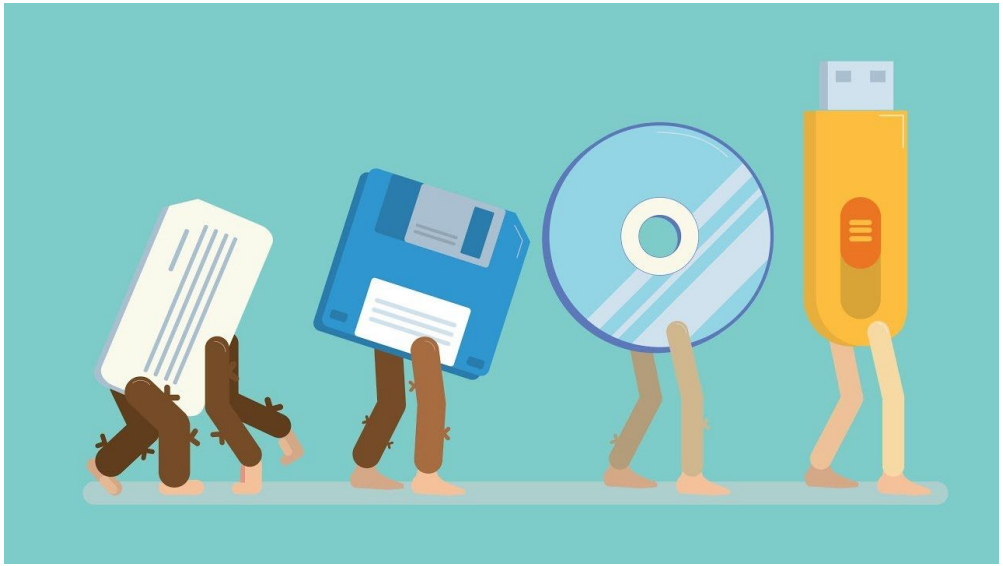
This article has been updated

Abstract

The integrated circuit is today synonymous with the concept of technological progress. In the seven decades since the invention of the transistor at Bell Labs, relentless progress in the development of semiconductor devices — Moore's law — has been achieved despite regular warnings from industry observers about impending limits. Here, drawing on technical and organizational archival work and oral histories, we argue that the current technological and structural challenges facing the industry are unprecedented and undermine the incentives for continued collective action in research and development,

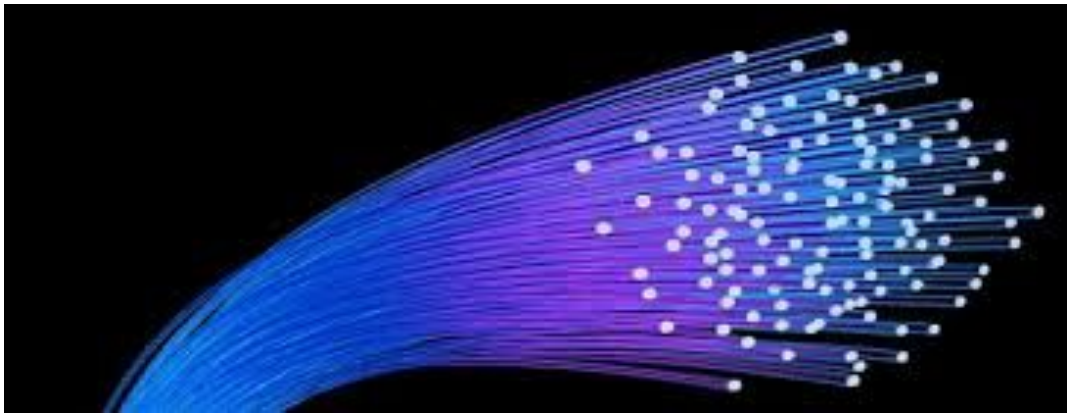
https://www.nature.com/articles/s41928-017-0005-9

LEI DE KRYDER



Mark Kryder (Intel): A 10.5 anos a densidade de informações armazenada em um disco rígido é aumentada por um fator de 1.000

LEI DE BUTTER

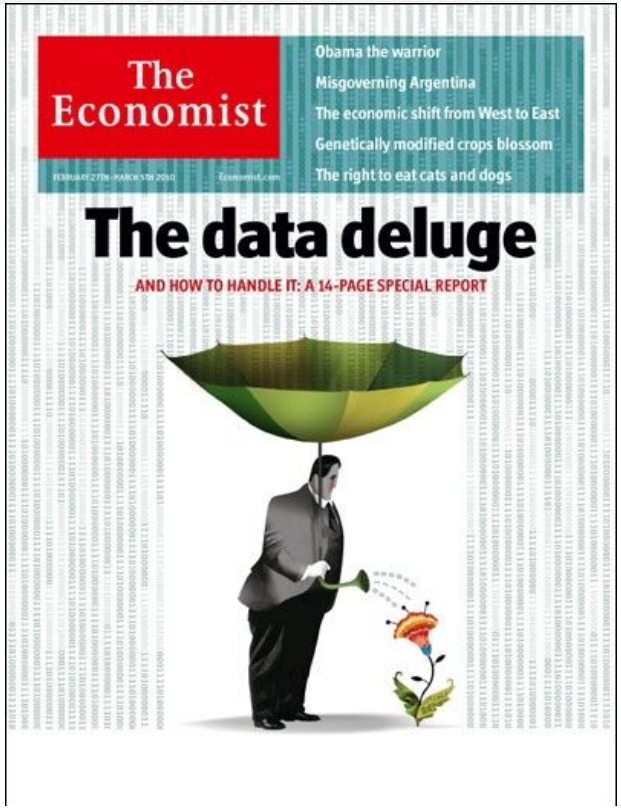


Gerry Butter (Bell Labs): O volume de informações que pode passar por uma fibra ótica dobra a cada 9 meses

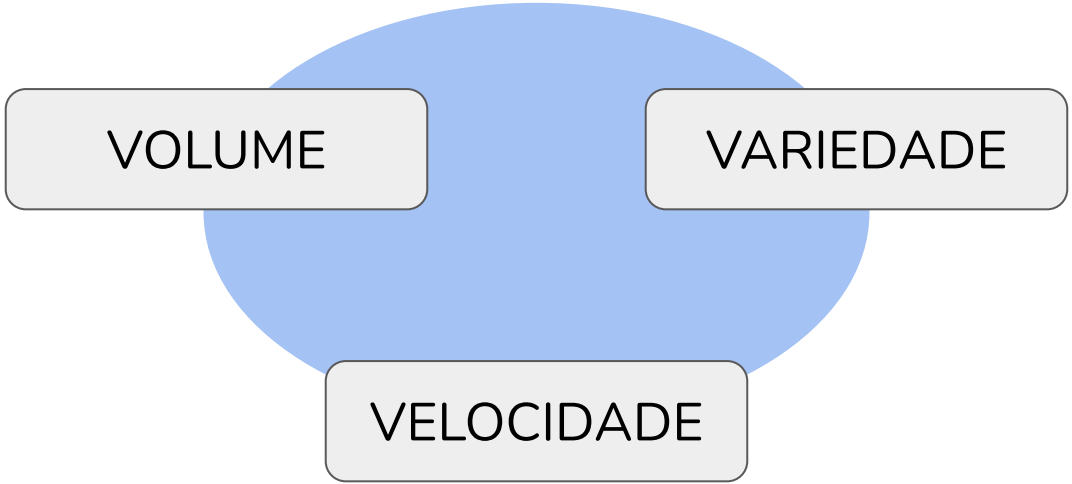
BIG DATA

“The term “*big data*” refers to *data* that is so large, fast or complex that it's difficult or impossible to process using traditional methods” SAS

https://www.sas.com/pt_br/insights/big-data/what-is-big-data.html



3Vs



V’s

CHANGEMAKER

Os 10 Vs do big data

O termo big data começou a aparecer com moderação no início dos anos 90, e sua prevalência e importância aumentaram exponencialmente com o passar dos últimos anos

4 min de leitura

Ouça

Em um mundo cada vez mais conectado, o Big Data é um dos temas mais relevantes do mercado de TI. Para te ajudar a entender melhor sobre este assunto, o LinkedIn fez uma lista que ensina exatamente o que é essa tecnologia.

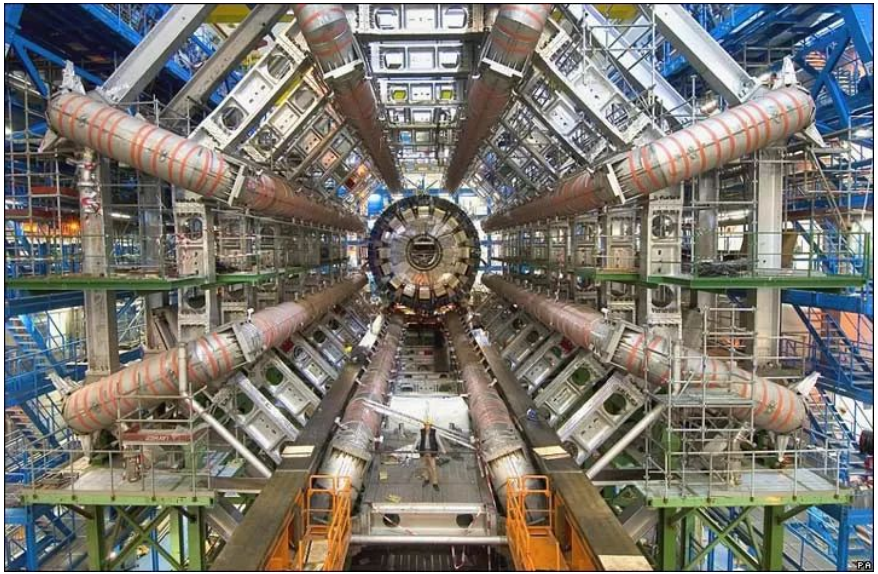
1. Volume

Big Data é uma grande quantidade de dados gerada a cada segundo. Pense em todos os e-mails, mensagens de Twitter, fotos e vídeos que circulam na rede a cada instante. Não são terabytes e sim zetabytes e brontobytes. Só no Facebook são 10 bilhões de mensagens, 4,5 bilhões de curtidas e 350 milhões de fotos compartilhadas todos os dias. A tecnologia do Big Data serve exatamente para lidar com esse volume de dados,

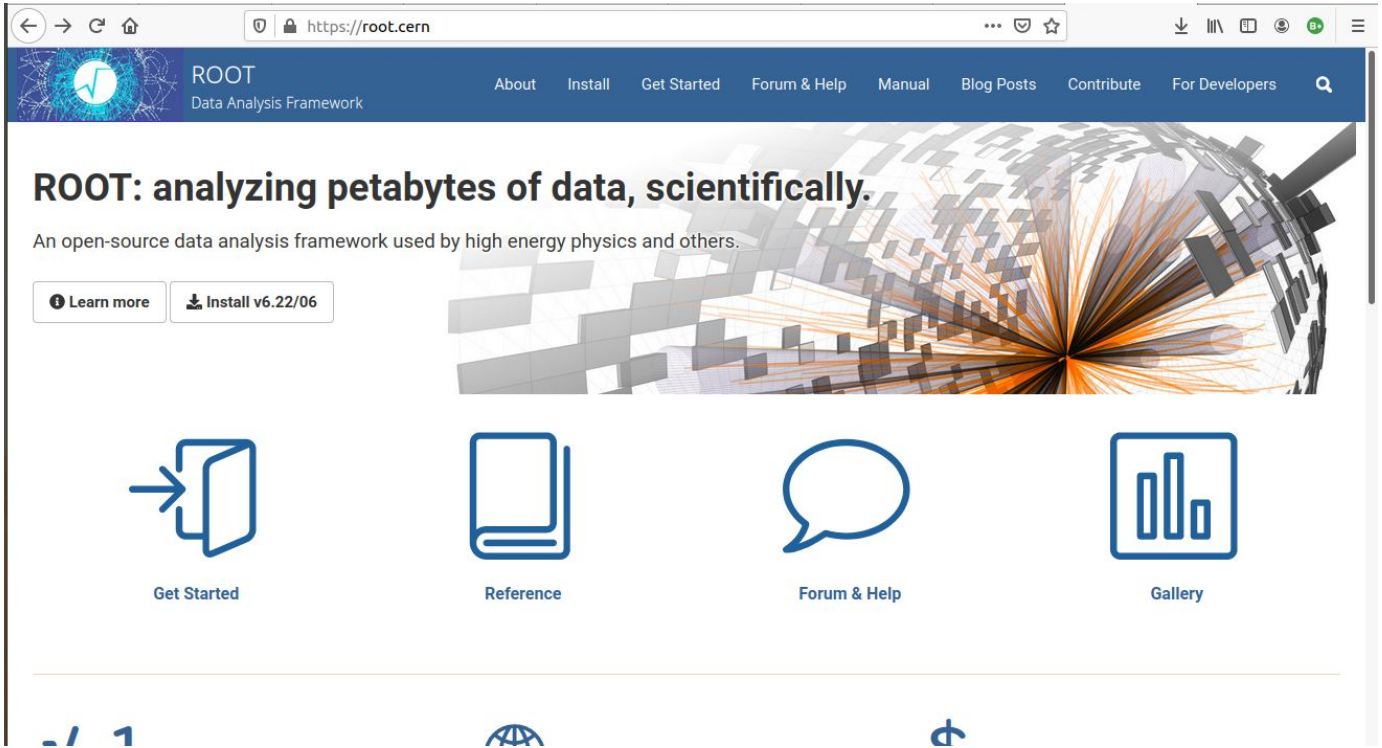
CERN (LHC)

“The raw data per event is around one million bytes (1 MB), produced at a rate of about 600 million events per second.”

600.000.000 x 1MB ~ 6 PB/s



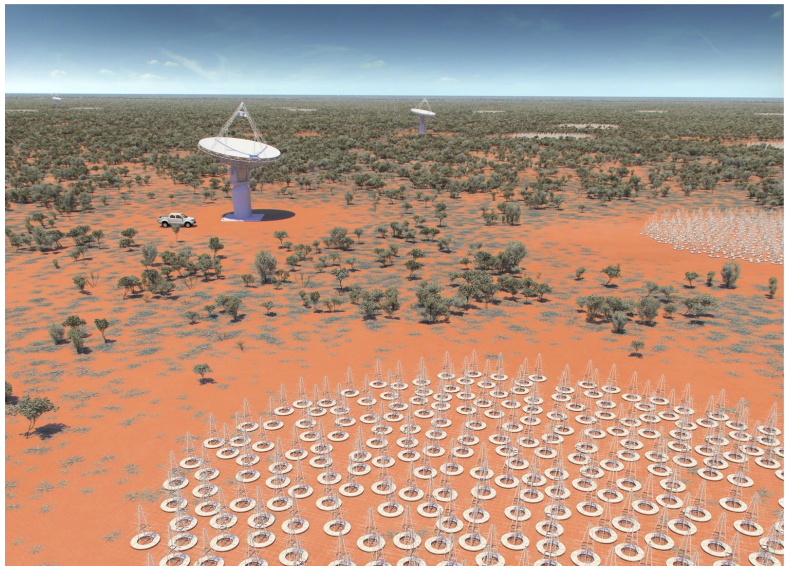
https://www.cloudwatchhub.eu/what-big-data-really-looks-cern-universe-and-everything



https://root.cern/

SKA – (AUSTRÁLIA e ÁFRICA DO SUL)

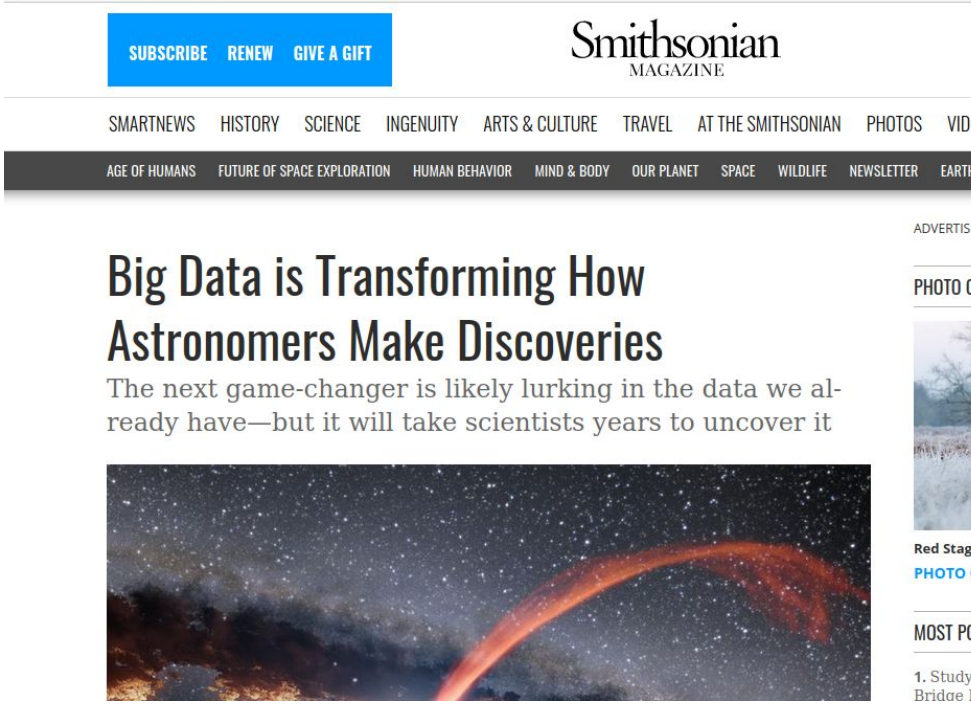
“The SKA-Low array will generate 5 zettabytes of data every year—an unimaginable volume when considering global Internet traffic only passed 1 zettabyte for the first time in 2016. “



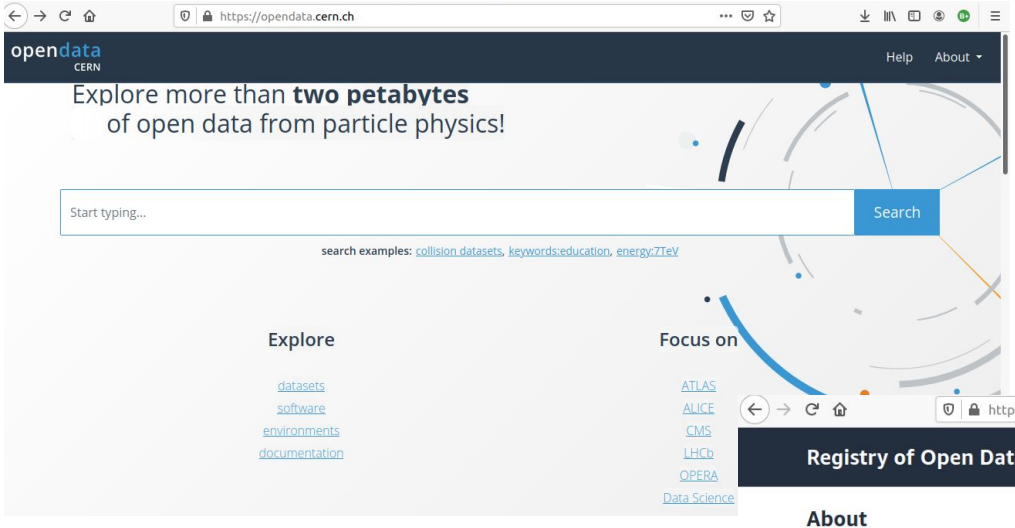
https://spie.org/news/photonics-focus/mayjun-2020/square-kilometer-array-big-data?SSO=1

“Earlier this year, astronomers stumbled upon a fascinating finding: Thousands of black holes likely exist near the center of our galaxy.

The X-ray images that enabled this discovery weren’t from some state-of-the-art new telescope. Nor were they even recently taken—**some of the data was collected nearly 20 years ago.** ”



https://www.smithsonianmag.com/science-nature/next-big-discovery-astronomy-scientists-probably-found-it-years-ago-they-dont-know-it-yet-180969073/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of open data from particle physics!
Start typing...
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documentation
Focus on
ATLAS
ALICE
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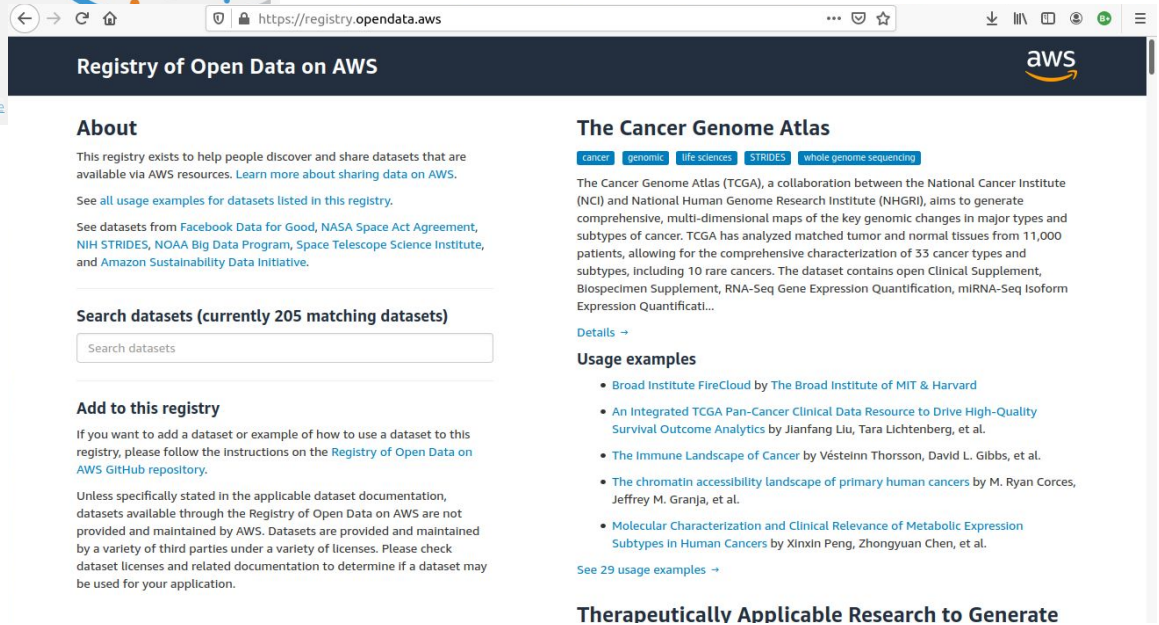
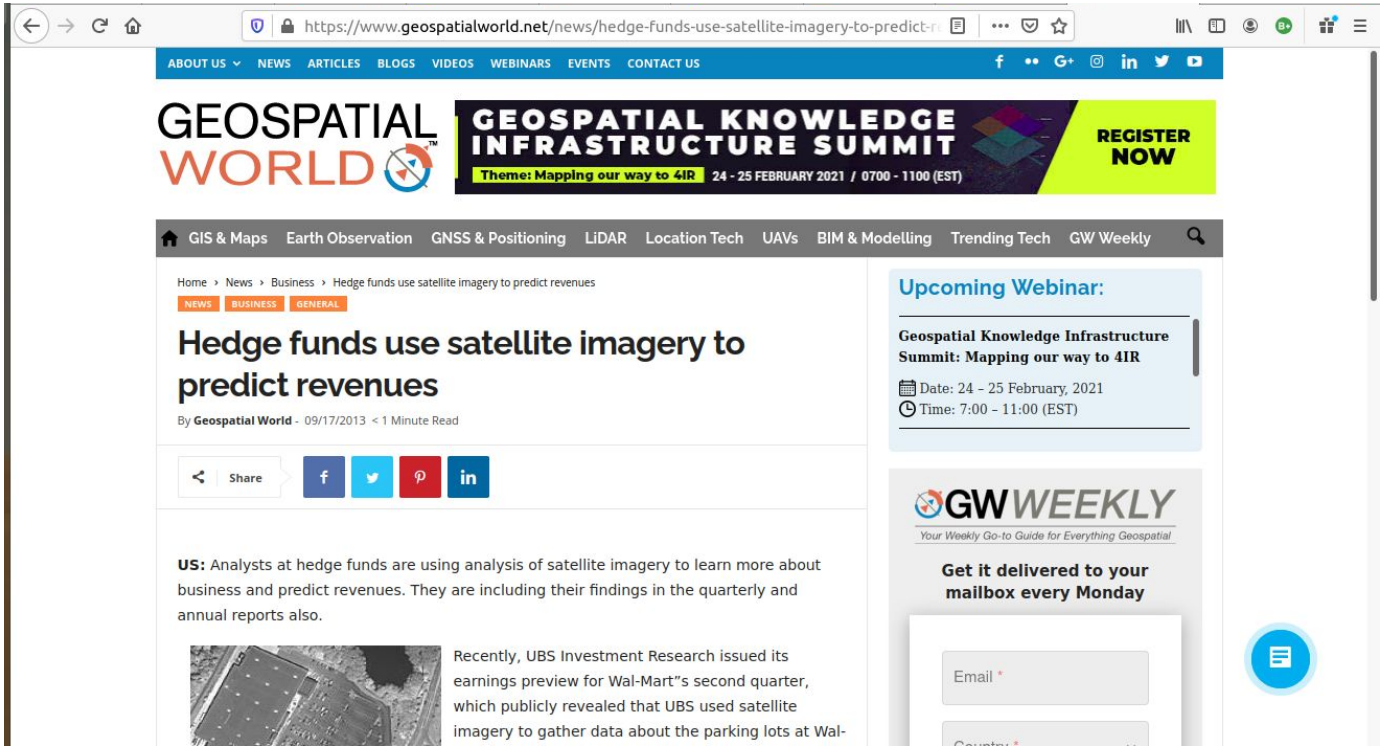
LHCb
OPERA
Data Science


https://registry.opendata.aws
Registry of Open Data on AWS
aws
About
This registry exists to help people discover and share datasets that are available via AWS resources. Learn more about sharing data on AWS.
See all usage examples for datasets listed in this registry.
See datasets from Facebook Data for Good, NASA Space Act Agreement, NIH STRIDES, NOAA Big Data Program, Space Telescope Science Institute, and Amazon Sustainability Data Initiative.
Search datasets (currently 205 matching datasets)
Search datasets
Add to this registry
If you want to add a dataset or example of how to use a dataset to this registry, please follow the instructions on the Registry of Open Data on AWS GitHub repository.
Unless specifically stated in the applicable dataset documentation, datasets available through the Registry of Open Data on AWS are not provided and maintained by AWS. Datasets are provided and maintained by a variety of third parties under a variety of licenses. Please check dataset licenses and related documentation to determine if a dataset may be used for your application.
The Cancer Genome Atlas
cancer
genomic
life sciences
STRIDES
whole genome sequencing
The Cancer Genome Atlas (TCGA), a collaboration between the National Cancer Institute (NCI) and National Human Genome Research Institute (NHGRI), aims to generate comprehensive, multi-dimensional maps of the key genomic changes in major types and subtypes of cancer. TCGA has analyzed matched tumor and normal tissues from 11,000 patients, allowing for the comprehensive characterization of 33 cancer types and subtypes, including 10 rare cancers. The dataset contains open Clinical Supplement, Biospecimen Supplement, RNA-Seq Gene Expression Quantification, miRNA-Seq Isoform Expression Quantificati...
Details →
Usage examples
Broad Institute FireCloud by The Broad Institute of MIT & Harvard
An Integrated TCGA Pan-Cancer Clinical Data Resource to Drive High-Quality Survival Outcome Analytics by Jianfang Liu, Tara Lichtenberg, et al.
The Immune Landscape of Cancer by Vésteinn Thorsson, David L. Gibbs, et al.
The chromatin accessibility landscape of primary human cancers by M. Ryan Corces, Jeffrey M. Granja, et al.
Molecular Characterization and Clinical Relevance of Metabolic Expression Subtypes in Human Cancers by Xinxin Peng, Zhongyuan Chen, et al.
See 29 usage examples →
Therapeutically Applicable Research to Generate

SATÉLITES


https://www.geospatialworld.net/news/hedge-funds-use-satellite-imagery-to-predict-r
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Theme: Mapping our way to 4IR
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BIM & Modelling
Trending Tech
GW Weekly
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BUSINESS
GENERAL
Hedge funds use satellite imagery to predict revenues
By Geospatial World - 09/17/2013 < 1 Minute Read
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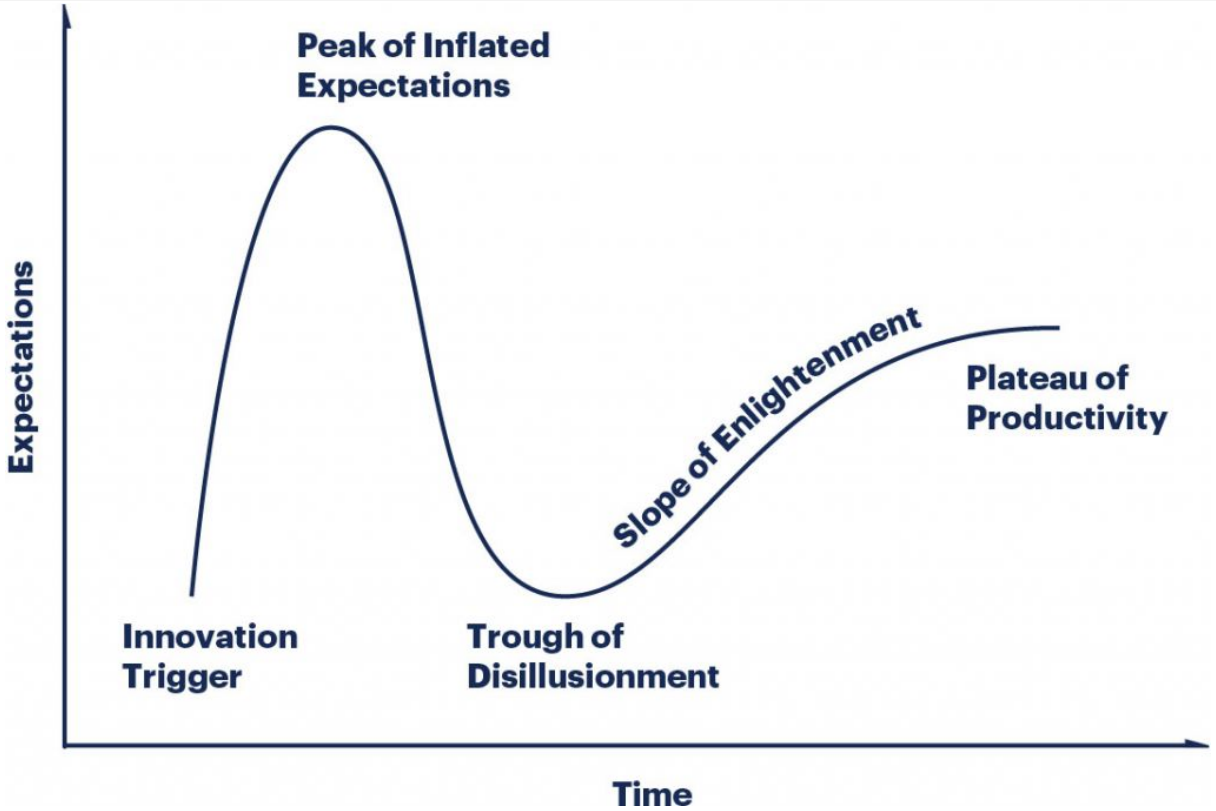
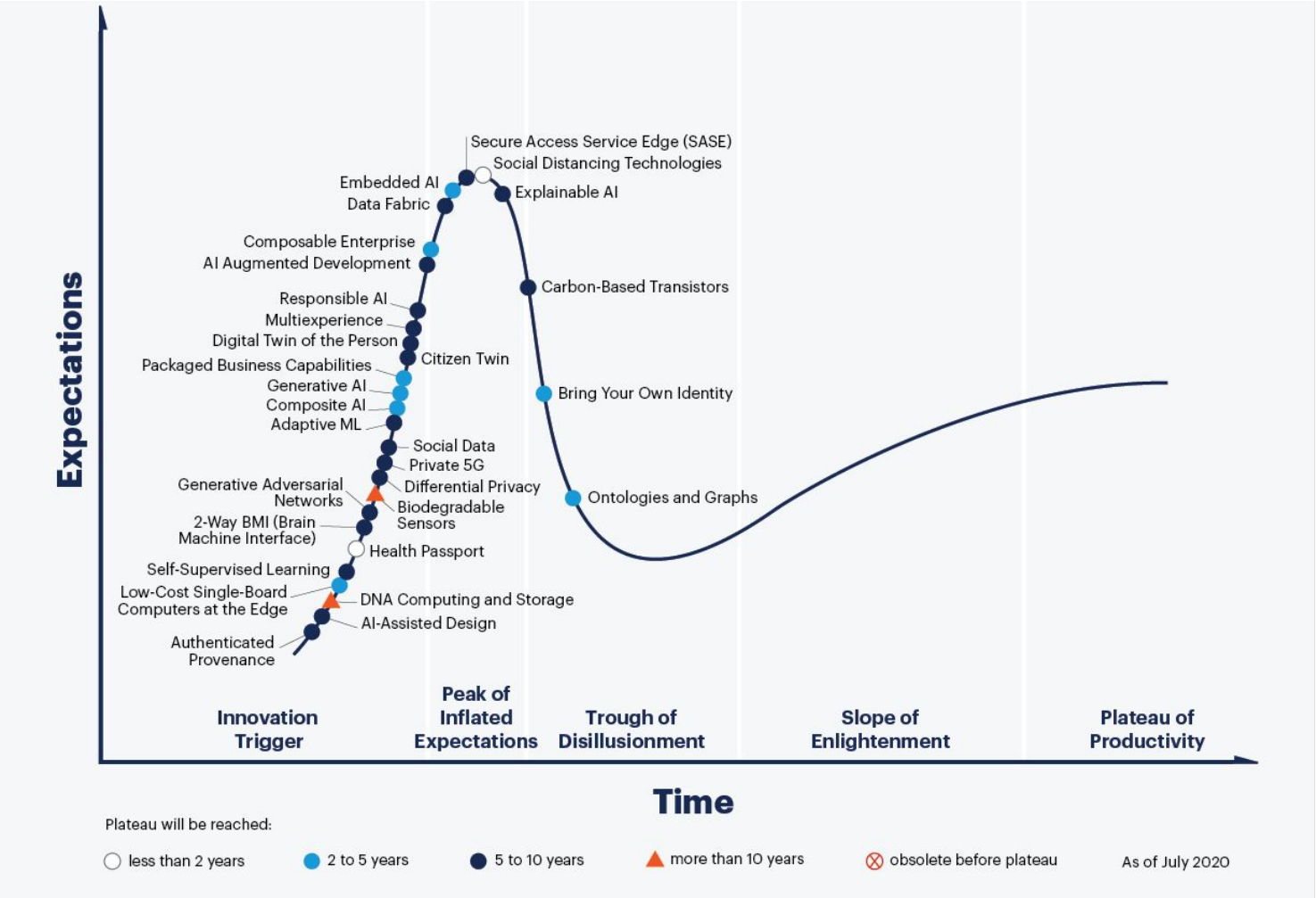
US: Analysts at hedge funds are using analysis of satellite imagery to learn more about business and predict revenues. They are including their findings in the quarterly and annual reports also.
Recently, UBS Investment Research issued its earnings preview for Wal-Mart"s second quarter, which publicly revealed that UBS used satellite imagery to gather data about the parking lots at Wal-
Upcoming Webinar:
Geospatial Knowledge Infrastructure Summit: Mapping our way to 4IR
Date: 24 - 25 February, 2021
Time: 7:00 - 11:00 (EST)
GW WEEKLY
Your Weekly Go-to Guide for Everything Geospatial
Get it delivered to your mailbox every Monday
Email *

HYPE CYCLE (GARTNER)



https://www.bmc.com/blogs/gartner-hype-cycle/



https://www.gartner.com/smarterwithgartner/5-trends-drive-the-gartner-hype-cycle-for-emerging-technologies-2020/

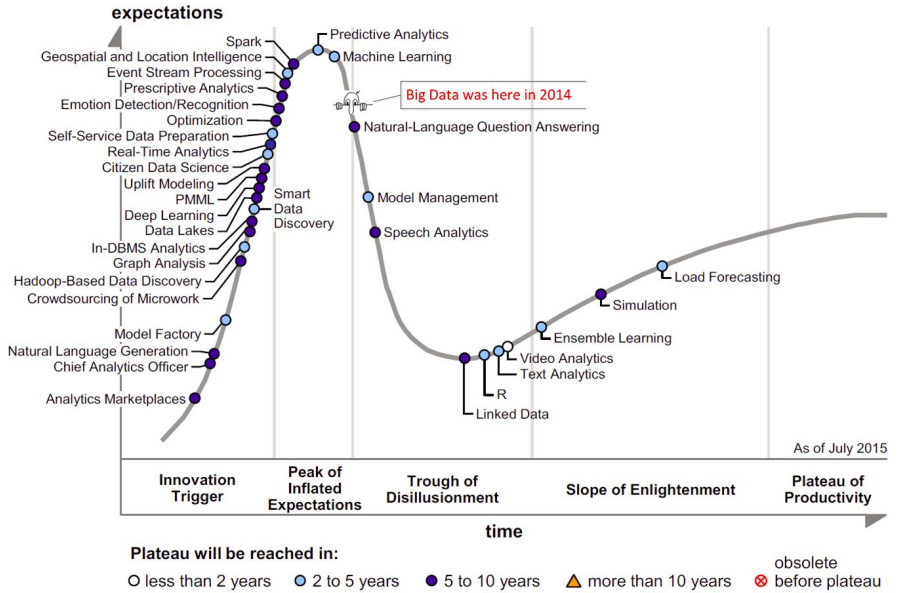
Big Data Falls Off the Hype Cycle

https://www.datasciencecentral.com/profiles/blogs/big-data-falls-off-the-hype-cycle

Why Gartner Dropped Big Data Off the Hype Curve

https://www.datanami.com/2015/08/26/why-gartner-dropped-big-data-off-the-hype-curve/

Figure 1. Hype Cycle for Advanced Analytics and Data Science, 2015



Source: Gartner (July 2015)

WATSON (DEEP BLUE)

WATSON (DEEP BLUE)

https://www.youtube.com/watch?v=HkEOJnn_zlg

GIZMODO BRASIL | ESPECIAIS | GALERIAS | REVIEWS

INTELIGÊNCIA ARTIFICIAL

IBM Watson teria recomendado tratamentos contra câncer "inseguros e incorretos"

Por: Jennings Brown
25 de julho de 2018 às 18:36

0 22

Documentos corporativos internos da IBM mostram que especialistas médicos trabalhando com o supercomputador Watson, da empresa, encontraram "vários exemplos de recomendações de tratamento inseguras e incorretas" ao usarem o software, segundo uma reportagem do *Stat*.

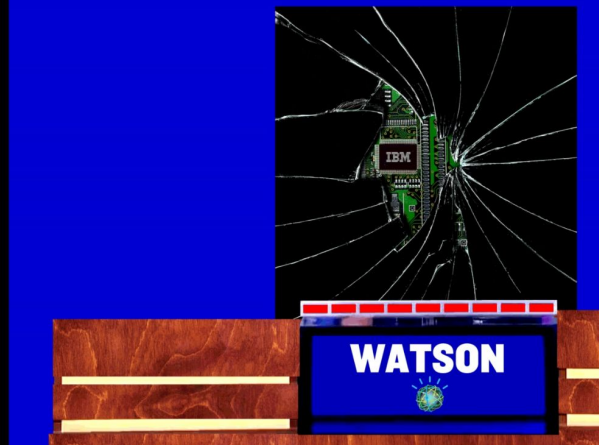
O site revisou documentos que foram incluídos em duas apresentações feitas em junho e julho de

https://gizmodo.uol.com.br/ibm-watson-saude-recomendacao-tratamentos-cancer-inseguros-incorretos/

GIZMODO VIDEO REVIEW SCIENCE IO9 FIELD GUIDE EARTHER DESIGN PALEOFUTURE

GADGETS

Why Everyone Is Hating on IBM Watson—Including the People Who Helped Make It



https://www.technologyreview.com/s/607965/a-reality-check-for-ibms-ai-ambitions/

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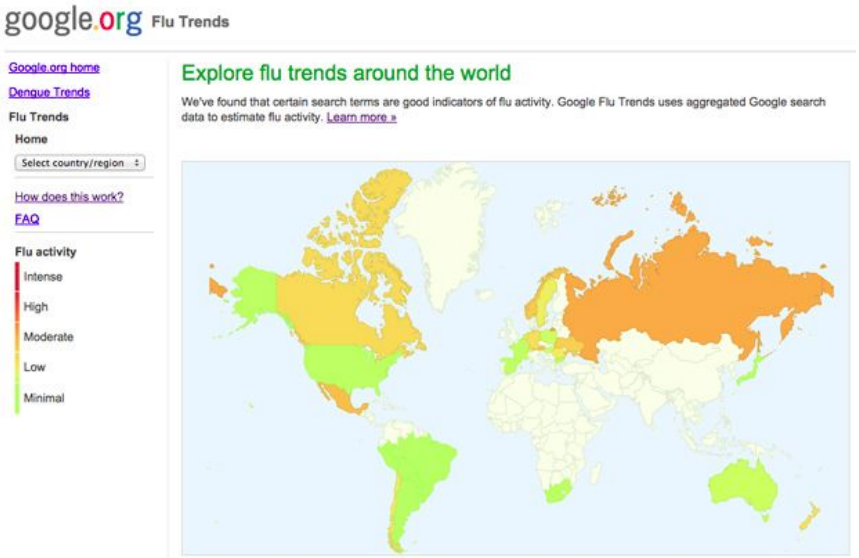
Business Impact

A Reality Check for IBM's AI Ambitions

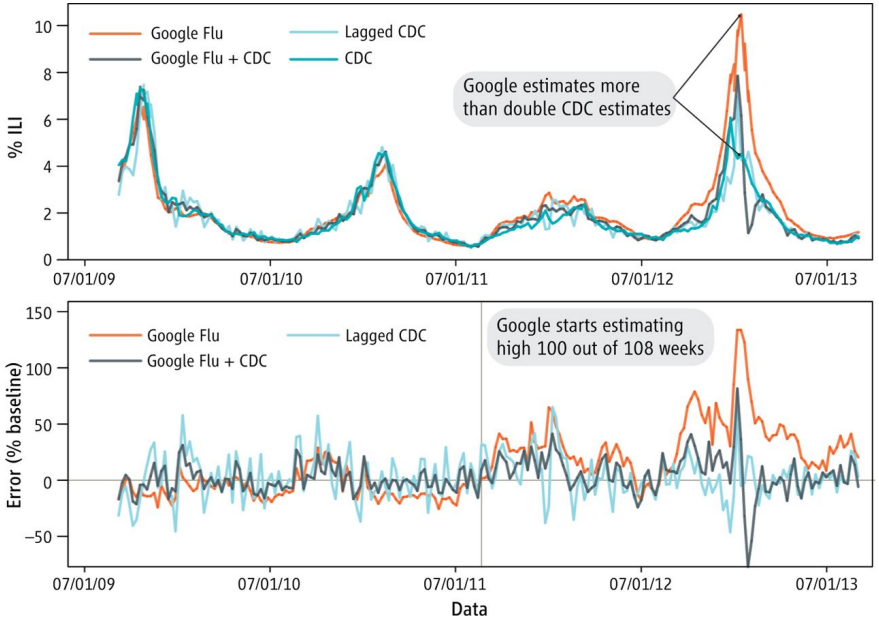
IBM, number 39 on our list of the 50 Smartest Companies, overhyped its Watson machine-learning

https://gizmodo.com/why-everyone-is-hating-on-watson-including-the-people-w-1797510888

GOOGLE FLU (2013)



GOOGLE FLU

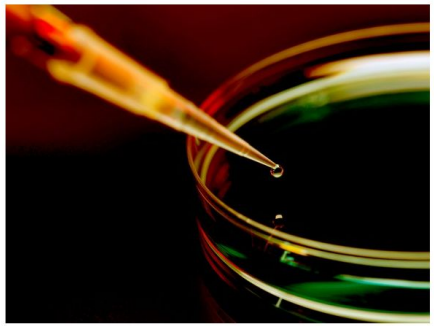


http://science.sciencemag.org/content/343/6176/1203

GOOGLE FLU

DAVID LAZER AND RYAN KENNEDY OPINION 10.01.15 07:00 AM

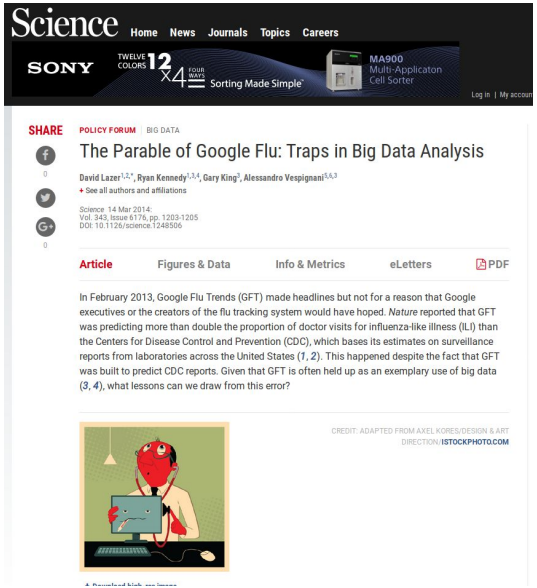
WHAT WE CAN LEARN FROM THE EPIC FAILURE OF GOOGLE FLU TRENDS



RAFE SWAN/GETTY IMAGES

EVERY DAY, MILLIONS of people use Google to dig up information that drives their daily lives, from how long their commute will be to how to treat their child's illness. This search data reveals a lot about the searchers: their wants,

https://www.wired.com/2015/10/can-learn-epic-failure-google-flu-trends/



http://science.sciencemag.org/content/343/6176/1203.full

A má interpretação da posse de bola e os enganos trazidos pelos números frios no Brasil
mais de 3 anos

Variação de sistema, mais jogo curto e presença ofensiva: como funciona o "novo" Atlético de Diego Simeone?
1 mês

Por que o gol da vitória do São Paulo sobre o Flamengo vai muito além do erro de Hugo Souza?
2 meses

Sai Coudet, entra Abel: quais as consequências de tais mudanças no Internacional?
3 meses

A má interpretação da posse de bola e os enganos trazidos pelos números frios no Brasil

Renato Rodrigues

19 Sep, 2017

Mourinho e Guardiola sempre travaram grandes duelos de times com e sem bola Getty Images

O Campeonato Brasileiro de 2017 tem levantado um grande debate sobre a posse de

https://www.digitalnewsasia.com/insights/why-85-big-data-projects-fail

DNA
DIGITAL NEWS ASIA
Your Eye on the Tech Ecosystem

Digital Economy powered by 'MDEC' | Insights | 'Software Testing is' Business | Personal Tech | Nat Infra

Why 85% of Big Data projects fail

By Sharala Axryd April 16, 2019

- *People from the top must define clear problem statements*
- *Deciding to become data driven can be a long, difficult process*

ww.digitalnewsasia.com/digerati50-2020-download

https://www.digitalnewsasia.com/insights/why-85-big-data-projects-fail

https://www.datanami.com/2020/10/01/most-data-science-projects-fail-but-

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October 1, 2020

Most Data Science Projects Fail, But Yours Doesn't Have To

Ryohei Fujimaki

(Poring Studio/Shutterstock)

In an effort to remain competitive in today's increasingly challenging economic times, companies are moving forward with digital transformations — powered by data science and machine learning — at an unprecedented rate. According to PwC 's global study, AI will provide up to 26% boost in GDP for local economies by 2030. Yet, for many companies, implementing data science into various aspects of their businesses can prove difficult if not daunting.

According to Gartner analyst Nick Heudecker, over 85% of data science projects fail. A report from Dimensional Research indicated that only 4% of companies have succeeded in deploying ML models to production environment.

https://www.datanami.com/2020/10/01/most-data-science-projects-fail-but-yours-doesnt-have-to/

“Yet, the connection of data investments to business insights and successful business outcomes remains an elusive ambition for most.”

Forbes

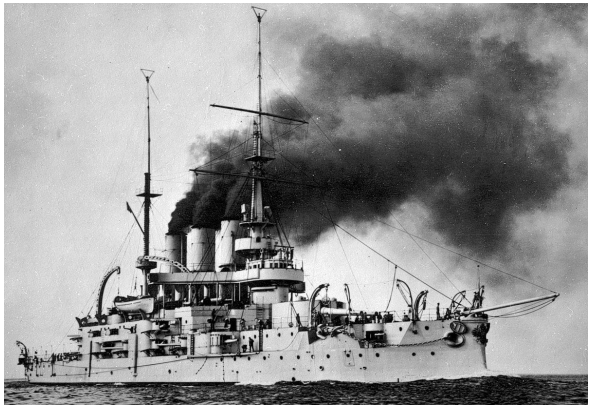
Oct 20, 2020, 01:14pm EDT | 7,786 views

The ‘Failure’ Of Big Data

Randy Bean Contributor ⓘ
CIO Network

https://www.forbes.com/sites/randybean/2020/10/20/the-failure-of-big-data/?sh=7c09883da218


ЭЛЕКТРО-ТЕАТР
УРАН
Сретенка, 19
Со ВТОРНИКА
19
ЯНВАРЯ.
1905
Г.
БРОНЕНОСЕЦ
ПОТЕМКИН
НАЧАЛО: в будни 7.30 9 и 10.30 ч. в праздники с 4 ч. дня




TELEPHONE
TELEPHONE

Estatística

Matemática formal

Relações entre as variáveis

Insights

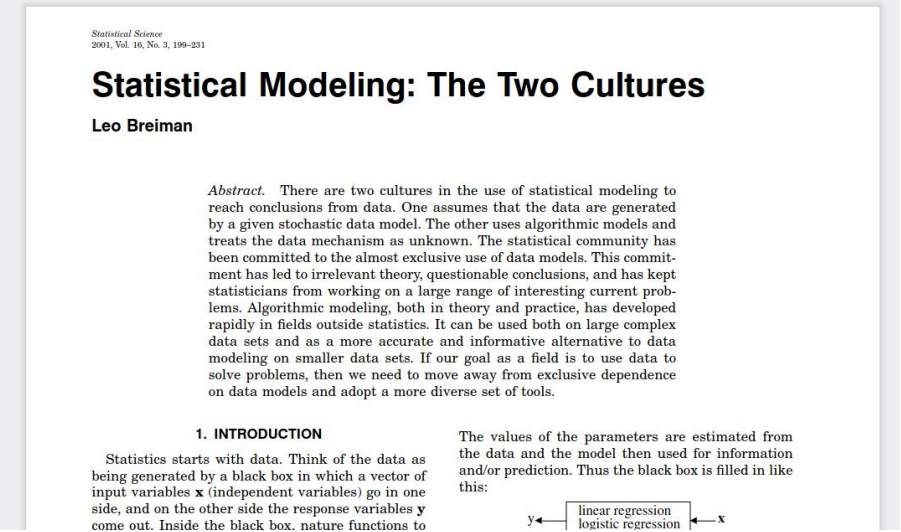
Machine Learning

Algoritmos

Black box

Foco nos resultados

“There are two cultures in the use of statistical modeling to reach conclusions from data. One assumes that the data are generated by a given stochastic data model. The other uses algorithmic models and treats the data mechanism as unknown. The statistical community has been committed to the almost exclusive use of data models. This commitment has led to irrelevant theory, questionable conclusions, and has kept statisticians from working on a large range of interesting current problems.”



Statistical Science
2001, Vol. 16, No. 3, 199–231

Statistical Modeling: The Two Cultures

Leo Breiman

Abstract. There are two cultures in the use of statistical modeling to reach conclusions from data. One assumes that the data are generated by a given stochastic data model. The other uses algorithmic models and treats the data mechanism as unknown. The statistical community has been committed to the almost exclusive use of data models. This commitment has led to irrelevant theory, questionable conclusions, and has kept statisticians from working on a large range of interesting current problems. Algorithmic modeling, both in theory and practice, has developed rapidly in fields outside statistics. It can be used both on large complex data sets and as a more accurate and informative alternative to data modeling on smaller data sets. If our goal as a field is to use data to solve problems, then we need to move away from exclusive dependence on data models and adopt a more diverse set of tools.

1. INTRODUCTION

Statistics starts with data. Think of the data as being generated by a black box in which a vector of input variables **x** (independent variables) go in one side, and on the other side the response variables **y** come out. Inside the black box. nature functions to

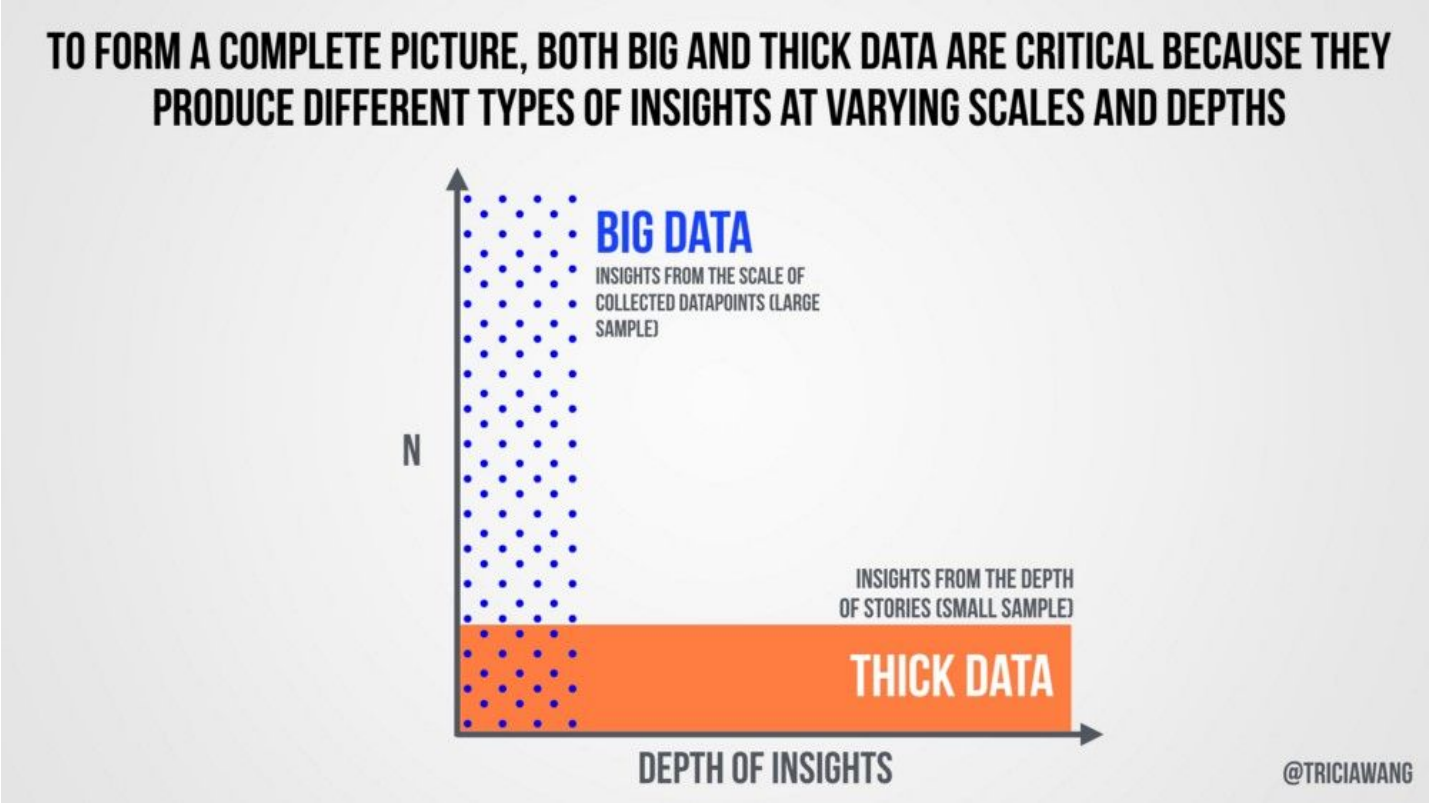
The values of the parameters are estimated from the data and the model then used for information and/or prediction. Thus the black box is filled in like this:

BREIMAN, Leo et al. Statistical modeling: The two cultures. **Statistical science**, v. 16, n. 3, p. 199-231, 2001.

SMALL DATA

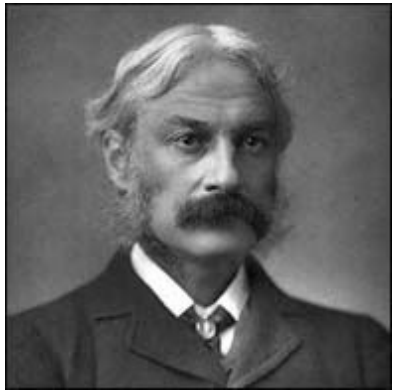
https://www.cgsinc.com/blog/hr-analytics-case-leveraging-small-data-big-data-world

THICK DATA


TO FORM A COMPLETE PICTURE, BOTH BIG AND THICK DATA ARE CRITICAL BECAUSE THEY PRODUCE DIFFERENT TYPES OF INSIGHTS AT VARYING SCALES AND DEPTHS
BIG DATA
INSIGHTS FROM THE SCALE OF COLLECTED DATAPOINTS (LARGE SAMPLE)
N
INSIGHTS FROM THE DEPTH OF STORIES (SMALL SAMPLE)
THICK DATA
DEPTH OF INSIGHTS
@TRICIAWANG

“Alguns usam a estatística como os bêbados usam postes: mais para apoio do que para iluminação.”

Andrew Lang



STELLA CUNLIFFE – GUINNESS

“Como parte do processo de controle de qualidade, os estatísticos acompanhavam as medidas da capacidade dos barris e quais eram descartados. Ao examinar o gráfico de medidas de capacidade, Stella Cunliffe se deu conta de que havia um número incomumente alto de barris que passavam no teste por muito pouco, e um número incomumente baixo de barris que eram rejeitados por muito pouco. Examinaram as condições de trabalho da mulher que media os barris. Ela devia jogar um barril descartado no alto de uma pilha e colocar um barril aprovado em uma esteira transportadora. Por sugestão de Stella Cunliffe, a posição da balança foi deslocada para acima do depósito de barris descartados. Então, tudo que ela tinha de fazer era chutar o barril rejeitado para o depósito. O excesso de barris que eram aprovados por pouco desapareceu. “

(Uma senhora toma chá... Como a estatística revolucionou a ciência no século XX. Capítulo 25)

GENCHI GENBUTSU – GEMBA

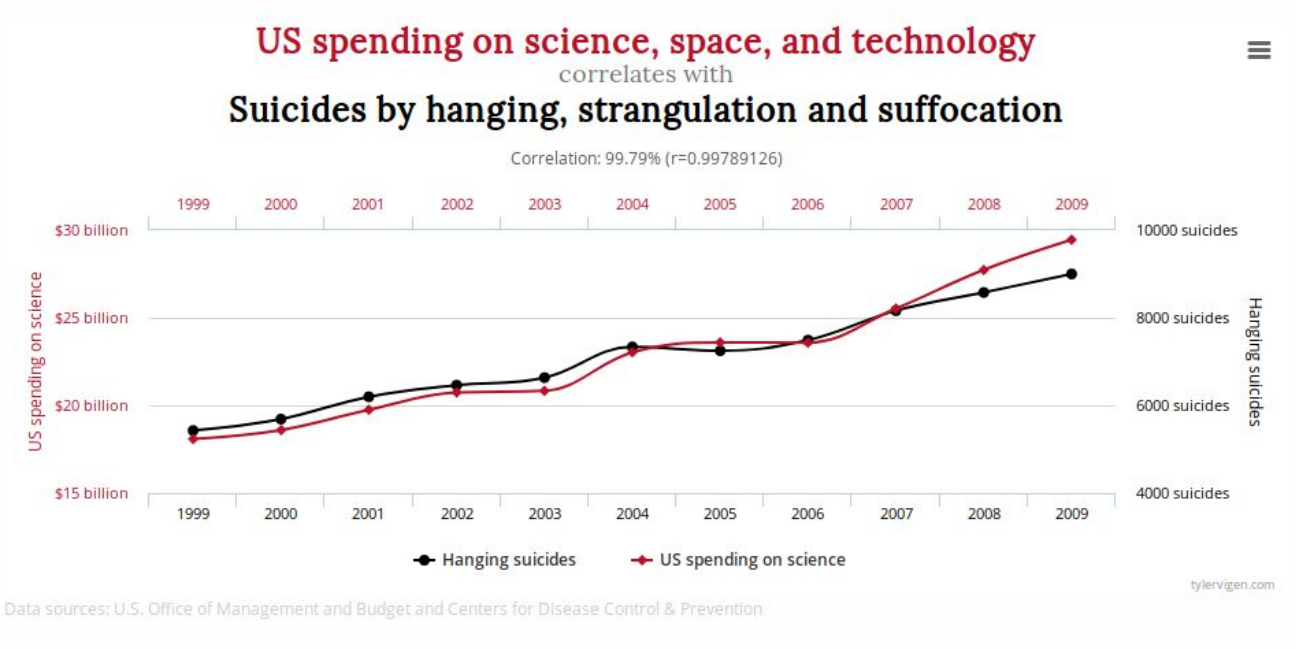
Criado na década de 80 por Masaaki Imai, Genchi Genbutsu significa “vá e veja por você mesmo”. Princípio que estabelece a primazia do conhecimento tácito e pessoal, e que o primeiro passo para a solução de qualquer problema está em ir onde ele ocorre .

O local onde as coisas ocorrem, ou o “chão de fábrica”, é chamado de Gemba.
A técnica que os gestores sempre vão onde as coisas ocorrem é chamada Gemba Walk e é utilizada para observar e compreender como o trabalho é feito.

CORRELAÇÃO

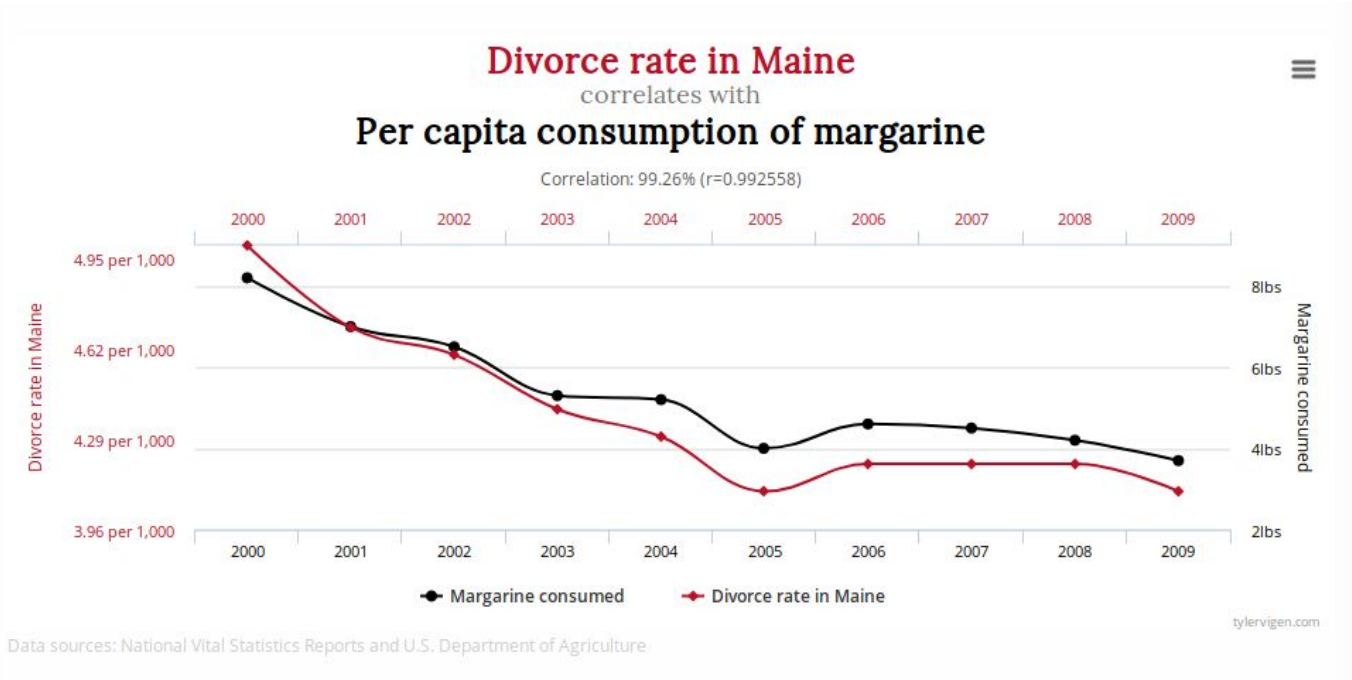

Correlações altas (Positivas ou Negativas)
Correlações legítimas

CORRELAÇÃO ESPÚRIA



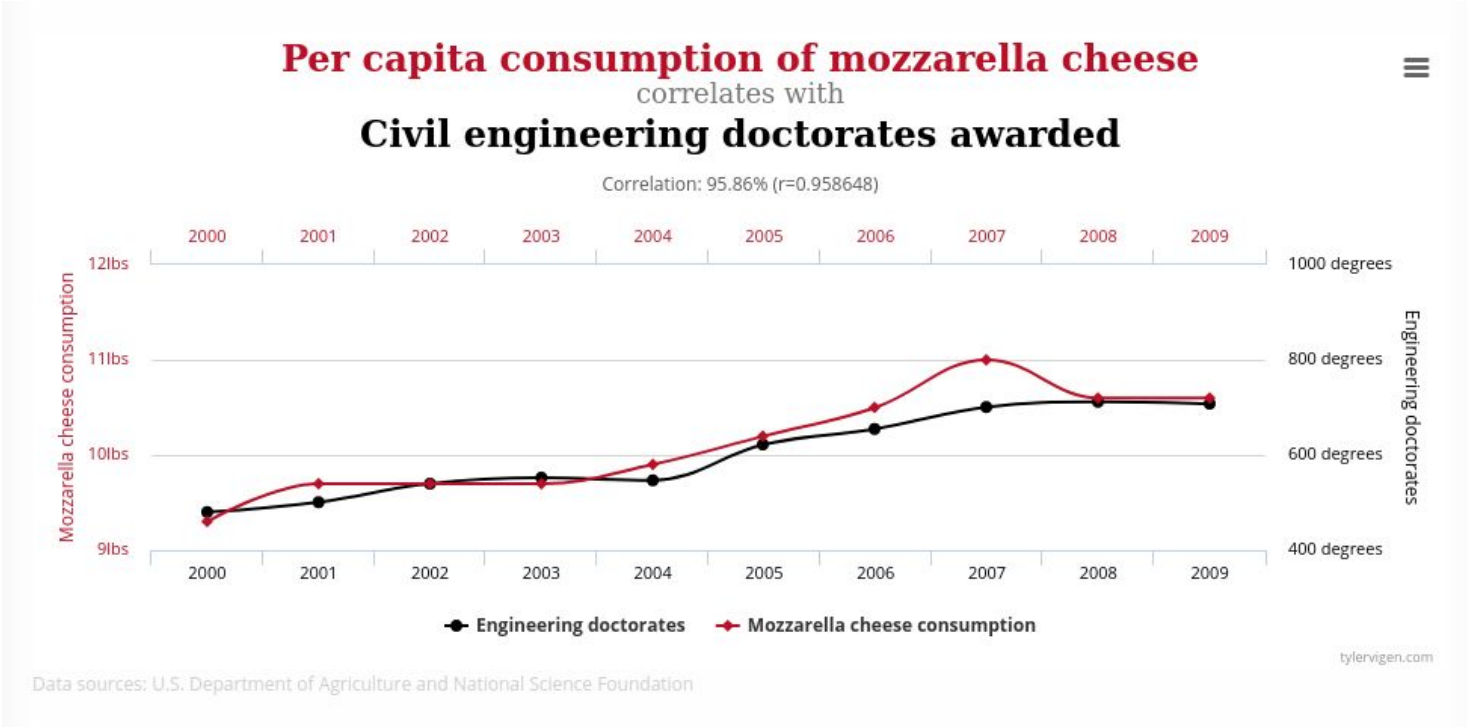
https://www.tylervigen.com/spurious-correlations

CORRELAÇÃO ESPÚRIA



https://www.tylervigen.com/spurious-correlations

CORRELAÇÃO ESPÚRIA



https://www.tylervigen.com/spurious-correlations

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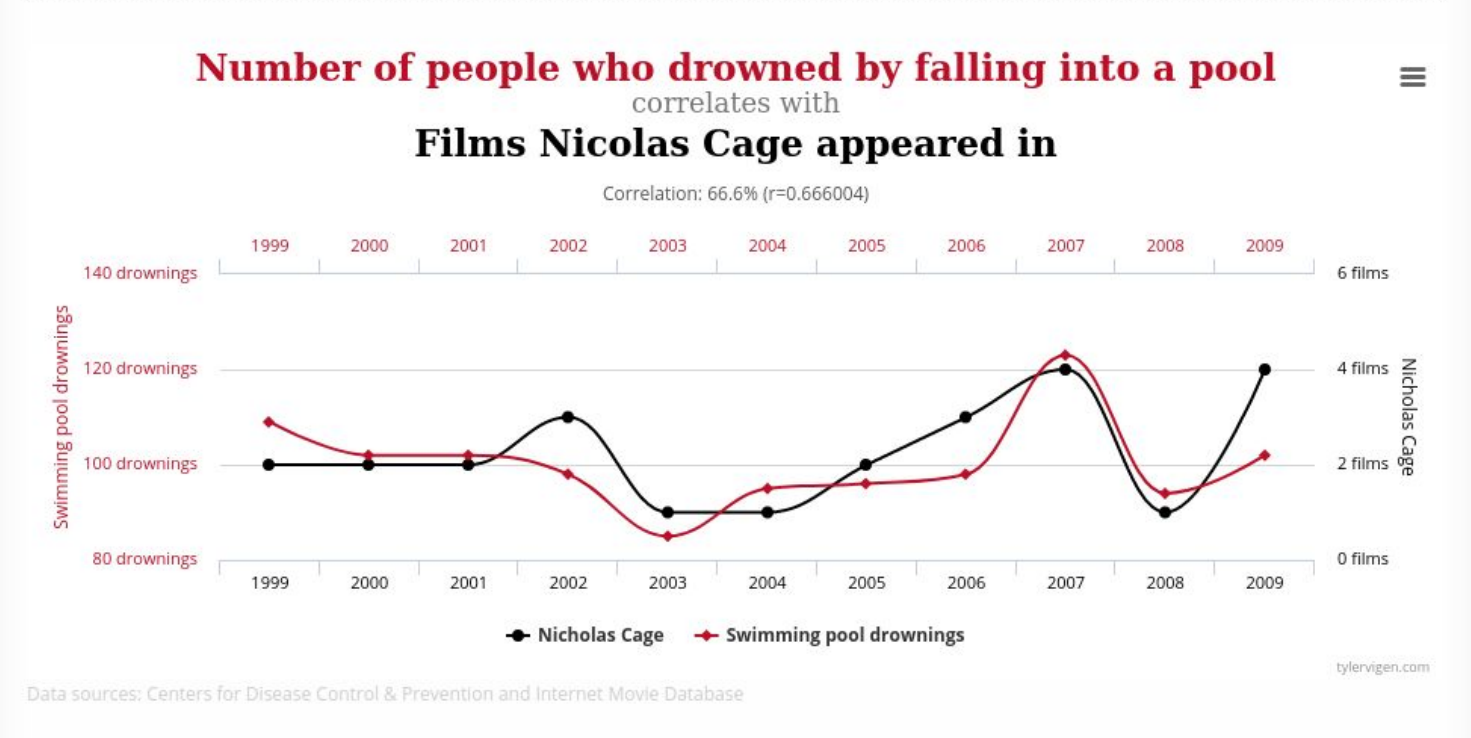


https://www.tylervigen.com/spurious-correlations

LIMITE RAM

Bigmemory, biganalytics, ...

Opções de trabalhar com base de dados sem carregá-las na RAM (< 10GB):

R: ff, bigmemory, biganalytics, bigtabulate

Python: Dask

https://rpubs.com/msundar/large_data_analysis

ORACLE R DISTRIBUTION

Oracle R Distribution

Ability to dynamically load

Intel Math Kernel Library (MKL)
AMD Core Math Library (ACML)
Solaris Sun Performance Library

Oracle Support

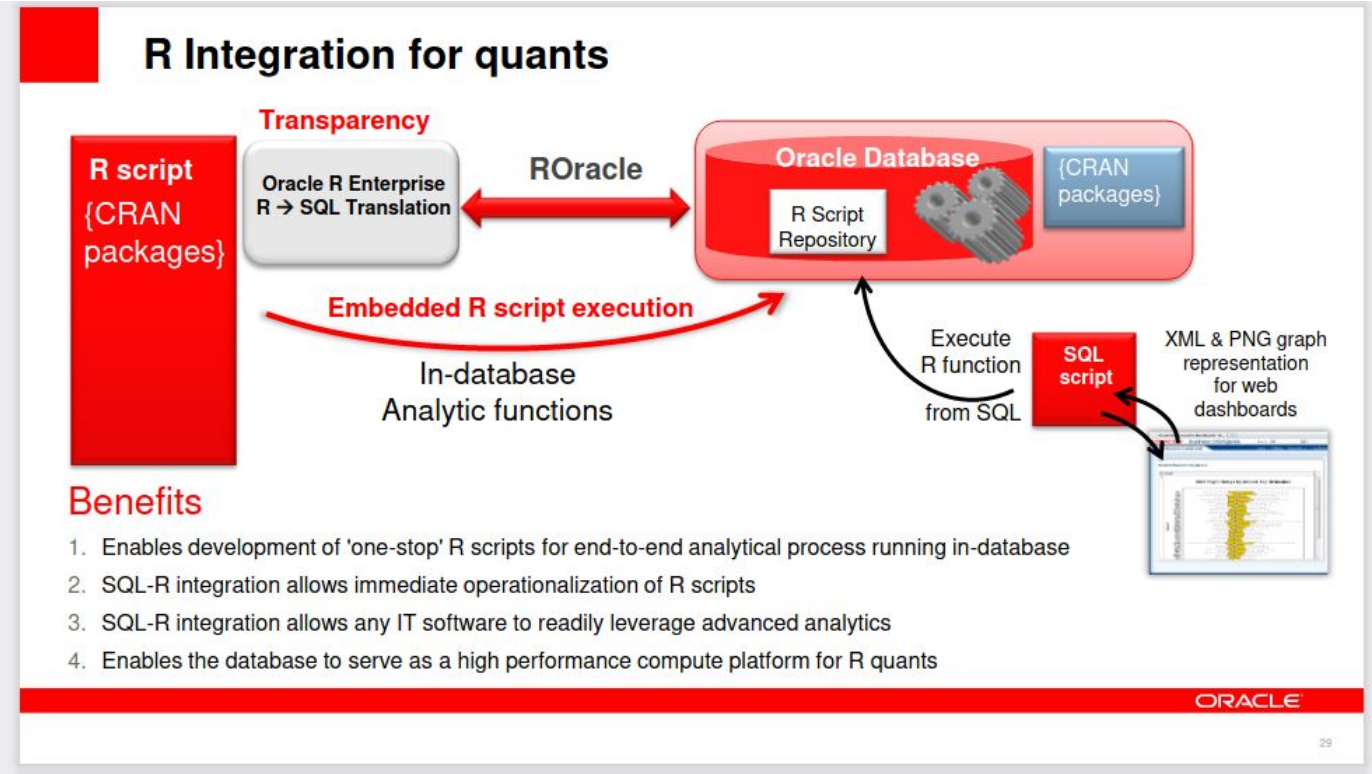
- Oracle's redistribution of open source R
- Enhanced linear algebra performance using Intel's MKL, AMD's ACML, and Sun Performance Library for Solaris
- Improve R scalability at client and at database server for embedded R execution
- Enterprise support for customers of Oracle Advanced Analytics option, Big Data Appliance, and Oracle Linux
- **Free** download
- Oracle makes bug fixes and enhancements available for open source R

ORACLE

14

https://www.oracle.com/assets/media/oraclertechnologies-2188877.pdf

ORACLE R DISTRIBUTION



https://www.oracle.com/assets/media/oraclertechnologies-2188877.pdf

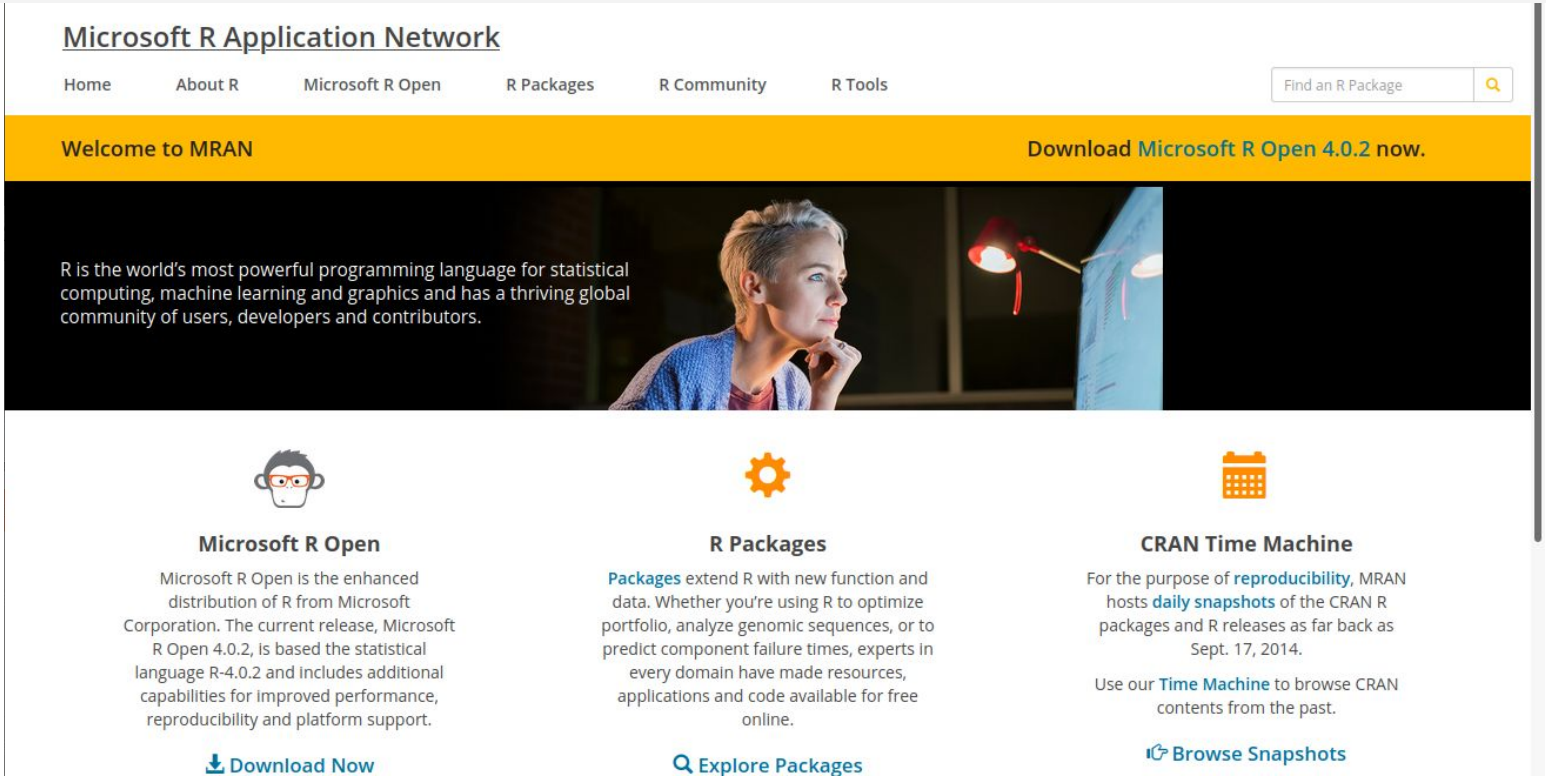
ORACLE R DISTRIBUTION

https://www.oracle.com/br/database/technologies/datawarehouse-bigdata/oml4r.html

https://oss.oracle.com/ORD/

https://docs.microsoft.com/pt-br/sql/machine-learning/sql-server-machine-learning-services?view=sql-server-ver15&viewFallbackFrom=sql-server-2016

MICROSOFT R OPEN

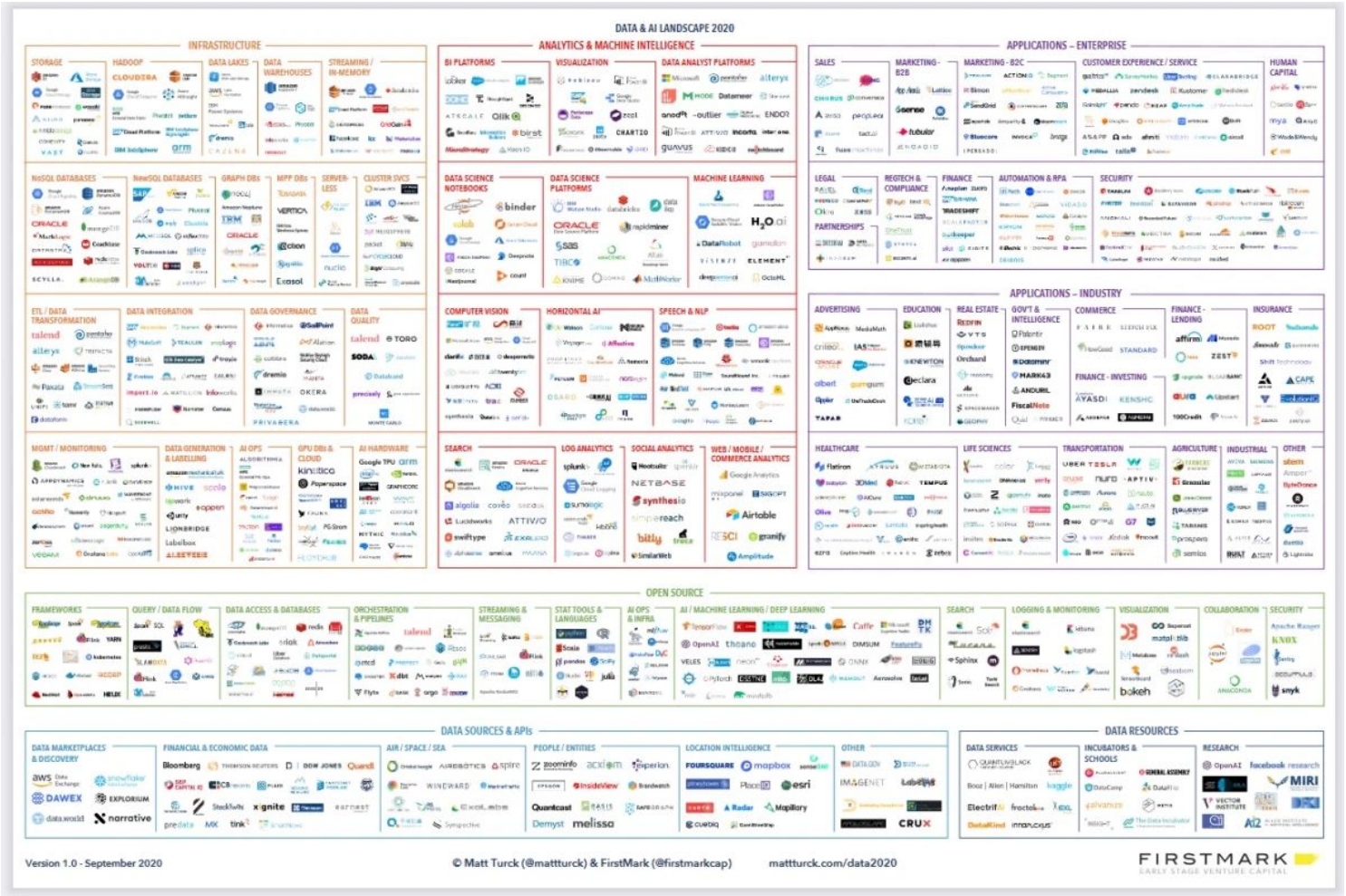


https://mran.microsoft.com/

Flink

APACHE
HBASE

CLOUDERA



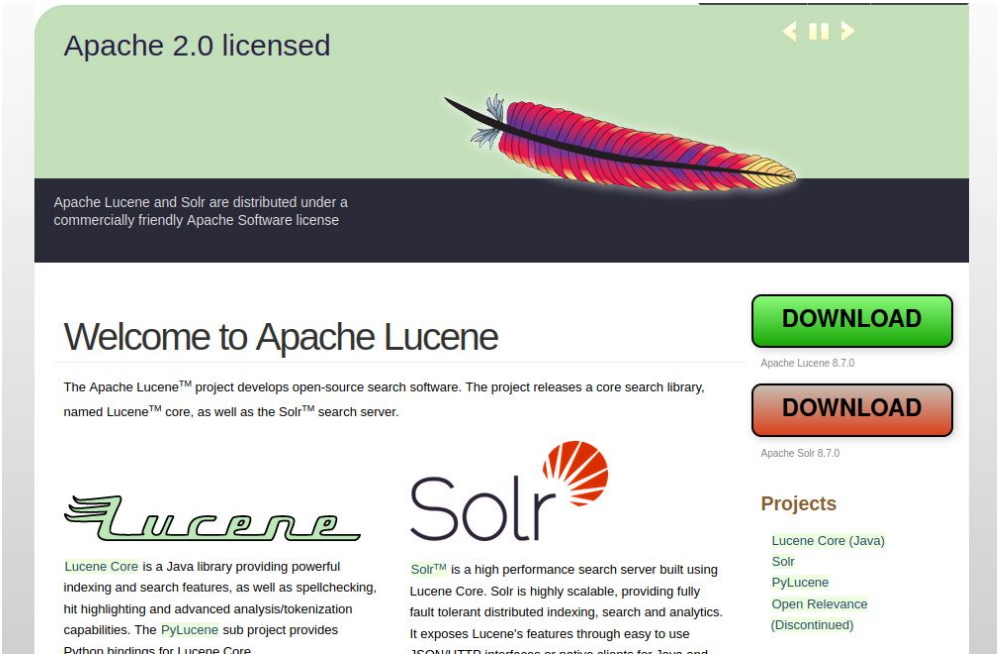
https://venturebeat.com/2020/10/21/the-2020-data-and-ai-landscape/

HISTÓRICO

APACHE LUCENE (1997)

Open Source Search Engine

Doug Cutting



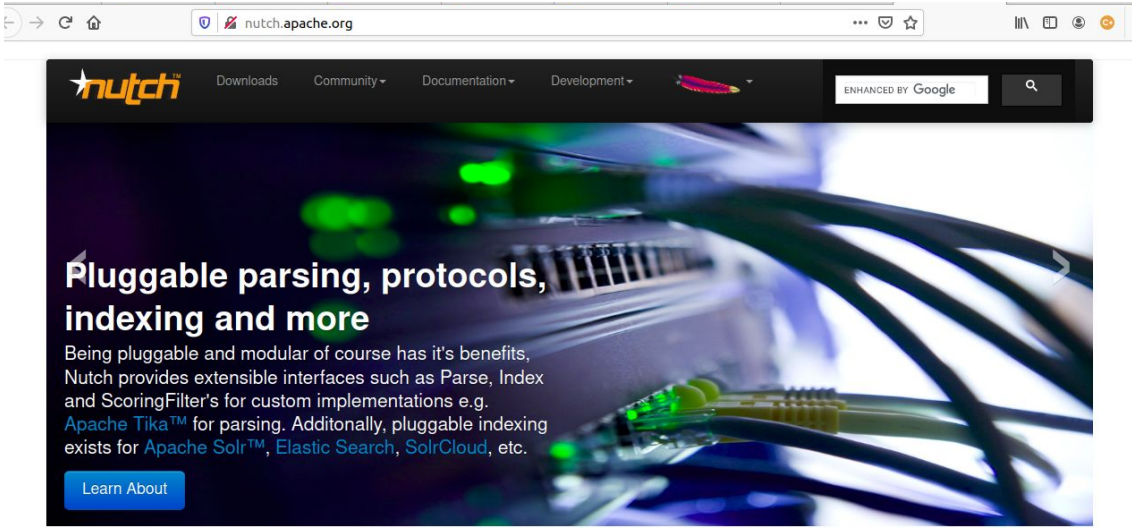
https://lucene.apache.org/

APACHE NUTCH (2001)

Web Crawler

Doug Cutting

Mike Cafarella

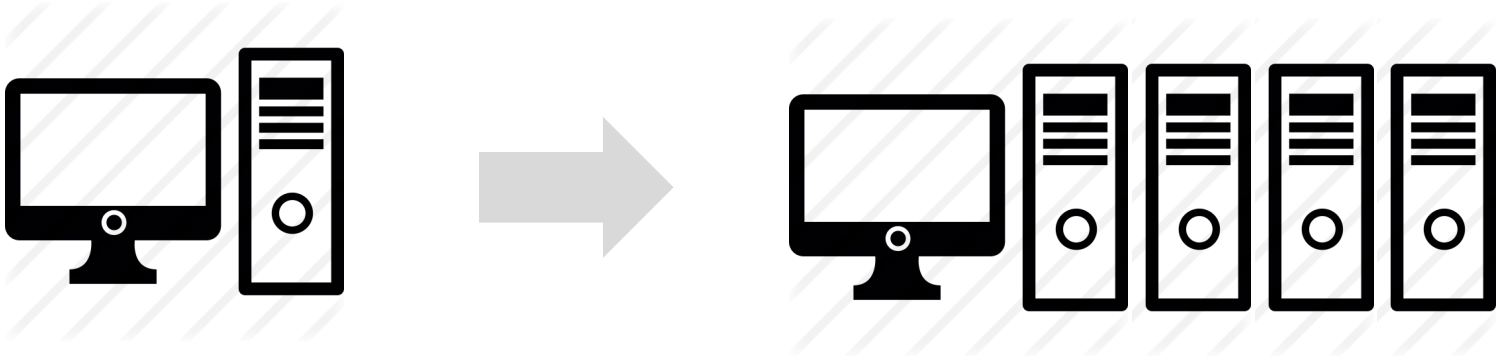


http://nutch.apache.org/

APACHE NUTCH

Começou em apenas uma máquina (single-core, 1GB de RAM, 1TB). O limite de indexação ficava em 100 milhões de páginas.

Aumento para 4 máquinas. Porém, a manutenção e gestão da utilização das máquinas era manual (além do problema de gestão crescer exponencialmente com o aumento no número de máquinas)



NECESSIDADES DO NUTCH

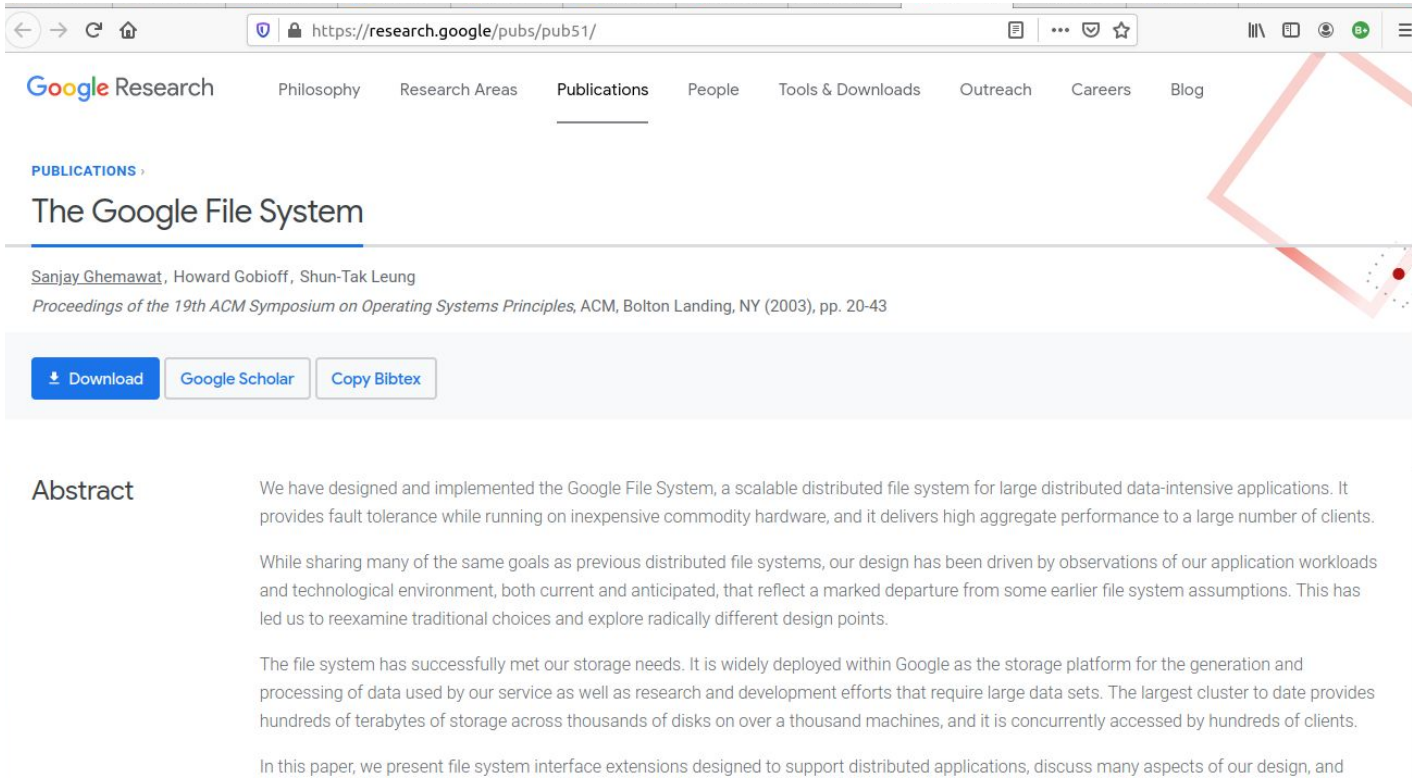
“

- ***schemaless*** *with no predefined structure, i.e. no rigid schema with tables and columns (and column types and sizes)*
- ***durable*** *once data is written it should never be lost*
- ***capable of handling component failure*** *without human intervention (e.g. CPU, disk, memory, network, power supply, MB)*
- ***automatically rebalanced*** *to even out disk space consumption throughout cluster*

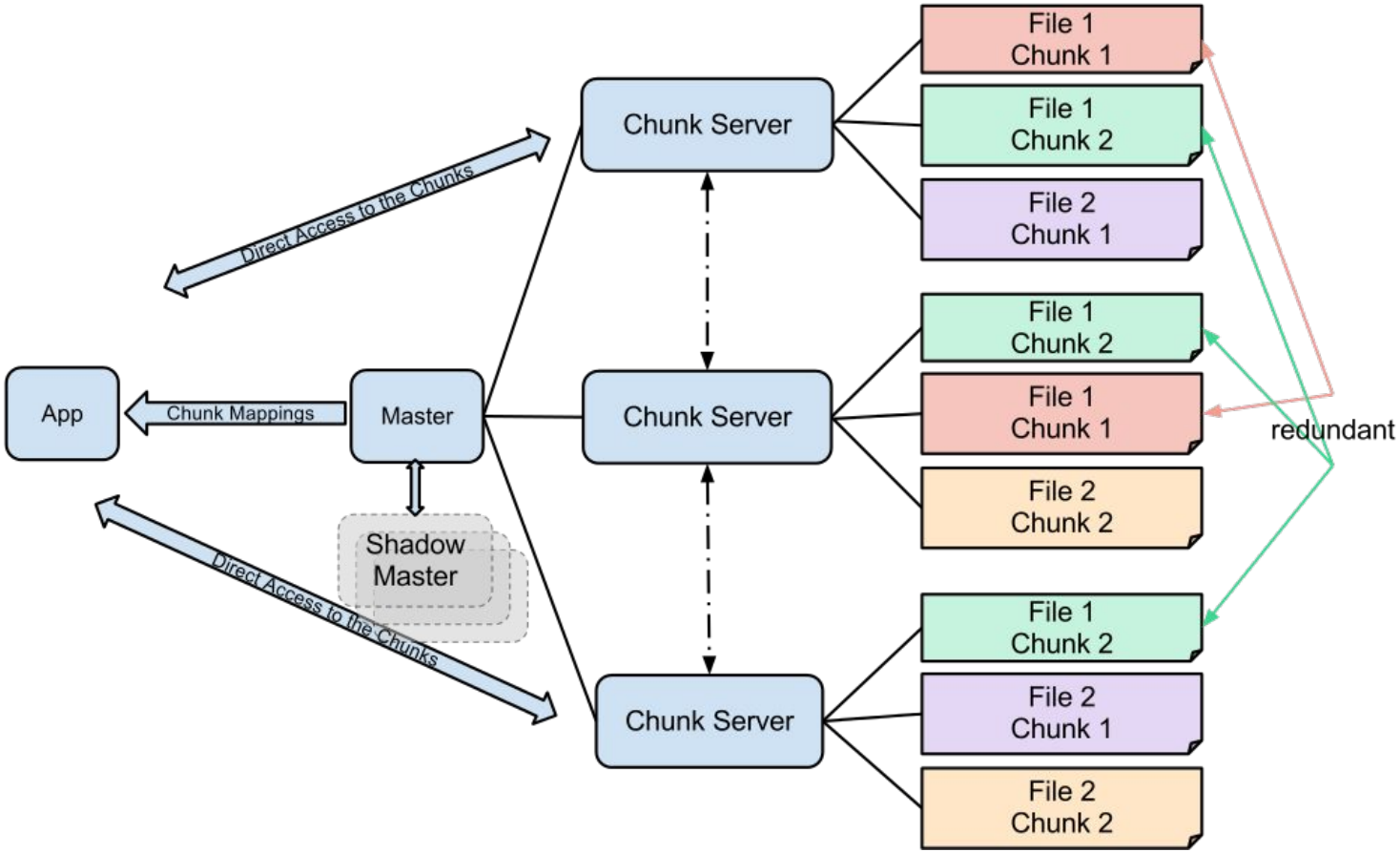
“

https://medium.com/@markobonaci/the-history-of-hadoop-68984a11704

GOOGLE FILE SYSTEM (2003)



https://research.google/pubs/pub51/



https://en.wikipedia.org/wiki/Google_File_System

NUTCH DISTRIBUTED FILE SYSTEM (NDFS)

- Escrito em Java a partir das especificações do Google File System (GFS)

- Arquivos divididos em pedaços de 64MB em 3 diferentes nós (replicação automática)

MAP REDUCE (2004)

MapReduce: Simplified Data Processing on Large Clusters

Jeffrey Dean and Sanjay Ghemawat

jeff@google.com, sanjay@google.com

Google, Inc.

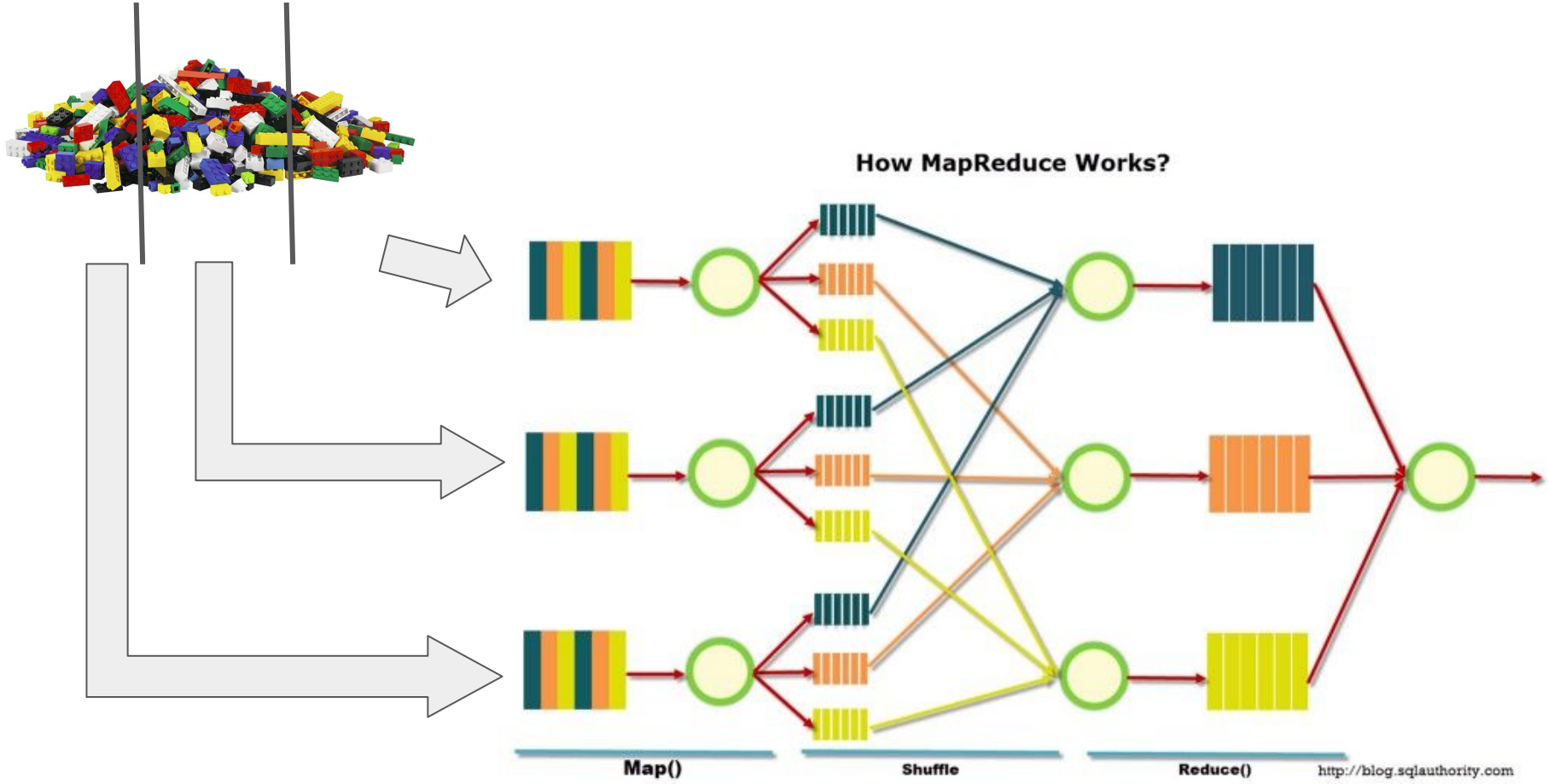
Abstract

MapReduce is a programming model and an associated implementation for processing and generating large data sets. Users specify a *map* function that processes a key/value pair to generate a set of intermediate key/value pairs, and a *reduce* function that merges all intermediate values associated with the same intermediate key. Many real world tasks are expressible in this model, as shown in the paper.

given day, etc. Most such computations are conceptually straightforward. However, the input data is usually large and the computations have to be distributed across hundreds or thousands of machines in order to finish in a reasonable amount of time. The issues of how to parallelize the computation, distribute the data, and handle failures conspire to obscure the original simple computation with large amounts of complex code to deal with these issues.

As a reaction to this complexity, we designed a new

http://static.googleusercontent.com/media/research.google.com/es/us/archive/mapreduce-osdi04.pdf


How MapReduce Works?
Map()
Shuffle
Reduce()
http://blog.sqlauthority.com

HADOOP (2006)

2005 - Map Reduce incluído no Nutch

2006 - NDFS e MapReduce retirados do Nutch e é estabelecido o projeto Hadoop, dentro do Lucene (NDFS se torna HDFS)

2006 em diante ...

2006 - Yahoo contrata Cutting para implementar o sistema Hadoop

2007 - Yahoo reporta rodar Hadoop em um cluster de 1.000 máquinas

2008 - Hadoop se “gradua” (sai debaixo do Lucene)

2012 - Hadoop v2.0.0 (YARN, aka NextGen MapReduce)

2012 - Cluster Hadoop do Yahoo com 42.000 máquinas

...

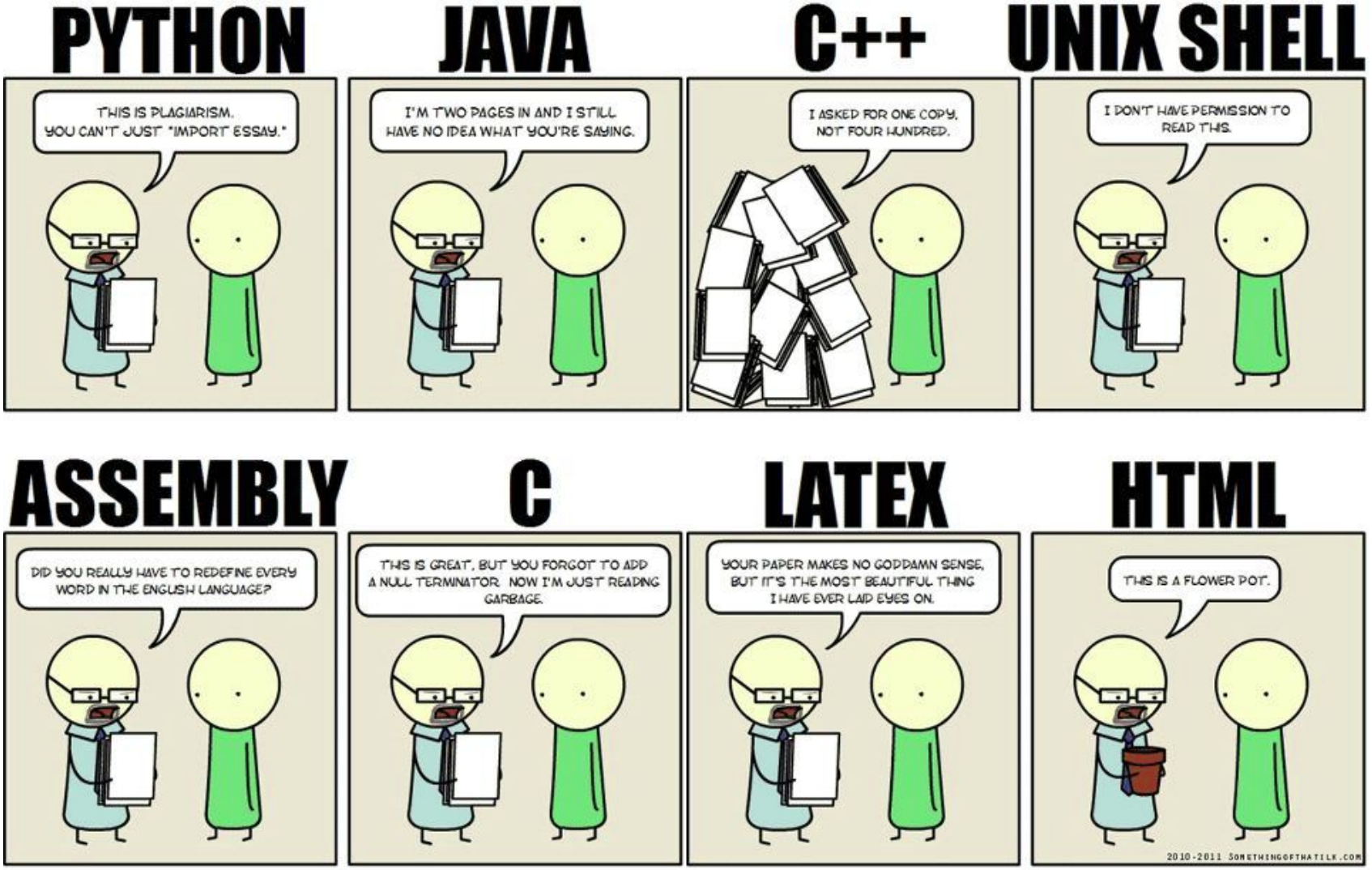
DOUG CUTTING

Doug Cutting: The Origins of Hadoop

https://www.youtube.com/watch?v=ebgXN7VaIZA&feature=emb_title

Doug Cutting: The Name of Hadoop

https://www.youtube.com/watch?v=irK7xHUmkUA&feature=emb_title


PYTHON
THIS IS PLAGIARISM. YOU CAN'T JUST "IMPORT ESSAY."
JAVA
I'M TWO PAGES IN AND I STILL HAVE NO IDEA WHAT YOU'RE SAYING.
C++
I ASKED FOR ONE COPY, NOT FOUR HUNDRED.
UNIX SHELL
I DON'T HAVE PERMISSION TO READ THIS.
ASSEMBLY
DID YOU REALLY HAVE TO REDEFINE EVERY WORD IN THE ENGLISH LANGUAGE?
C
THIS IS GREAT, BUT YOU FORGOT TO ADD A NULL TERMINATOR. NOW I'M JUST READING GARBAGE.
LATEX
YOUR PAPER MAKES NO GODDAMN SENSE, BUT IT'S THE MOST BEAUTIFUL THING I HAVE EVER LAID EYES ON.
HTML
THIS IS A FLOWER POT.
2010-2011 SOMETHINGOFTHATILK.COM

mapper

```
1.  package com.javatpoint;
2.
3.  import java.io.IOException;
4.  import java.util.StringTokenizer;
5.  import org.apache.hadoop.io.IntWritable;
6.  import org.apache.hadoop.io.LongWritable;
7.  import org.apache.hadoop.io.Text;
8.  import org.apache.hadoop.mapred.MapReduceBase;
9.  import org.apache.hadoop.mapred.Mapper;
10. import org.apache.hadoop.mapred.OutputCollector;
11. import org.apache.hadoop.mapred.Reporter;
12. public class WC_Mapper extends MapReduceBase implements Mapper<LongWritable,Text,Text,IntWritable>{
13.     private final static IntWritable one = new IntWritable(1);
14.     private Text word = new Text();
15.     public void map(LongWritable key, Text value,OutputCollector<Text,IntWritable> output,
16.             Reporter reporter) throws IOException{
17.         String line = value.toString();
18.         StringTokenizer  tokenizer = new StringTokenizer(line);
19.         while (tokenizer.hasMoreTokens()){
20.             word.set(tokenizer.nextToken());
21.             output.collect(word, one);
22.         }
23.     }
24.
25. }
```

https://www.javatpoint.com/mapreduce-word-count-example

reducer

```
1.  package com.javatpoint;
2.     import java.io.IOException;
3.     import java.util.Iterator;
4.     import org.apache.hadoop.io.IntWritable;
5.     import org.apache.hadoop.io.Text;
6.     import org.apache.hadoop.mapred.MapReduceBase;
7.     import org.apache.hadoop.mapred.OutputCollector;
8.     import org.apache.hadoop.mapred.Reducer;
9.     import org.apache.hadoop.mapred.Reporter;
10.
11.    public class WC_Reducer  extends MapReduceBase implements Reducer<Text,IntWritable,Text,IntWritable> {
12.    public void reduce(Text key, Iterator<IntWritable> values,OutputCollector<Text,IntWritable> output,
13.     Reporter reporter) throws IOException {
14.    int sum=0;
15.    while (values.hasNext()) {
16.    sum+=values.next().get();
17.    }
18.    output.collect(key,new IntWritable(sum));
19.    }
20.    }
```

https://www.javatpoint.com/mapreduce-word-count-example

runner

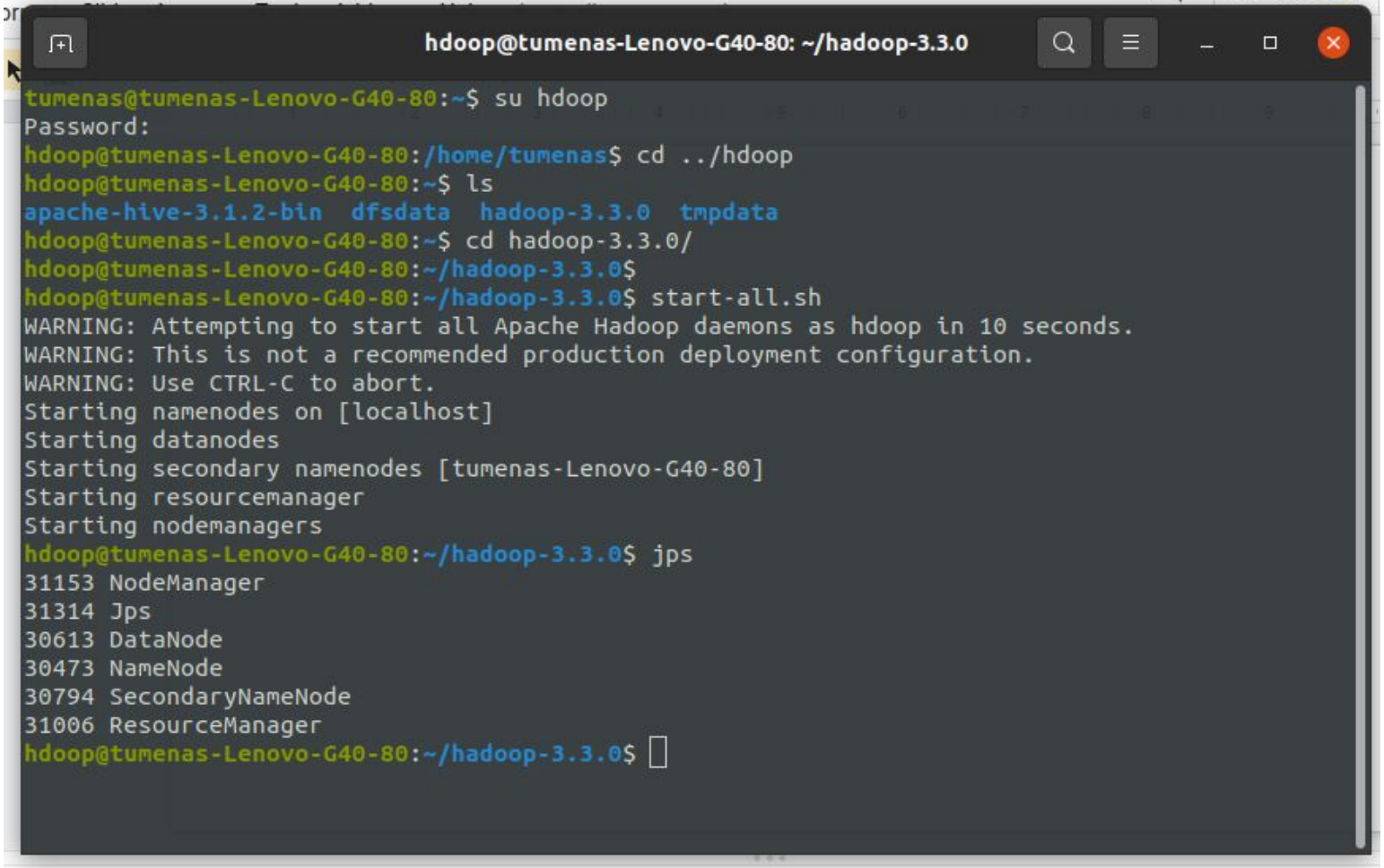
```
1.  package com.javatpoint;
2.
3.      import java.io.IOException;
4.      import org.apache.hadoop.fs.Path;
5.      import org.apache.hadoop.io.IntWritable;
6.      import org.apache.hadoop.io.Text;
7.      import org.apache.hadoop.mapred.FileInputFormat;
8.      import org.apache.hadoop.mapred.FileOutputFormat;
9.      import org.apache.hadoop.mapred.JobClient;
10.     import org.apache.hadoop.mapred.JobConf;
11.     import org.apache.hadoop.mapred.TextInputFormat;
12.     import org.apache.hadoop.mapred.TextOutputFormat;
13.     public class WC_Runner {
14.         public static void main(String[] args) throws IOException{
15.             JobConf conf = new JobConf(WC_Runner.class);
16.             conf.setJobName("WordCount");
17.             conf.setOutputKeyClass(Text.class);
18.             conf.setOutputValueClass(IntWritable.class);
19.             conf.setMapperClass(WC_Mapper.class);
20.             conf.setCombinerClass(WC_Reducer.class);
21.             conf.setReducerClass(WC_Reducer.class);
22.             conf.setInputFormat(TextInputFormat.class);
23.             conf.setOutputFormat(TextOutputFormat.class);
24.             FileInputFormat.setInputPaths(conf,new Path(args[0]));
25.             FileOutputFormat.setOutputPath(conf,new Path(args[1]));
26.             JobClient.runJob(conf);
27.         }
28.     }
```

https://www.javatpoint.com/mapreduce-word-count-example

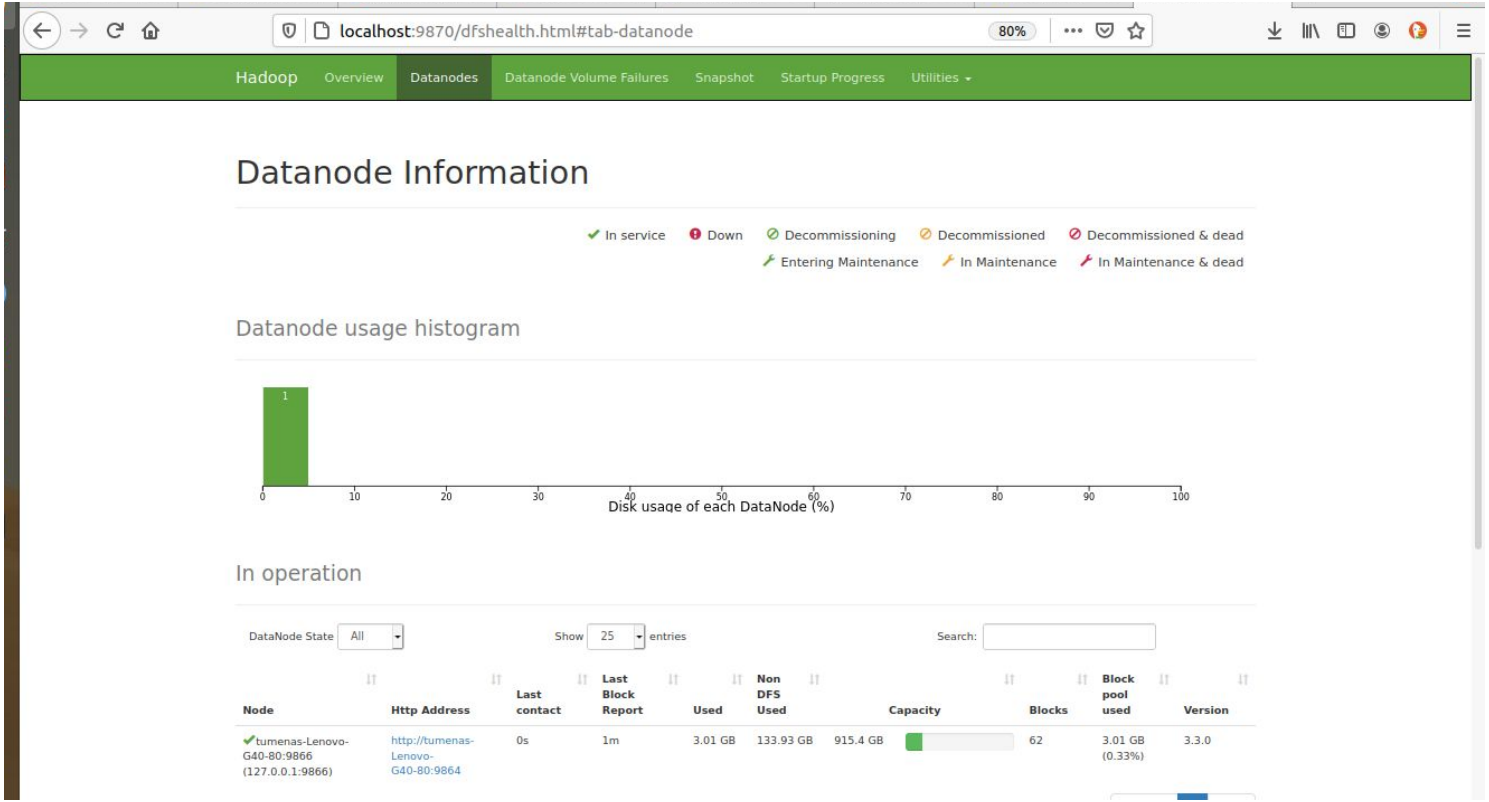
```
#!/usr/bin/env python3
"""mapper.py"""

import sys

for line in sys.stdin:
        line = line.strip()
        words = line.split()
        for word in words:
                print('%s\t%s' % (word, 1))
```

Reducer Python

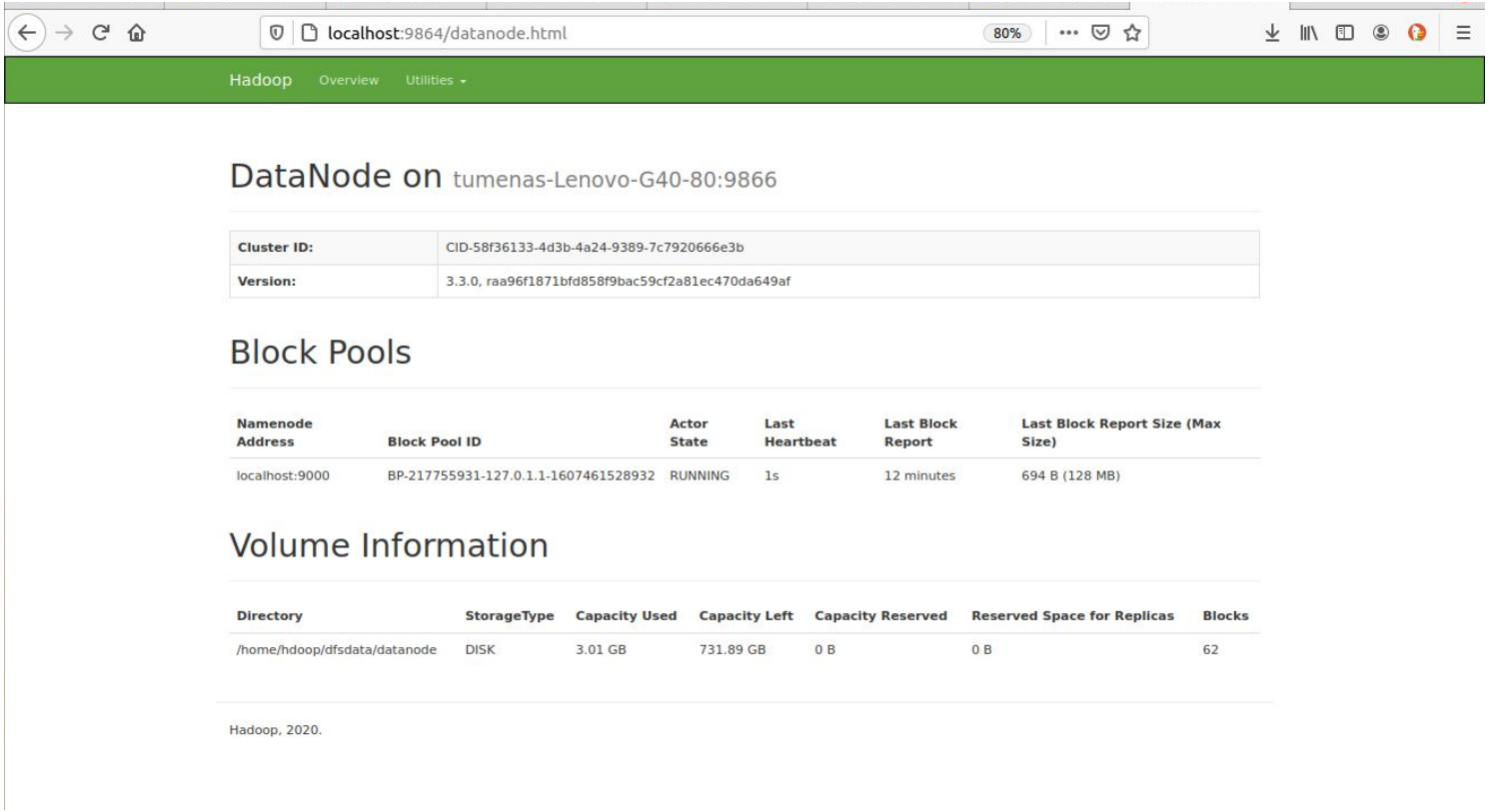
```
#!/usr/bin/env python3
"""reducer.py"""

from operator import itemgetter
import sys

current_word = None
current_count = 0
word = None

for line in sys.stdin:
	line = line.strip()
	word, count = line.split('\t', 1)
	try:
		count = int(count)
	except ValueError:
		continue

	if current_word == word:
		current_count += count
	else:
		if current_word:
			print('%s\t%s' % (current_word, current_count))
			current_count = count
			current_word = word

if current_word == word:
	print('%s\t%s' % (current_word, current_count))
```


hdoop@tumenas-Lenovo-G40-80: ~/hadoop-3.3.0
tumenas@tumenas-Lenovo-G40-80:~$ su hdoop
Password:
hdoop@tumenas-Lenovo-G40-80:/home/tumenas$ cd ../hdoop
hdoop@tumenas-Lenovo-G40-80:~$ ls
apache-hive-3.1.2-bin dfsdata hadoop-3.3.0 tmpdata
hdoop@tumenas-Lenovo-G40-80:~$ cd hadoop-3.3.0/
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0$
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0$ start-all.sh
WARNING: Attempting to start all Apache Hadoop daemons as hdoop in 10 seconds.
WARNING: This is not a recommended production deployment configuration.
WARNING: Use CTRL-C to abort.
Starting namenodes on [localhost]
Starting datanodes
Starting secondary namenodes [tumenas-Lenovo-G40-80]
Starting resourcemanager
Starting nodemanagers
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0$ jps
31153 NodeManager
31314 Jps
30613 DataNode
30473 NameNode
30794 SecondaryNameNode
31006 ResourceManager
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0$

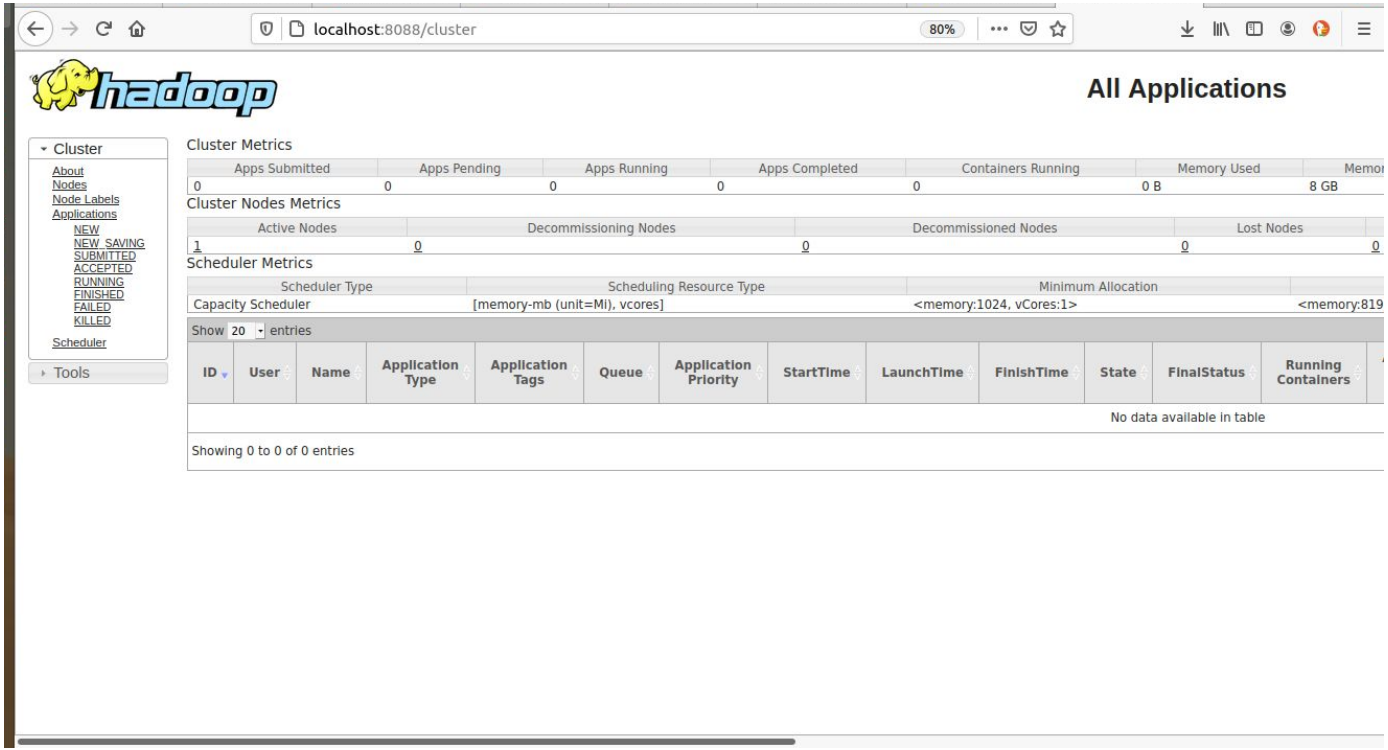
NAMENODE


localhost:9870/dfshealth.html#tab-datanode
80%
Hadoop
Overview
Datanodes
Datanode Volume Failures
Snapshot
Startup Progress
Utilities
Datanode Information
In service
Down
Decommissioning
Decommissioned
Decommissioned & dead
Entering Maintenance
In Maintenance
In Maintenance & dead
Datanode usage histogram
1
0
10
20
30
40
50
60
70
80
90
100
Disk usage of each DataNode (%)
In operation
DataNode State
All
Show
25
entries
Search:
Node
Http Address
Last contact
Last Block Report
Used
Non DFS Used
Capacity
Blocks
Block pool used
Version
tumenas-Lenovo-G40-80:9866 (127.0.0.1:9866)
http://tumenas-Lenovo-G40-80:9864
0s
1m
3.01 GB
133.93 GB
915.4 GB
62
3.01 GB (0.33%)
3.3.0

DATANODE


localhost:9864/datanode.html
80%
Hadoop
Overview
Utilities
DataNode on tumenas-Lenovo-G40-80:9866
Cluster ID: CID-58f36133-4d3b-4a24-9389-7c7920666e3b
Version: 3.3.0, raa96f1871bfd858f9bac59cf2a81ec470da649af
Block Pools
Namenode Address | Block Pool ID | Actor State | Last Heartbeat | Last Block Report | Last Block Report Size (Max Size)
localhost:9000 | BP-217755931-127.0.1.1-1607461528932 | RUNNING | 1s | 12 minutes | 694 B (128 MB)
Volume Information
Directory | StorageType | Capacity Used | Capacity Left | Capacity Reserved | Reserved Space for Replicas | Blocks
/home/hdoop/dfsdata/datanode | DISK | 3.01 GB | 731.89 GB | 0 B | 0 B | 62
Hadoop, 2020.

YARN


localhost:8088/cluster
80%
hadoop
All Applications
Cluster
About
Nodes
Node Labels
Applications
NEW
NEW_SAVING
SUBMITTED
ACCEPTED
RUNNING
FINISHED
FAILED
KILLED
Scheduler
Tools
Cluster Metrics
Apps Submitted
Apps Pending
Apps Running
Apps Completed
Containers Running
Memory Used
0
0
0
0
0
0 B
8 GB
Cluster Nodes Metrics
Active Nodes
Decommissioning Nodes
Decommissioned Nodes
Lost Nodes
1
0
0
0
0
Scheduler Metrics
Scheduler Type
Scheduling Resource Type
Minimum Allocation
Capacity Scheduler
[memory-mb (unit=Mi), vcores]
<memory:1024, vCores:1>
Show 20 entries
ID
User
Name
Application Type
Application Tags
Queue
Application Priority
StartTime
LaunchTime
FinishTime
State
FinalStatus
Running Containers
No data available in table
Showing 0 to 0 of 0 entries

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One author name matches your search.

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One subject heading matches your search.

Sort Alphabetically

Sort by Release Date

Displaying results 1–14

Dom Casmurro (Portuguese)
Machado de Assis
259 downloads

Brazilian Tales
Machado de Assis, Medeiros e Albuquerque, Henrique Coelho Netto, and Carmen Dolores

Quincas Borba (Portuguese)
Machado de Assis
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Machado de Assis
45 downloads

Les travailleurs de la mer. Portuguese (Portuguese)
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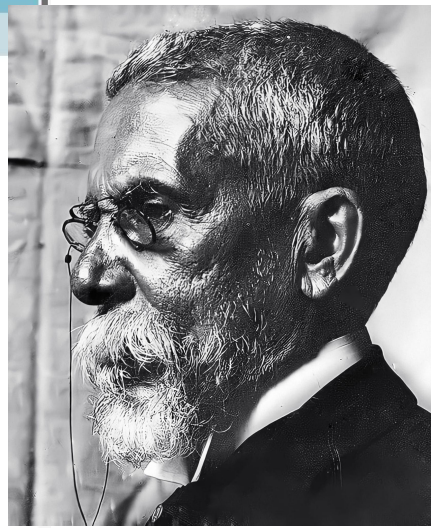
Poesias Completas (Portuguese)
Machado de Assis
35 downloads

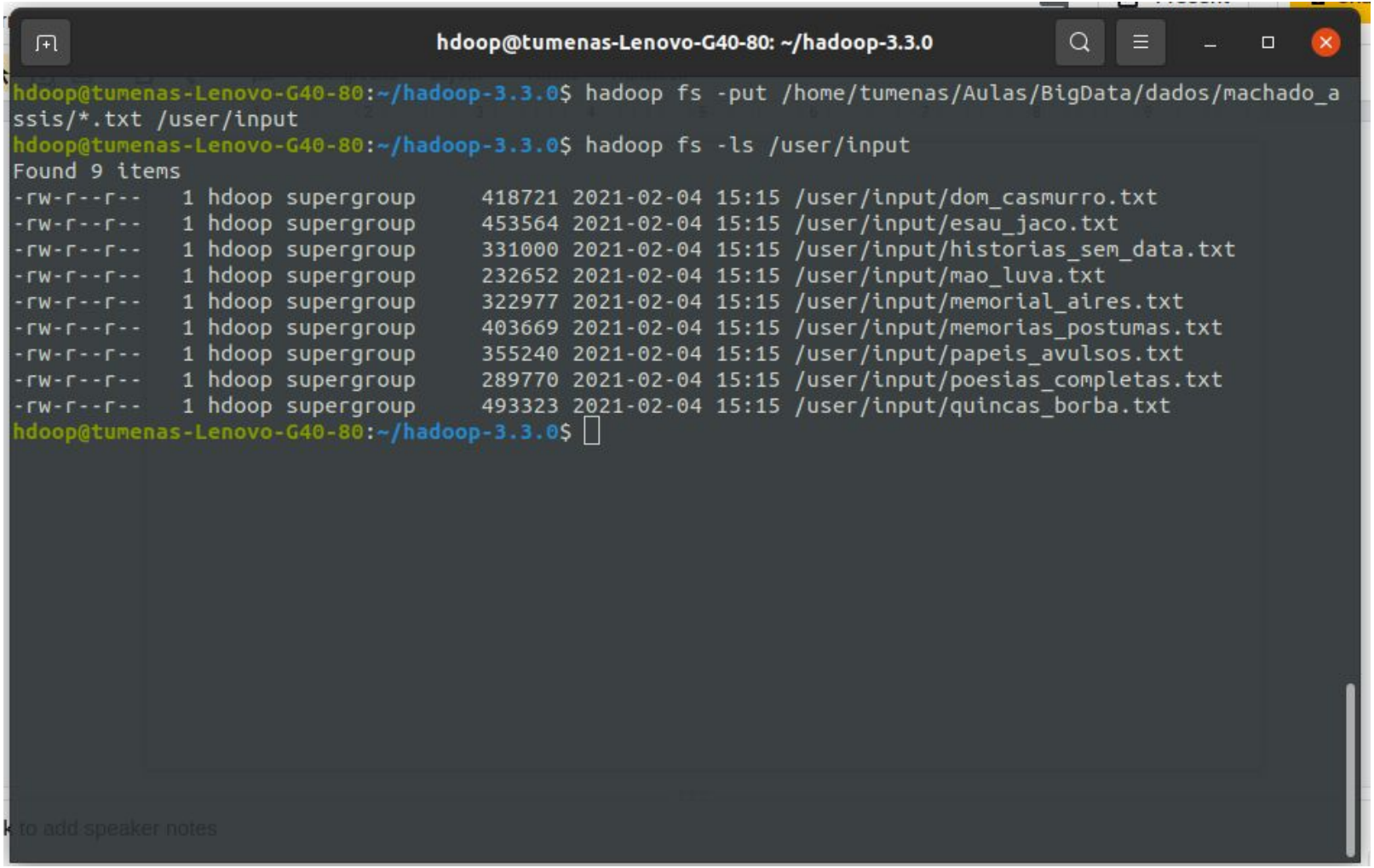
A Mao e A Luva (Portuguese)
Machado de Assis
32 downloads

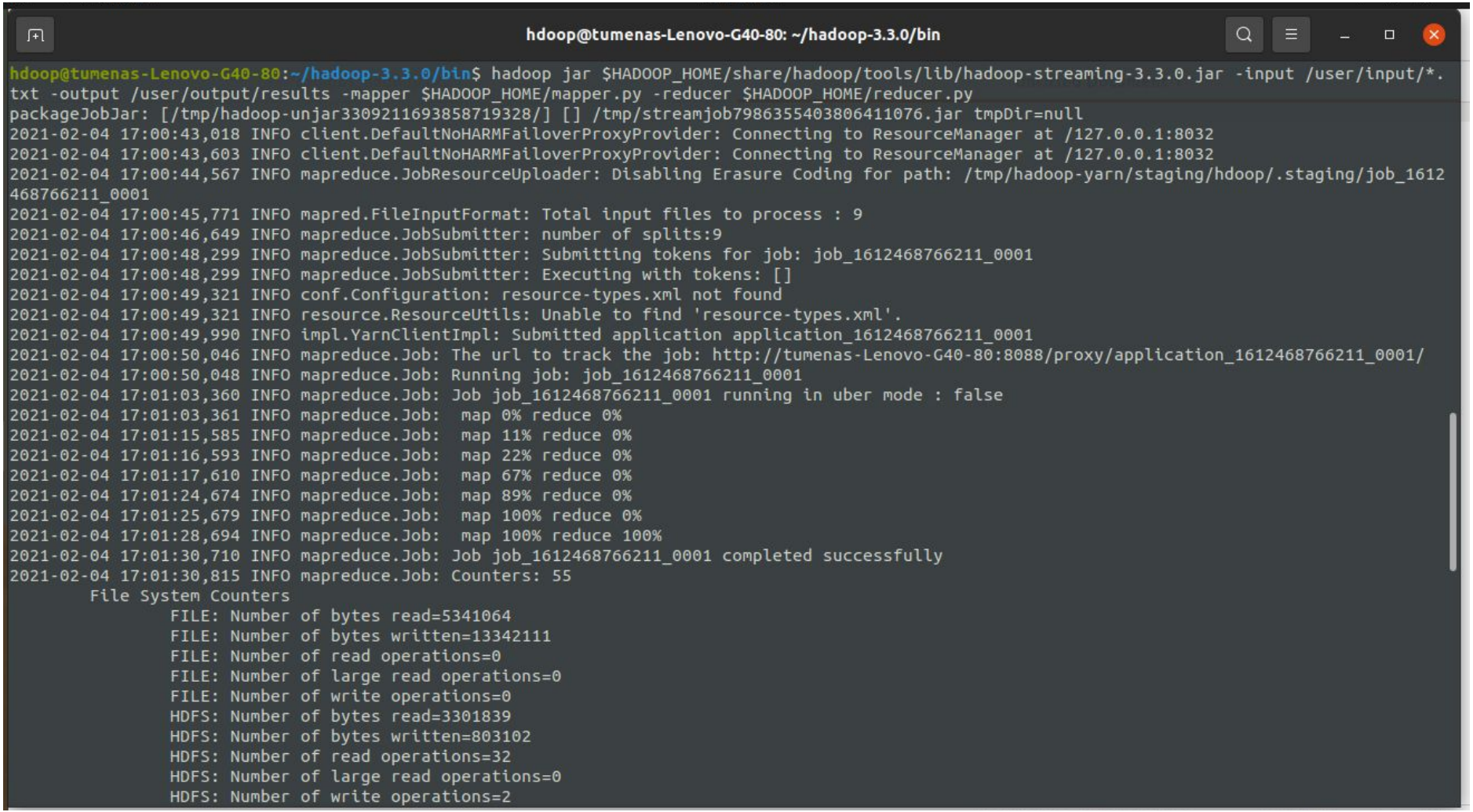
Esau e Jacob (Portuguese)
Machado de Assis
27 downloads

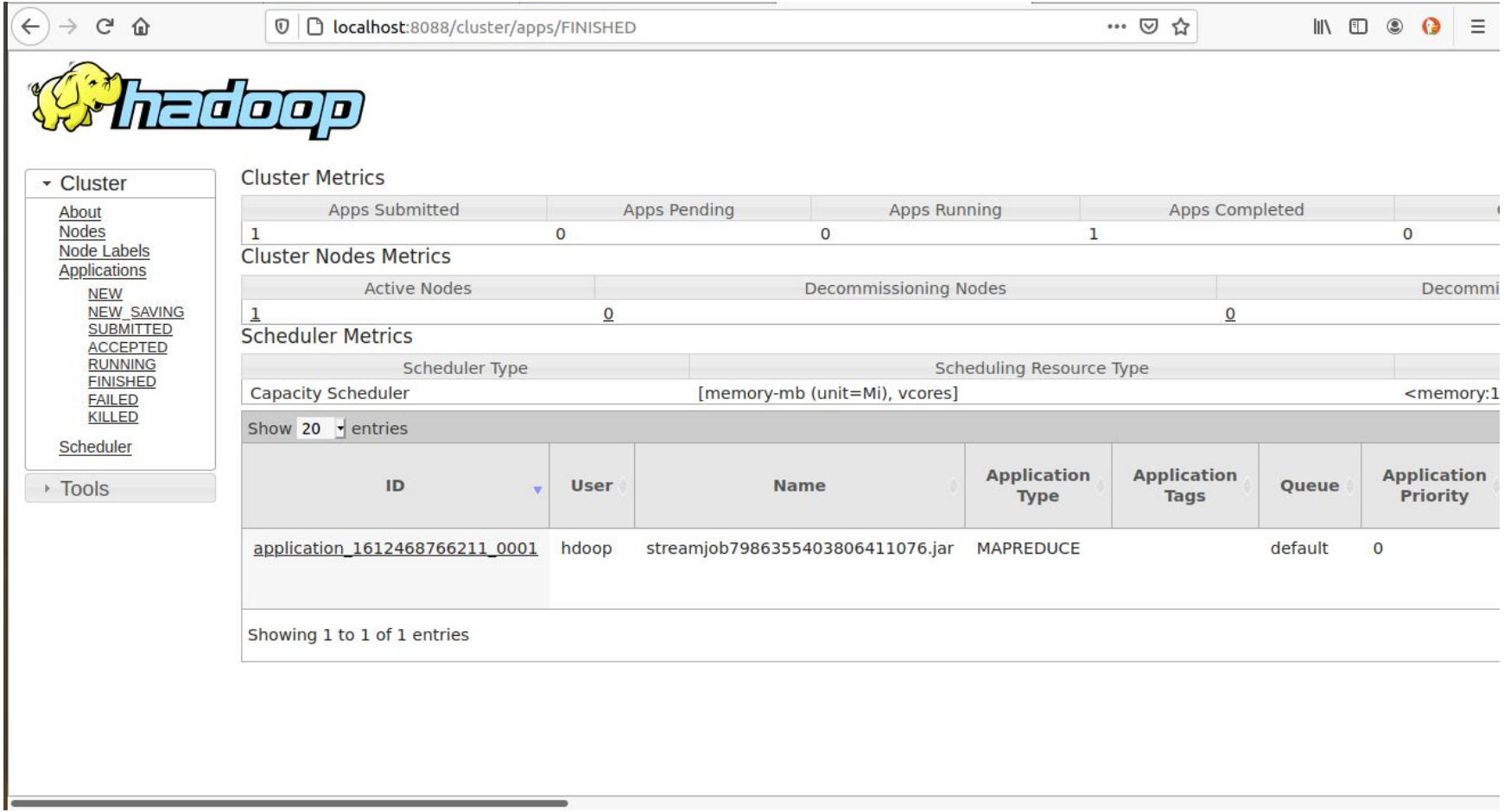
Memorial de Ayres (Portuguese)
Machado de Assis
25 downloads

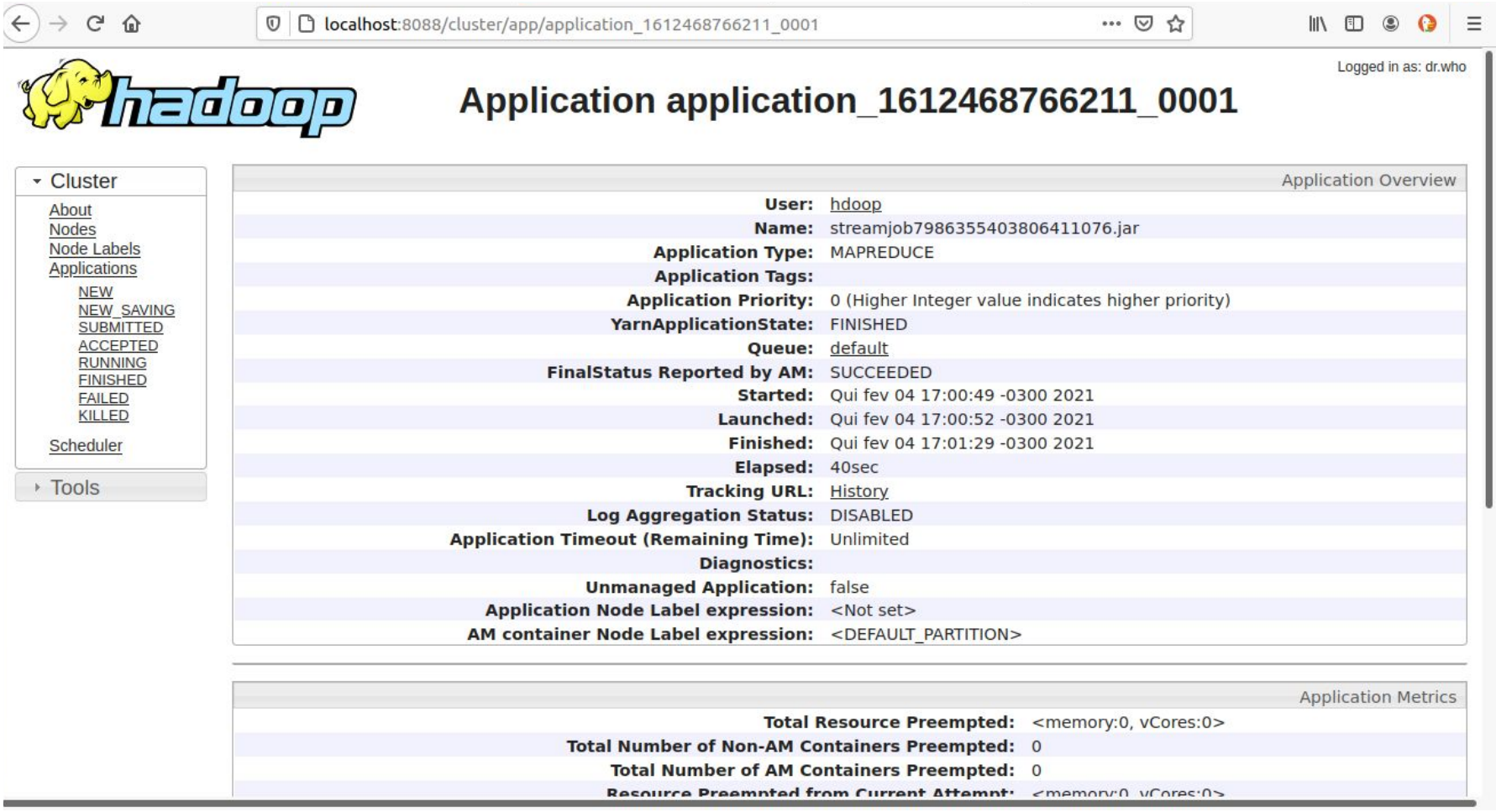
De l'amour des femmes pour les sots. Portuguese (Portuguese)
Victor Hénaux
10 downloads

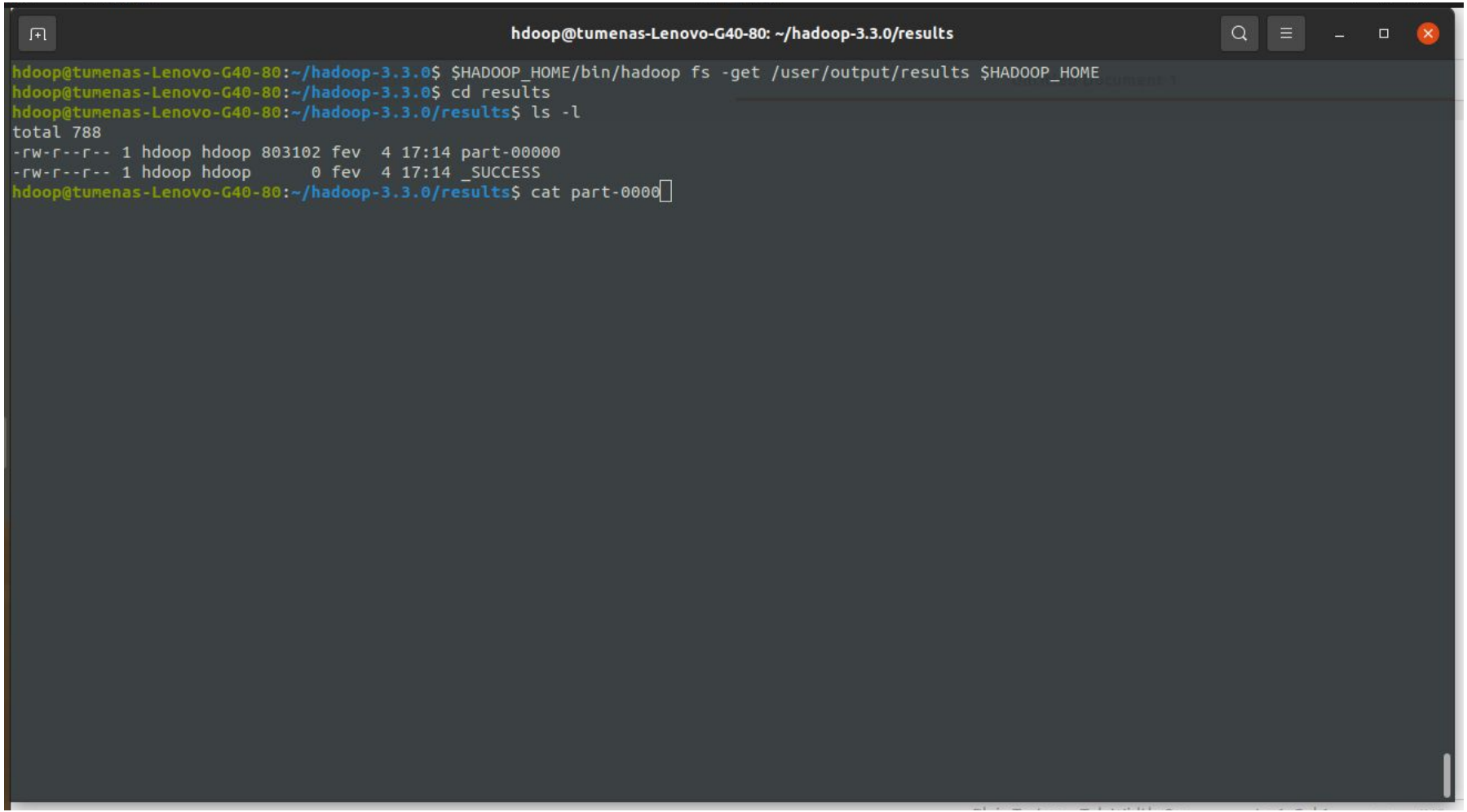


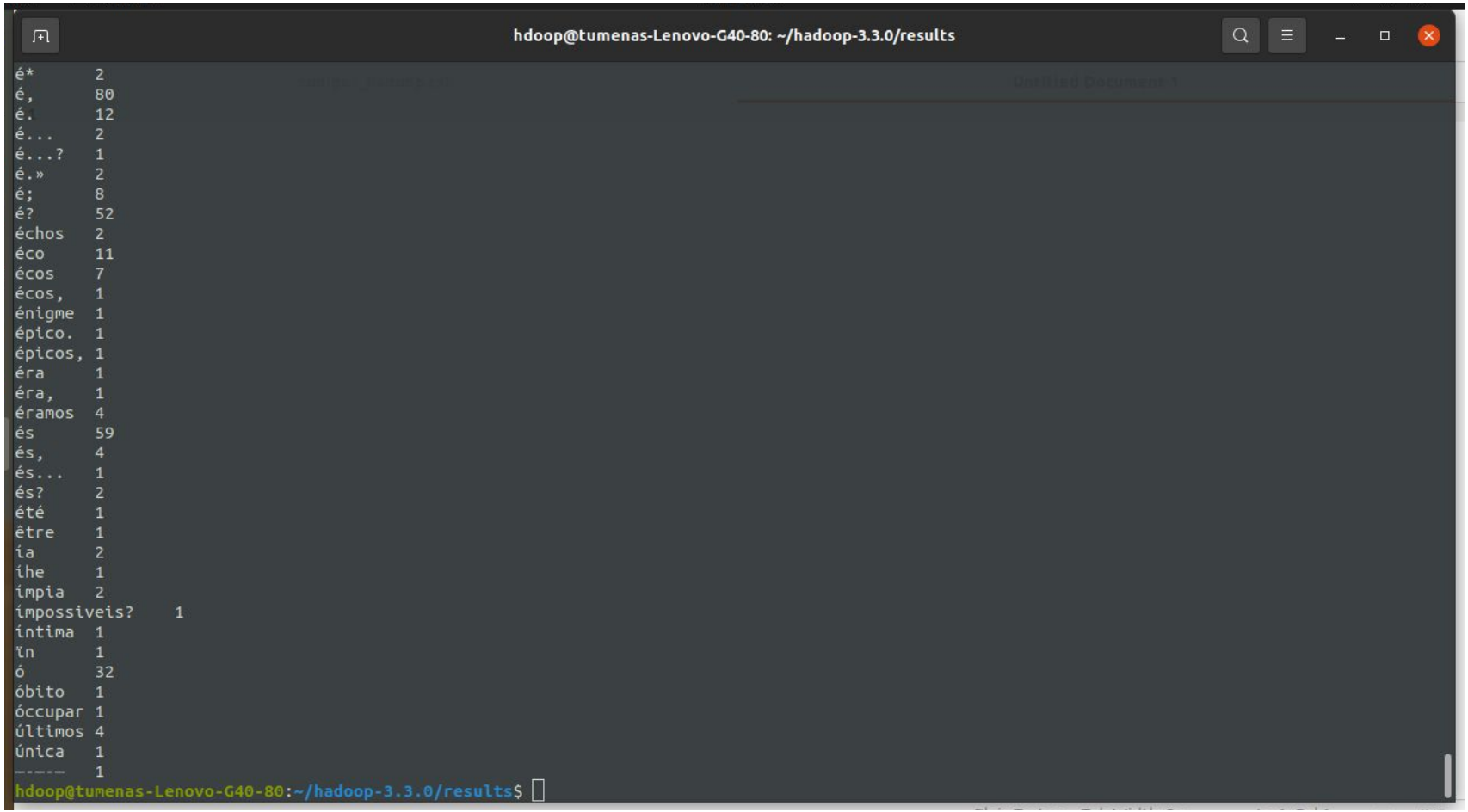

hdoop@tumenas-Lenovo-G40-80: ~/hadoop-3.3.0
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0$ hadoop fs -put /home/tumenas/Aulas/BigData/dados/machado_assis/*.txt /user/input
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0$ hadoop fs -ls /user/input
Found 9 items
-rw-r--r-- 1 hdoop supergroup 418721 2021-02-04 15:15 /user/input/dom_casmurro.txt
-rw-r--r-- 1 hdoop supergroup 453564 2021-02-04 15:15 /user/input/esau_jaco.txt
-rw-r--r-- 1 hdoop supergroup 331000 2021-02-04 15:15 /user/input/historias_sem_data.txt
-rw-r--r-- 1 hdoop supergroup 232652 2021-02-04 15:15 /user/input/mao_luva.txt
-rw-r--r-- 1 hdoop supergroup 322977 2021-02-04 15:15 /user/input/memorial_aires.txt
-rw-r--r-- 1 hdoop supergroup 403669 2021-02-04 15:15 /user/input/memorias_postumas.txt
-rw-r--r-- 1 hdoop supergroup 355240 2021-02-04 15:15 /user/input/papeis_avulsos.txt
-rw-r--r-- 1 hdoop supergroup 289770 2021-02-04 15:15 /user/input/poesias_completas.txt
-rw-r--r-- 1 hdoop supergroup 493323 2021-02-04 15:15 /user/input/quincas_borba.txt
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0$


hdoop@tumenas-Lenovo-G40-80: ~/hadoop-3.3.0/bin
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0/bin$ hadoop jar $HADOOP_HOME/share/hadoop/tools/lib/hadoop-streaming-3.3.0.jar -input /user/input/*.txt -output /user/output/results -mapper $HADOOP_HOME/mapper.py -reducer $HADOOP_HOME/reducer.py
packageJobJar: [/tmp/hadoop-unjar3309211693858719328/] [] /tmp/streamjob7986355403806411076.jar tmpDir=null
2021-02-04 17:00:43,018 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /127.0.0.1:8032
2021-02-04 17:00:43,603 INFO client.DefaultNoHARMFailoverProxyProvider: Connecting to ResourceManager at /127.0.0.1:8032
2021-02-04 17:00:44,567 INFO mapreduce.JobResourceUploader: Disabling Erasure Coding for path: /tmp/hadoop-yarn/staging/hdoop/.staging/job_1612468766211_0001
2021-02-04 17:00:45,771 INFO mapred.FileInputFormat: Total input files to process : 9
2021-02-04 17:00:46,649 INFO mapreduce.JobSubmitter: number of splits:9
2021-02-04 17:00:48,299 INFO mapreduce.JobSubmitter: Submitting tokens for job: job_1612468766211_0001
2021-02-04 17:00:48,299 INFO mapreduce.JobSubmitter: Executing with tokens: []
2021-02-04 17:00:49,321 INFO conf.Configuration: resource-types.xml not found
2021-02-04 17:00:49,321 INFO resource.ResourceUtils: Unable to find 'resource-types.xml'.
2021-02-04 17:00:49,990 INFO impl.YarnClientImpl: Submitted application application_1612468766211_0001
2021-02-04 17:00:50,046 INFO mapreduce.Job: The url to track the job: http://tumenas-Lenovo-G40-80:8088/proxy/application_1612468766211_0001/
2021-02-04 17:00:50,048 INFO mapreduce.Job: Running job: job_1612468766211_0001
2021-02-04 17:01:03,360 INFO mapreduce.Job: Job job_1612468766211_0001 running in uber mode : false
2021-02-04 17:01:03,361 INFO mapreduce.Job: map 0% reduce 0%
2021-02-04 17:01:15,585 INFO mapreduce.Job: map 11% reduce 0%
2021-02-04 17:01:16,593 INFO mapreduce.Job: map 22% reduce 0%
2021-02-04 17:01:17,610 INFO mapreduce.Job: map 67% reduce 0%
2021-02-04 17:01:24,674 INFO mapreduce.Job: map 89% reduce 0%
2021-02-04 17:01:25,679 INFO mapreduce.Job: map 100% reduce 0%
2021-02-04 17:01:28,694 INFO mapreduce.Job: map 100% reduce 100%
2021-02-04 17:01:30,710 INFO mapreduce.Job: Job job_1612468766211_0001 completed successfully
2021-02-04 17:01:30,815 INFO mapreduce.Job: Counters: 55
File System Counters
FILE: Number of bytes read=5341064
FILE: Number of bytes written=13342111
FILE: Number of read operations=0
FILE: Number of large read operations=0
FILE: Number of write operations=0
HDFS: Number of bytes read=3301839
HDFS: Number of bytes written=803102
HDFS: Number of read operations=32
HDFS: Number of large read operations=0
HDFS: Number of write operations=2


localhost:8088/cluster/apps/FINISHED
hadoop
Cluster
About
Nodes
Node Labels
Applications
NEW
NEW_SAVING
SUBMITTED
ACCEPTED
RUNNING
FINISHED
FAILED
KILLED
Scheduler
Tools
Cluster Metrics
Apps Submitted
Apps Pending
Apps Running
Apps Completed
1
0
0
1
0
Cluster Nodes Metrics
Active Nodes
Decommissioning Nodes
Decommi
1
0
0
Scheduler Metrics
Scheduler Type
Scheduling Resource Type
Capacity Scheduler
[memory-mb (unit=Mi), vcores]
<memory:1
Show 20 entries
ID
User
Name
Application Type
Application Tags
Queue
Application Priority
application_1612468766211_0001
hdoop
streamjob7986355403806411076.jar
MAPREDUCE
default
0
Showing 1 to 1 of 1 entries


localhost:8088/cluster/app/application_1612468766211_0001
Logged in as: dr.who
Application application_1612468766211_0001
Cluster
About
Nodes
Node Labels
Applications
NEW
NEW_SAVING
SUBMITTED
ACCEPTED
RUNNING
FINISHED
FAILED
KILLED
Scheduler
Tools
Application Overview
User: hdoop
Name: streamjob7986355403806411076.jar
Application Type: MAPREDUCE
Application Tags:
Application Priority: 0 (Higher Integer value indicates higher priority)
YarnApplicationState: FINISHED
Queue: default
FinalStatus Reported by AM: SUCCEEDED
Started: Qui fev 04 17:00:49 -0300 2021
Launched: Qui fev 04 17:00:52 -0300 2021
Finished: Qui fev 04 17:01:29 -0300 2021
Elapsed: 40sec
Tracking URL: History
Log Aggregation Status: DISABLED
Application Timeout (Remaining Time): Unlimited
Diagnostics:
Unmanaged Application: false
Application Node Label expression: <Not set>
AM container Node Label expression: <DEFAULT_PARTITION>
Application Metrics
Total Resource Preempted: <memory:0, vCores:0>
Total Number of Non-AM Containers Preempted: 0
Total Number of AM Containers Preempted: 0


hdoop@tumenas-Lenovo-G40-80: ~/hadoop-3.3.0/results
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0$ $HADOOP_HOME/bin/hadoop fs -get /user/output/results $HADOOP_HOME
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0$ cd results
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0/results$ ls -l
total 788
-rw-r--r-- 1 hdoop hdoop 803102 fev 4 17:14 part-00000
-rw-r--r-- 1 hdoop hdoop 0 fev 4 17:14 _SUCCESS
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0/results$ cat part-0000


hdoop@tumenas-Lenovo-G40-80: ~/hadoop-3.3.0/results
é*	2
é,	80
é.	12
é...	2
é...?	1
é.»	2
é;	8
é?	52
échos	2
éco	11
écos	7
écos,	1
énigme	1
épico.	1
épicos,	1
éra	1
éra,	1
éramos	4
és	59
és,	4
és...	1
és?	2
été	1
être	1
ía	2
íhe	1
ímpia	2
ímpossiveis?	1
íntima	1
ín	1
ó	32
óbito	1
óccupar	1
últimos	4
única	1
----	1
hdoop@tumenas-Lenovo-G40-80:~/hadoop-3.3.0/results$

APLICAÇÕES

2008 - PIG (Yahoo)**, Hive** (Facebook) : Linguagens “como SQL”

2009 - **Mahout**: Algoritmos de ML e Estatística

2010 - Storm (Twitter): Processamento Real Time

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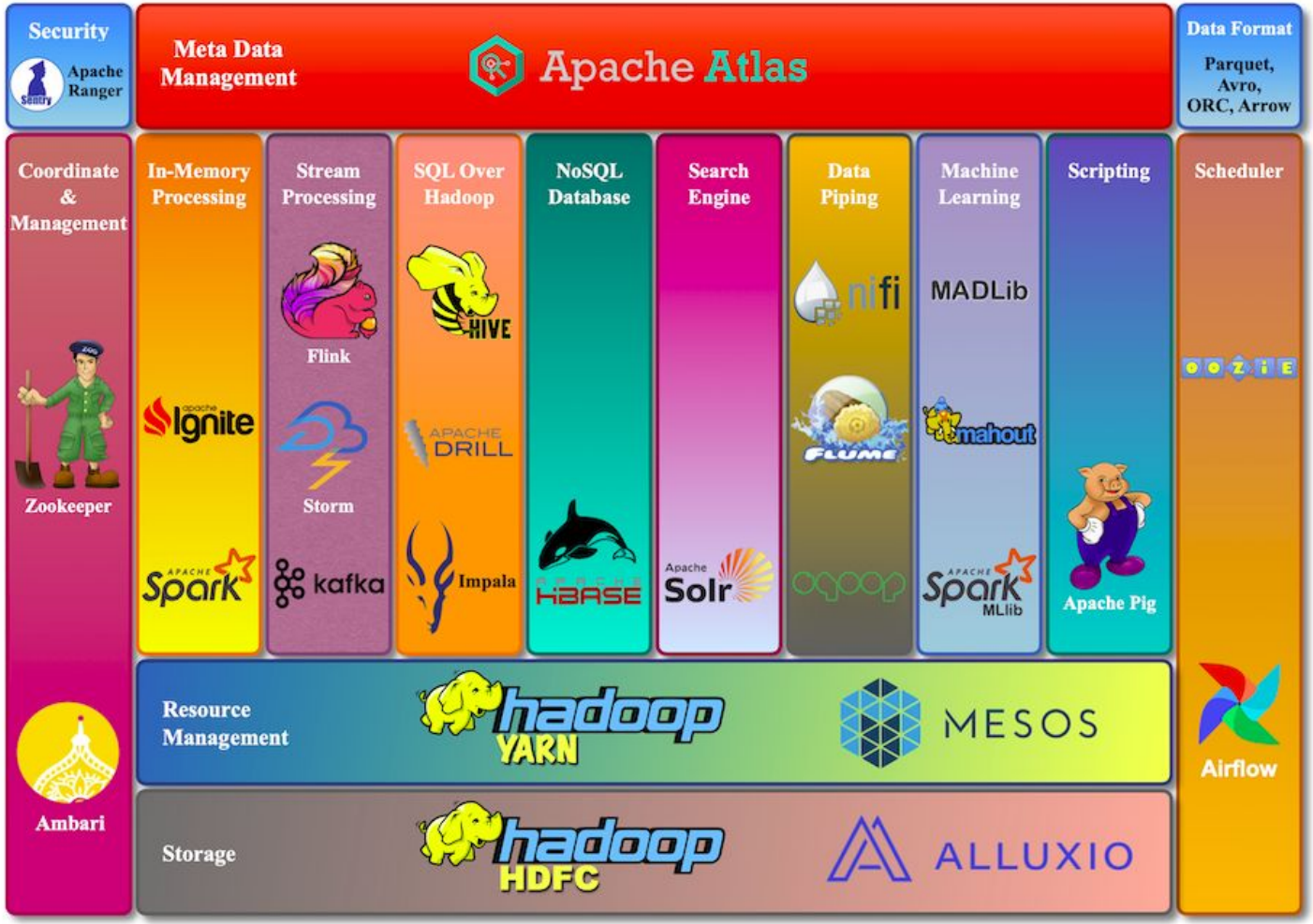

http://www.cloudduggu.com/hadoop/ecosystem/


FRONT END
BACK END
comic.browserling.com

DIFICULDADES x FACILIDADES

aws

Microsoft Azure

Google Cloud

CLOUDERA

PRÓXIMA AULA

-SPARK, SPARKLYR

-PARQUET

-MONGODB