Bash <3's CSVs

Command line data analysis

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csv,conf 2019

Who am I?

- Database infrastructure @GitHub
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Who am I?

@nick_canz

Bash isn't great for *everything*

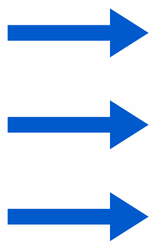
reddit.com/r/pics/comments/53k48s
by /u/NoUsernamHere

Why use bash?

"Command-line Tools can be 235x Faster than your Hadoop Cluster"
https://adamdrake.com/command-line-tools-can-be-235x-faster-than-your-hadoop-cluster.html

> Since the data volume was **only about 1.75GB** containing around 2 million chess games,
>
> for the same amount of data I was able to use my laptop to get the results in about **12 seconds** while the Hadoop processing took about **26 minutes**

When is Bash a good choice?



```
New York city,New York,8537673
Los Angeles city,California,3976322
Chicago city,Illinois,2704958
```

When is Bash a good choice?

```
New York city,New York,8537673
Los Angeles city,California,3976322
Chicago city,Illinois,2704958
```

First step: peeking at the data

```
$ head -n2 populations.csv
New York city,New York,8537673
Los Angeles city,California,3976322
```

…sort of like

```
SELECT * FROM populations
LIMIT 2
```

First step: peeking at the data

```
$ tail -n2 populations.csv
Saginaw city,Michigan,48984
Niagara Falls city,New York,48632
```

…sort of like

```
SELECT * FROM populations
ORDER BY DESC
LIMIT 2
```

First step: peeking at the data

```
$ wc -l populations.csv
     761 populations.csv
```

…sort of like

```
SELECT count(*)
FROM populations
```

First step: peeking at the data

```
$ wc -l populations.csv
     761 populations.csv
```

Count lines

```
$ wc -m populations.csv
   23643 populations.csv
```

Count characters

```
$ wc -w populations.csv
    1849 populations.csv
```

Count words

First step: peeking at the data

```
$ head -n2 populations.csv
New York city,New York,8537673
Los Angeles city,California,3976322

$ tail -n2 populations.csv
Saginaw city,Michigan,48984
Niagara Falls city,New York,48632

$ wc -l populations.csv
     761 populations.csv
```

Getting the lines you want

```
$ grep Pennsylvania populations.csv
Philadelphia city,Pennsylvania,1567872
Pittsburgh city,Pennsylvania,303625
Allentown city,Pennsylvania,120443
```

…sort of like

```
SELECT * FROM populations
WHERE row like 'Pennsylvania'
```

Excluding the lines you don't want

```
$ grep -v city populations.csv
Urban Honolulu CDP,Hawaii,351792
Lexington-Fayette urban county,Kentucky,318449
Anchorage municipality,Alaska,298192
```

…sort of like

```
SELECT * FROM populations
WHERE row not like 'city'
```

Get the fields you want

```
New York city,New York,8537673
Los Angeles city,California,3976322

$ cut -d',' -f1,3 populations.csv
New York city,8537673
Los Angeles city,3976322
```

Get the fields you want

```
[17/May/2015:08:05:32 +0000] "GET /downloads/product_1 HTTP/1.1" 304
```

```
$ cut -d' ' -f1 nginx.log
```

```
[17/May/2015:08:05:32
```

```
$ cut -d' ' -f1 nginx.log | cut -d':' -f2-
```

```
08:05:32
```

Organizing your data

```
$ sort populations.csv | head -n 5

Abilene city,Texas,122225
Akron city,Ohio,197633
Alameda city,California,78906
Albany city,Georgia,73801
Albany city,New York,98111
```

Organizing your data

```
$ sort -t',' -k2,2 populations.csv

Auburn city,Alabama,63118
Birmingham city,Alabama,212157
Decatur city,Alabama,55072
Dothan city,Alabama,68468
Hoover city,Alabama,84978
```

…sort of like

```
SELECT *
FROM populations
ORDER BY state
```

Organizing your data

```
$ sort -t',' -k2,2 -k3,3nr populations.csv

Birmingham city,Alabama,212157
Montgomery city,Alabama,200022
Huntsville city,Alabama,193079
Mobile city,Alabama,192904
Tuscaloosa city,Alabama,99543
```

…sort of like

```
SELECT *
FROM populations
ORDER BY state
THEN BY pop DESC
```

What are the biggest cities by state?

```
$ sort -t',' -k2,2 -k3,3nr populations.csv |
  sort -u -t',' -k2,2

Birmingham city,Alabama,212157
Anchorage municipality,Alaska,298192
Phoenix city,Arizona,1615017
Little Rock city,Arkansas,198541
Los Angeles city,California,3976322
Denver city,Colorado,693060
```

How many cities per state?

```
$ cut -d',' -f2 populations.csv |
  sort |
  uniq -c |
  sort -nr
```

Get only the state field

Sort it

Get the unique values and count

Sort by number descending

```
 178 California
  65 Texas
  57 Florida
  29 Illinois
  25 Michigan
```

Where does Portland rank?

Sort the file by population

```
$ sort -t',' -k3,3nr populations.csv |
  grep -n Portland
```

Find Portland and it's number in the list

```
26:Portland city,Oregon,639863
537:Portland city,Maine,66937
```

Working with multiple files

```
$ cat fips_and_city.csv
06,Los Angeles
06,San Francisco
12,Miami
12,Orlando
42,Philadelphia
42,Pittsburgh
```

```
$ cat fips_and_state.csv
06,California
12,Florida
42,Pennsylvania
```

Working with multiple files

```
$ cat fips_and_city.csv
06,Los Angeles
06,San Francisco
12,Miami
12,Orlando
42,Philadelphia
42,Pittsburgh
```

```
$ cat fips_and_state.csv
06,California
12,Florida
42,Pennsylvania
```

```
$ join -t',' fips_and_city.csv fips_and_state.csv
06,Los Angeles,California
06,San Francisco,California
12,Miami,Florida
12,Orlando,Florida
42,Philadelphia,Pennsylvania
42,Pittsburgh,Pennsylvania
```

Working with multiple files

```
$ cat cities.csv
Philadelphia
New York
Austin

$ paste -d',' cities.csv foods.csv
Philadelphia,Cheesesteak
New York,Pizza
Austin,Brisket
```

```
$ cat foods.csv
Cheesesteak
Pizza
Brisket

$ paste -s -d',' cities.csv foods.csv
Philadelphia,New York,Austin
Cheesesteak,Pizza,Brisket
```

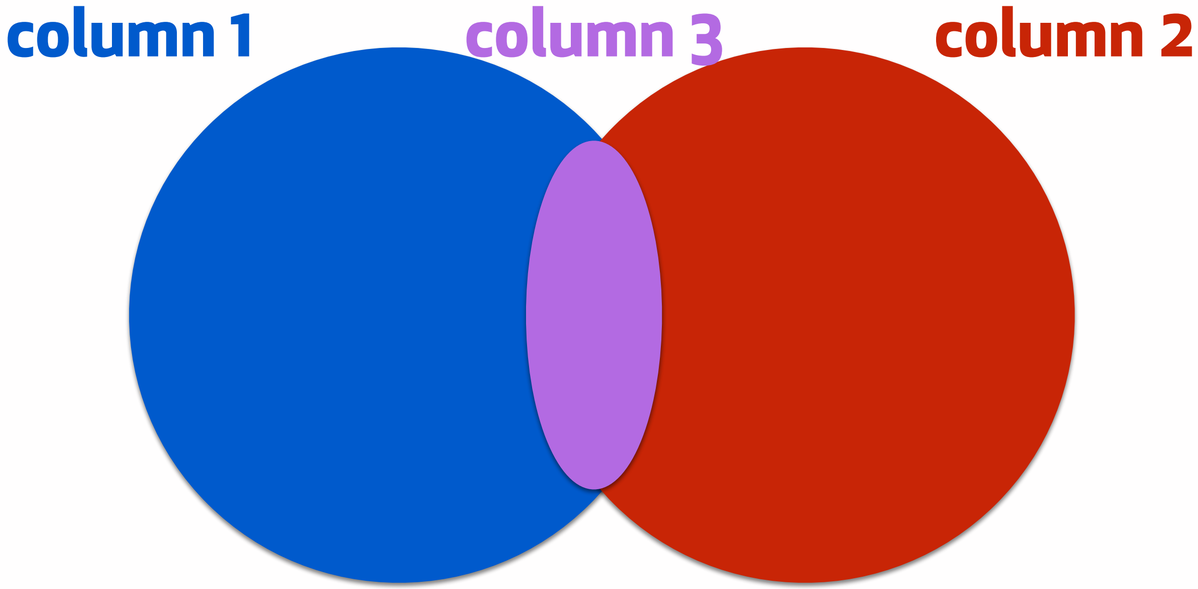
Working with multiple files

```
$ seq 1 5
1
2
3
4
5

$ paste -d, <(seq 1 5) <(head -n5 populations.csv)
1,New York city,New York,8537673
2,Los Angeles city,California,3976322
3,Chicago city,Illinois,2704958
4,Houston city,Texas,2303482
5,Phoenix city,Arizona,1615017
```

Comparing files

```
$ comm ohio_cities.csv missouri_cities.csv
Akron city
Cincinnati city
Cleveland city
Columbus city
        Joplin city
        Kansas City city
        O'Fallon city
                Springfield city
        St. Louis city
```

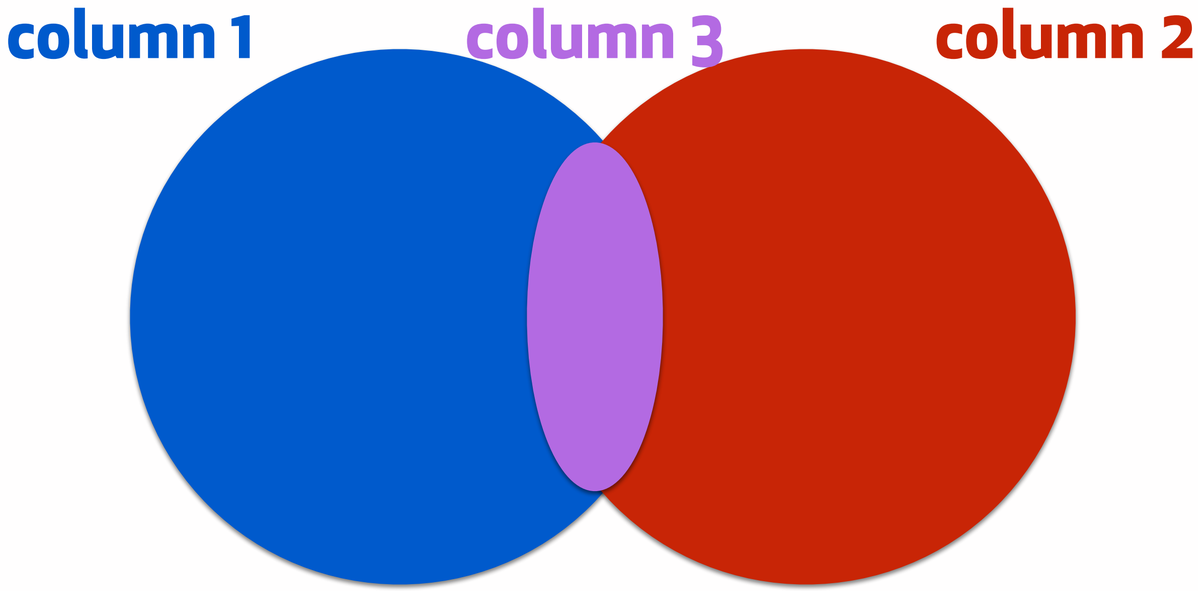


Comparing files

```
$ comm -23 ohio_cities.csv missouri_cities.csv
```

```
$ comm -13 ohio_cities.csv missouri_cities.csv
```

```
$ comm -12 ohio_cities.csv missouri_cities.csv
```



Dealing with cleanup

```
Brookhaven city,Georgia,52444
Minnetonka city,Minnesota,52369
Palm Desert city,California,52231

$ sed 's/ city//' populations.csv

Brookhaven,Georgia,52444
Minnetonka,Minnesota,52369
Palm Desert,California,52231
```

Dealing with cleanup

```
$ echo 'A B C' | tr ' ' '\n'
A
B
C

$ echo 'APPLE PEAR' | tr '[:upper:]' '[:lower:]'
apple pear

$ echo '0 1 2' | tr '[0-8]' '[1-9]'
1 2 3
```

Practical example time

A nice dataset

```
$ head populations.csv
New York city,New York,8537673
Los Angeles city,California,3976322
Chicago city,Illinois,2704958
Houston city,Texas,2303482
Phoenix city,Arizona,1615017
Philadelphia city,Pennsylvania,1567872
San Antonio city,Texas,1492510
San Diego city,California,1406630
Dallas city,Texas,1317929
San Jose city,California,1025350
```

Where to get the data?

United States Census Bureau

AMERICAN FactFinder

MAIN | COMMUNITY FACTS | GUIDED SEARCH | ADVANCED SEARCH | DOWNLOAD CENTER

Advanced Search - Search all data in American FactFinder

1 Advanced Search | 2 Table Viewer

Result 1 of 1

PEPANNRSIP

Annual Estimates of the Resident Population for Incorporated Places of 50,000 or More, Ranked by July 1, 2016 Population: April 1, 2010 to July 1, 2016 - United States -- Places of 50,000+ Population
2016 Population Estimates

Table View

Actions: Modify Table | Add/Remove Geographies | Bookmark/Save | Print | Download | Create a Map

This table is displayed with default geographies.
Click Back to Search to select other geographies using the search options on the left.

View Geograph

Versions of this table are available for the following years:
2017
2016
2015
2014
2013
2012

Geography: United States

1 - 300 of 761

Rank	Geography	April 1, 2010		Population Estimate (as of July 1)						
		Census	Estimates Base	2010	2011	2012	2013	2014	2015	2016
	United States									
1	New York city, New York	8,175,133	8,174,962	8,192,026	8,284,098	8,361,179	8,422,460	8,471,990	8,516,502	8,537,673
2	Los Angeles city, California	3,792,621	3,792,584	3,796,292	3,825,393	3,858,137	3,890,436	3,920,173	3,949,149	3,976,322
3	Chicago city, Illinois	2,695,598	2,695,620	2,697,736	2,705,404	2,714,120	2,718,887	2,718,530	2,713,596	2,704,958
4	Houston city, Texas	2,099,451	2,100,277	2,105,625	2,132,157	2,166,458	2,204,406	2,243,999	2,284,816	2,303,482
5	Phoenix city, Arizona	1,445,632	1,447,624	1,450,629	1,469,353	1,499,007	1,525,562	1,554,179	1,582,904	1,615,017
6	Philadelphia city, Pennsylvania	1,526,006	1,526,006	1,528,427	1,539,022	1,550,379	1,555,868	1,560,609	1,564,964	1,567,872
7	San Antonio city, Texas	1,327,407	1,327,538	1,333,952	1,359,002	1,385,250	1,411,652	1,439,150	1,468,037	1,492,510
8	San Diego city, California	1,307,402	1,301,722	1,306,153	1,320,686	1,338,983	1,358,242	1,379,299	1,390,915	1,406,630
9	Dallas city, Texas	1,197,816	1,197,824	1,200,711	1,218,664	1,241,624	1,258,016	1,277,376	1,297,327	1,317,929

@nick_canz

A not nice dataset

```
$ head PEP_2016_PEPANNRSIP.US12A_with_ann.csv
GEO.id,GEO.id2,GEO.display-label,GC_RANK.target-geo-id,GC_RANK.target-geo-id2,GC_RANK.rank-label,GC_RANK
Id,Id2,Geography,Target Geo Id,Target Geo Id2,Rank,Geography,Geography,"April 1, 2010 - Census","April 1
0100000US,,United States,1620000US3651000,3651000,1,"United States - New York city, New York","New York
0100000US,,United States,1620000US0644000,0644000,2,"United States - Los Angeles city, California","Los A
0100000US,,United States,1620000US1714000,1714000,3,"United States - Chicago city, Illinois","Chicago ci
```

Making our nice dataset

```
$ cat PEP_2016_PEPANNRSIP.US12A_with_ann.csv |
    tail -n +3
```

Remove the two(?) header lines

```
0100000US,,United States,1620000US3651000,3651000,1,"United States - New York city, New York","Ne
0100000US,,United States,1620000US0644000,0644000,2,"United States - Los Angeles city, California
0100000US,,United States,1620000US1714000,1714000,3,"United States - Chicago city, Illinois","Chi
0100000US,,United States,1620000US4835000,4835000,4,"United States - Houston city, Texas","Housto
```

Making our nice dataset

```
$ cat PEP_2016_PEPANNRSIP.US12A_with_ann.csv |
    tail -n +3 |
    cut -d',' -f9,10,19
```

Get the fields we want

```
"New York city, New York",8537673
"Los Angeles city, California",3976322
"Chicago city, Illinois",2704958
"Houston city, Texas",2303482
"Phoenix city, Arizona",1615017
```

Making our nice dataset

```
$ cat PEP_2016_PEPANNRSIP.US12A_with_ann.csv |
    tail -n +3 |
    cut -d',' -f9,10,19 |
    sed 's/"//g'
```

Clean up the quotes

```
New York city, New York,8537673
Los Angeles city, California,3976322
Chicago city, Illinois,2704958
Houston city, Texas,2303482
Phoenix city, Arizona,1615017
```

Making our nice dataset

```
$ cat PEP_2016_PEPANNRSIP.US12A_with_ann.csv |
    tail -n +3 |
    cut -d',' -f9,10,19 |
    sed 's/"//g' |
    sed 's/, /,/'
```

Remove leading space in state column

```
New York city,New York,8537673
Los Angeles city,California,3976322
Chicago city,Illinois,2704958
Houston city,Texas,2303482
Phoenix city,Arizona,1615017
```

Making our nice dataset

```
$ cat PEP_2016_PEPANNRSIP.US12A_with_ann.csv |
    tail -n +3 |
    cut -d',' -f9,10,19 |
    sed 's/"//g' |
    sed 's/, //' > populations.csv
```

Save it all to a file!

Shakespeare word count

```
$ cat shakespeare.txt |
  tr -d -c '[:alpha:][:space:]' |
  tr -s '[:space:]' ' ' |
  tr ' ' '\n' |
  tr '[:upper:]' '[:lower:]' |
  sort | uniq -c |
  sort -nr
```

```
27825 the
26791 and
20681 i
19261 to
18289 of
14668 a
13716 you
12481 my
11135 that
11027 in
9621 is
…
1 foiled
1 foemens
1 foemans
1 foeman
1 fodder
```

Thanks!

Talk materials
github.com/nickcanz/csvconf2019

@nick_canz on twitter