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1 Overview

The datamash program (https://www.gnu.org/software/datamash) performs calculation (e.g. sum, count, min, max, skewness, standard deviation) on input files.

Example: sum up the values in the first column of the input:

$ seq 10 | datamash sum 1
55

datamash can group input data and perform operations on each group. It can sort the file, and read header lines.

Example: Given a file with three fields (name, subject, score), find the average score in each subject:

$ cat scores.txt
Name  Subject  Score
Bryan  Arts  68
Isaiah  Arts  80
Gabriel  Health-Medicine  100
Tysza  Business  92
Zackery  Engineering  54
...

$ datamash --sort --headers --group 2 mean 3 sstdev 3 < scores.txt
GroupBy(Subject) mean(Score) sstdev(Score)
Arts  68.9474  10.4215
Business  87.3636  5.18214
Engineering  66.5385  19.8814
Health-Medicine  90.6154  9.22441
Life-Sciences  55.3333  20.606
Social-Sciences  60.2667  17.2273

datamash is designed for interactive exploration of textual data and for automating tasks in shell scripts.

datamash has a rich set of statistical functions to quickly assess information in textual input files. An example of calculating basic statistic (mean, 1st quartile, median, 3rd quartile, IQR, sample-standard-deviation, and p-value of Jarque-Bera test for normal distribution:

$ datamash -H mean 1 q1 1 median 1 q3 1 iqr 1 sstdev 1 jarque 1 < FILE
mean(x)  q1(x)  median(x)  q3(x)  iqr(x)  sstdev(x)  jarque(x)
45.32  23  37  61.5  38.5  30.4487  8.0113-09
2 Invoking datamash

The format for running the datamash program is:

```
datamash [option]... op1 column1  [op2 column2 ...]
```

Where op1 is the operation to perform on the values in column1. datamash reads input from stdin and performs one or more operations on the input data. If --group is used, each operation is performed on every group. If --group is not used, each operation is performed on all the values in the input file.

datamash supports the following operations:

Primary operations:
- groupby, crosstab, transpose, reverse, check

Line-Filtering operations:
- rmdup

Per-Line operations:
- base64, debase64, md5, sha1, sha224, sha256, sha384, sha512, bin, strbin,
- round, floor, ceil, trunc, frac, dirname, basename, extname, barename, getnum, cut

Group-by Numeric operations:
- sum, min, max, absmin, absmax, range

Group-by Textual/Numeric operations:
- count, first, last, rand, unique, collapse, countunique

Group-by Statistical operations:
- mean, mode, median, q1, q3, iqr, perc, antimode, pstdev, sstdev, pvar, svar,
- mad, madraw, sskew, pskew, skurt, pkurt, jarque, dpo, scov, pcov, spearson, ppearson

Grouping options:

- --full
- -f
- --group=X[,Y,X]
- -g X[,Y,X]

Group input via fields X[,Y,Z]. By default, fields are separated by TABs. Use --field-separator to change the delimiter character. Input file must be sorted by the same fields X[,Y,Z]. Use --sort to automatically sort the input. If --group is not specified, each operation is performed in the entire input file.

- --header-in

Indicates the first input line is column headers, and should not be used for any calculations.
Chapter 2: Invoking datamash

--header-out
Print column headers as first line. If the column header names are known (i.e. the input file had a header line, and the command was invoked with --header-in, -H or --headers), prints the operation and the name of the field (e.g. ‘mean(X)’). Otherwise, prints the number operation and the field number (e.g. ‘mean(field-3)’).

--headers
-H Same as ‘--header-in --header-out’. A short option indicating the input file has a header line, and the output should contain a header line as well.

--ignore-case
-i Ignore upper/lower case when comparing text for grouping, sorting, and comparing unique values in the ‘countunique’ and ‘unique’ operations.

--sort
-s Sort the input before grouping. datamash requires sorted input. If the input is not sorted, using --sort will automatically sort the input before processing it further. Sorting will be performed based on the specified --group parameter, and respecting case --ignore-case option (if used). The following commands are equivalent:

```
$ cat FILE | sort -k1,1 | datamash --group 1 sum 1
$ cat FILE | datamash --sort --group 1 sum 1
```

File Operation options:

--no-strict
Allow lines with varying number of fields. By default, transpose and reverse will fail with an error message unless all input lines have the same number of fields.

--filler=x
When use --no-strict option, missing fields will be filled with this value.

General options:

--format=FORMAT
print numeric values with printf style floating-point FORMAT.

--field-separator=x
-t x Use character X instead of TAB as input and output field delimiter. If --output-delimiter is also used, it will override the output field delimiter.

--narm
Skip NA or NaN values.

--output-delimiter=x
Use character X instead as output field delimiter. This option overrides --field-separator/-t/ --whitespace/-W.
--round=N
-R N Round numeric output to N decimal places.

--whitespace
-W Use whitespace (one or more spaces and/or tabs) for field delimiters. TAB character will be used as output field separator. If --output-delimiter is also used, it will override the output field delimiter.

--zero-terminated
-z End lines with a 0 byte, not newline.

--help Print an informative help message on standard output and exit successfully.

--version Print the version number and licensing information of Datamash on standard output and then exit successfully.
3 Available operations in datamash

Primary operations:

- **groupby**: alternative syntax for `--group`
- **crosstab**: cross-tabulate two fields (also known as 'pivot-tables')
- **transpose**: transpose rows, columns of a text file
- **reverse**: reverse fields in each line of a text file
- **check**: verify tabular structure of input (ensure same number of fields in all lines)

Line-Filtering operation:

- **rmdup**: remove lines with duplicated key value

Per-Line operations:

- **base64**: encode the field as base64
- **debase64**: decode the field as base64. Exit with an error if the field is invalid base64 value which cannot be decoded.
- **md5**: calculates md5 hash of the field
- **sha1**: calculates sha1 hash of the field
- **sha224**: calculates sha224 hash of the field
- **sha256**: calculates sha256 hash of the field
- **sha384**: calculates sha384 hash of the field
- **sha512**: calculates sha512 hash of the field
- **dirname**: extracts the directory name of the field (assuming the field is a file name). Similar to `dirname(1)`.
- **basename**: extracts the base file name of the field (assuming the field is a file name). Similar to `basename(1)`.
- **extname**: extracts the extension of the file name of the field (assuming the field is a file name).
- **extname**: extracts the base file name of the field without the extension (assuming the field is a file name).
- **getnum**: extract a number from the field. `getnum` accepts an optional single letter option ‘n/i/d/p/h/o’ affecting the detected value.
- **cut**: copy input field to output field (similar to `cut(1)`).

Group-by Numeric operations:

- **sum**: sum the of values
- **min**: minimum value
max  maximum value
absin minimum of the absolute values
absmax maximum of the absolute values
range range of values (maximum - minimum)

Group-By Textual/Numeric operations:
count  count number of elements in the group
first  the first value of the group
last   the last value of the group
rand   one random value from the group
unique comma-separated sorted list of unique values
collapse comma-separated list of all input values
countunique number of unique/distinct values

Group-By Statistical operations:
mean  mean of the values
geomean geometric mean of the values
harmmean harmonic mean of the values
trimmean trimmed mean of the values
median median value
q1    1st quartile value
q3    3rd quartile value
iqr   inter-quartile range
perc  percentile value
mode  mode value (most common value)
antimode anti-mode value (least common value)
pstdev population standard deviation
sstdev sample standard deviation
pvar  population variance
svar  sample variance
mad   Median Absolute Deviation, scaled by a constant 1.4826 for normal distributions
madraw Median Absolute Deviation, unscaled
sskew skewness of the (sample) group
pskew skewness of the (population) group
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>skurt</td>
<td>Excess Kurtosis of the (sample) group</td>
</tr>
<tr>
<td>pkurt</td>
<td>Excess Kurtosis of the (population) group</td>
</tr>
<tr>
<td>jarque</td>
<td>p-value of the Jarque-Beta test for normality</td>
</tr>
<tr>
<td>dpo</td>
<td>p-value of the D’Agostino-Pearson Omnibus test for normality</td>
</tr>
</tbody>
</table>
4 Statistical Operations

Equivalent R functions

GNU Datamash is designed to closely follow R project’s (https://www.r-project.org/) statistical functions. See the files/operators.R file for the R equivalent code for each of datamash’s operators. When building datamash from source code on your local computer, operators are compared to known results of the equivalent R functions.
5 Usage Examples

5.1 Summary Statistics

The following are examples of using `datamash` to quickly calculate summary statistics. The examples will use a file with three fields (name, subject, score) representing grades of students:

```bash
$ cat scores.txt
Shawn Arts 65
Marques Arts 58
Fernando Arts 78
Paul Arts 63
Walter Arts 75
...
```

Counting how many students study each subject (subject is the second field in the input file, thus `groupby 2`):

```bash
$ datamash --sort groupby 2 count 2 < scores.txt
Arts 19
Business 11
Engineering 13
Health-Medicine 13
Life-Sciences 12
Social-Sciences 15
```

Similarly, find the minimum and maximum score in each subject:

```bash
$ datamash --sort groupby 2 min 3 max 3 < scores.txt
Arts 46 88
Business 79 94
Engineering 39 99
Health-Medicine 72 100
Life-Sciences 14 91
Social-Sciences 27 90
```

Find the mean and (population) standard deviation in each subject:

```bash
$ datamash --sort groupby 2 mean 3 pstdev 3 < scores.txt
Arts 68.947 10.143
Business 87.363 4.940
Engineering 66.538 19.101
Health-Medicine 90.615 8.862
Life-Sciences 55.333 19.728
Social-Sciences 60.266 16.643
```

Find the median, first, third quartiles and the inter-quartile range in each subject:

```bash
$ datamash --sort groupby 2 median 3 q1 3 q3 3 iqr 3 < scores.txt
Arts 71 61.5 75.5 14
Business 87 83 92 9
Engineering 56 51 83 32
```
Health-Medicine    91    84    100    16
Life-Sciences      58.5  44.25  67.75  23.5
Social-Sciences    62    55    70.5   15.5

See Section 5.2 [Header Lines and Column Names], page 10, for examples of dealing with header lines.

5.2 Header Lines and Column Names

Output Header Lines

If the input does not have a header line, use \texttt{--header-out} to add a header in the first line of the output, indicating which operation was performed:

\begin{verbatim}
$ datamash --sort --header-out groupby 2 min 3 max 3 < scores.txt
GroupBy(field-2)  min(field-3)  max(field-3)
Arts              46            88
Business          79            94
Engineering       39            99
Health-Medicine   72            100
Life-Sciences     14            91
Social-Sciences   27            90
\end{verbatim}

Skipping Input Header Lines

If the input has a header line (first line containing column names), use \texttt{--header-in} to skip the line:

\begin{verbatim}
$ cat scores_h.txt
Name    Major  Score
Shawn   Arts    65
Marques Arts    58
Fernando Arts    78
Paul    Arts    63
...

$ datamash --sort --header-in groupby 2 mean 3 < scores_h.txt
Arts         68.947
Business     87.363
Engineering  66.538
Health-Medicine 90.615
Life-Sciences 55.333
Social-Sciences 60.266
\end{verbatim}

If the header line is not skipped, \texttt{datamash} will show an error (due to strict input validation):

\begin{verbatim}
$ datamash groupby 2 mean 3 < scores_h.txt
datamash: invalid numeric value in line 1 field 3: 'Score'
\end{verbatim}
Using Header Lines

Column names in the input header lines can be printed in the output header lines by using `--headers` (or `-H`, both are equivalent to `--header-in --header-out`):

```
$ datamash --sort --headers groupby 2 mean 3 < scores_h.txt
GroupBy(Major)  mean(Score)
Arts           68.947
Business       87.363
Engineering    66.538
Health-Medicine 90.615
Life-Sciences  55.333
Social-Sciences 60.266
```

Or in short form (`-sH` instead of `--sort --headers`), equivalent to the above command:

```
$ datamash -sH groupby 2 mean 3
```

Column Names

When the input file has a header line, column names can be used instead of column numbers. In the example below, `Major` is used instead of the value 2, and `Score` is used instead of the value 3:

```
$ datamash --sort --headers groupby Major mean Score < scores_h.txt
GroupBy(Major)  mean(Score)
Arts           68.947
Business       87.363
Engineering    66.538
Health-Medicine 90.615
Life-Sciences  55.333
Social-Sciences 60.266
```

`datamash` will read the first line of the input, and deduce the correct column number based on the given name. If the column name is not found, an error will be printed:

```
$ datamash --sort --headers groupby 2 mean Foo < scores_h.txt
datamash: column name 'Foo' not found in input file
```

Field names must be escaped with a backslash if they start with a digit or contain special characters (dash/minus, colons, commas). Note the interplay between escaping with backslash and shell quoting. The following equivalent command sum the values of a field named ‘FOO-BAR’:

```
$ datamash -H sum FOO\-BAR < input.txt
$ datamash -H sum 'FOO\-BAR' < input.txt
$ datamash -H sum "FOO\-BAR" < input.txt
```

5.3 Field Delimiters

datamash uses tabs (asci character 0x09) as default field delimiters. Use `-W` to treat one or more consecutive whitespace characters as field delimiters. Use `-t`, `--field-separator` to set a custom field delimiter.

The following examples illustrate the various options.
By default, fields are separated by a single tab. Multiple tabs denotes multiple fields (this is consistent with GNU coreutil’s `cut`):

```bash
$ printf '1\t\t2\n' | datamash sum 3
2
$ printf '1\t\t2\n' | cut -f3
2
```

Using `-W`, one or more consecutive whitespace characters are treated as a single field delimiter:

```bash
$ printf '1\t2\n' | datamash -W sum 2
2
$ printf '1\t2\n' | datamash -W sum 3
datamash: invalid input: field 3 requested, line 1 has only 2 fields
```

Using `-t`, a custom field delimiter character can be specified. Multiple consecutive delimiters are treated as multiple fields:

```bash
$ printf '1,10,,100\n' | datamash -t, sum 4
100
```

### 5.4 Column Ranges

`datamash` accepts column ranges such as `1,2,3` and `1-3`.

Simulating input with multiple columns:

```bash
$ seq 100 | paste - - - -
1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16
17 18 19 20
...
```

The following are equivalent:

```bash
$ seq 100 | paste - - - - | datamash sum 1 sum 2 sum 3 sum 4
1225 1250 1275 1300

$ seq 100 | paste - - - - | datamash sum 1,2,3,4
1225 1250 1275 1300

$ seq 100 | paste - - - - | datamash sum 1-4
1225 1250 1275 1300

$ seq 100 | paste - - - - | datamash sum 1-3,4
1225 1250 1275 1300
```

Ranges can be used with multiple operations:

```bash
$ seq 100 | paste - - - - | datamash sum 1-4 mean 1-4
1225 1250 1275 1300 49 50 51 52
```
5.5 Reverse and Transpose

Transpose

Use `transpose` to swap rows and columns in a file:

```
$ cat input.txt
Sample Year Count
A 2014 1002
B 2013 990
C 2014 2030
D 2014 599
```

```
$ datamash transpose < input.txt
Sample A B C D
Year 2014 2013 2014 2014
Count 1002 990 2030 599
```

By default, `transpose` verifies the input has the same number of fields in each line, and fails with an error otherwise:

```
$ cat input.txt
Sample Year Count
A 2014 1002
B 2013
C 2014 2030
D 2014 599
```

```
$ datamash transpose < input1.txt
datamash: transpose input error: line 3 has 2 fields (previous lines had 3);
see --help to disable strict mode
```

Use `--no-strict` to allow missing values:

```
$ datamash --no-strict transpose < input1.txt
Sample A B C D
Year 2014 2013 2014 2014
Count 1002 N/A 2030 599
```

Use `--filler` to set the missing-field filler value:

```
$ datamash --no-strict --filler XYZ transpose < input1.txt
Sample A B C D
Year 2014 2013 2014 2014
Count 1002 XYZ 2030 599
```

Reverse

Use `reverse` to reverse the fields order in a file:

```
$ cat input.txt
Sample Year Count
A 2014 1002
B 2013 990
```

```
$ datamash reverse < input.txt
Sample Year Count
A 2014 1002
B 2013 990
```
$ datamash reverse < input.txt

<table>
<thead>
<tr>
<th>Count</th>
<th>Year</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1002</td>
<td>2014</td>
<td>A</td>
</tr>
<tr>
<td>990</td>
<td>2013</td>
<td>B</td>
</tr>
<tr>
<td>2030</td>
<td>2014</td>
<td>C</td>
</tr>
<tr>
<td>599</td>
<td>2014</td>
<td>D</td>
</tr>
</tbody>
</table>

By default, reverse verifies the input has the same number of fields in each line, and fails with an error otherwise. Use `--no-strict` to disable this behaviour (see section above for an example).

**Combining Reverse and Transpose**

Reverse and Transpose can be combined to achieve various manipulations. (reminder: tac (https://www.gnu.org/software/coreutils/tac) can be used to reverse lines in a file):

```bash
$ cat input.txt
A 1 xx
B 2 yy
C 3 zz

$ tac input.txt
C 3 zz
B 2 yy
A 1 xx

$ tac input.txt | datamash reverse
zz 3 C
yy 2 B
xx 1 A

$ cat input.txt | datamash reverse | datamash transpose
xx yy zz
1 2 3
A B C

$ tac input.txt | datamash reverse | datamash transpose
zz yy xx
3 2 1
C B A
```

**5.6 Groupby on /etc/passwd**

datamash with the `groupby` operation mode can be used to aggregate information.
Using this simulated `/etc/passwd` file as input:

```
$ cat passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/bin/sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
proxy:x:13:13:proxy:/usr/sbin/nologin
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin
mysql:x:115:124:mysql:/var/lib/mysql:/bin/false
sshd:x:116:65534::/var/run/sshd:/usr/sbin/nologin
guest:x:118:125:Guest,,,:/tmp/guest-home.phc17z:/bin/bash
gordon:x:1004:1000:Assaf Gordon,,,:/home/gordon:/bin/bash
charles:x:1005:1000:Charles,,,:/home/charles:/bin/bash
alice:x:1006:1000:Alice,,,:/home/alice:/bin/bash
bob:x:1007:1000:Bob,,,:/home/bob:/bin/bash
postgres:x:119:126:PostgreSQL administrator,,,:/var/lib/postgresql:/bin/bash
rabbitmq:x:125:138:RabbitMQ messaging server,,,:/var/lib/rabbitmq:/bin/false
redis:x:126:140:redis server,,,:/var/lib/redis:/bin/false
postfix:x:127:141::/var/spool/postfix:/bin/false
```

Parameter `-t` is used to indicate the field separator (instead of the default `tab`).

Aggregate (groupby) login shells (column 7) and count how many users use each:

```
$ datamash -t: --sort groupby 7 count 7 < passwd
/bin/bash:7
/bin/false:4
/bin/sync:1
/usr/sbin/nologin:14
```

Aggregate (groupby) login shells (column 7) and print comma-separated list of users (column 1) for each shell (collapse):

```
$ cat passwd | datamash -t: --sort groupby 7 collapse 1
/bin/bash:root,guest,gordon,charles,alice,bob,postgres
/bin/false:mysql,rabbitmq,redis,postfix
/bin/sync:sync
/usr/sbin/nologin:daemon,bin,sy,game,man,lp,mail,news,uucp,proxy,www-data,backup,list
```

Aggregate unix-groups (column 4) and print comma-separated list of users (column 1) for each group:

```
$ datamash -t: --sort groupby 4 collapse 1 < /etc/passwd
```
5.7 Check - checking tabular structure

datamash check validates the tabular structure of a file, ensuring all lines have the same number of fields. check is meant to be used in scripting and automation pipelines, as it will terminate with non-zero exit code if the file is not well structured, while also printing detailed context information about the offending lines:

```
$ cat good.txt
A   1   ww
B   2   xx
C   3   yy
D   4   zz

$ cat bad.txt
A   1   ww
B   2   xx
C
D   4   zz

$ datamash check < good.txt && echo ok || echo fail
4 lines, 3 fields
ok
```
$ datamash check < bad.txt && echo ok || echo fail
line 2 (3 fields):
  B  2 xx
line 3 (2 fields):
  C  3
datamash: check failed: line 3 has 2 fields (previous line had 3)
fail

5.7.1 Expected number of lines/fields

check accepts optional lines and fields and will return failure if the input does not have the requested number of lines/fields.

The syntax is:

    datamash check [N lines] [N fields]

Usage examples:

$ cat file.txt
A  1  ww
B  2  xx
C  3  yy
D  4  zz

$ datamash check 4 lines < file.txt && echo ok
4 lines, 3 fields
ok

$ datamash check 3 fields < file.txt && echo ok
4 lines, 3 fields
ok

$ datamash check 4 lines 3 fields < file.txt && echo ok
4 lines, 3 fields
ok

$ datamash check 7 fields < file.txt && echo ok
line 1 (3 fields):
  A  1  ww
datamash: check failed: line 1 has 3 fields (expecting 22)

$ datamash check 10 lines < file.txt && echo ok
datamash: check failed: input had 4 lines (expecting 10)

For convenience, line,row,rows can be used instead of lines; field,columns,column,col can be used instead of fields. The following are all equivalent:
```
datamash check 4 lines 10 fields < file.txt
datamash check 4 rows 10 columns < file.txt
datamash check 10 col 4 row < file.txt

5.7.2 checks in automation scripts
In pipeline/automation context, it is often beneficial to validate files as early as possible
(immediately after file is created, as in fail-fast methodology (https://en.wikipedia.org/
wiki/Fail-fast)). A typical usage in a shell script would be:

```sh
#!/bin/sh
die()
{
    base=$(basename "$0")
    echo "$base: error: $@" >&2
    exit 1
}

custom pipeline-or-program > output.txt \
    || die "program failed"

datamash check < output.txt \
    || die "'output.txt' has invalid structure (missing fields)"
```

If the generated `output.txt` file has invalid structure (i.e. missing fields), `datamash`
will print the `stderr` enough details to help in troubleshooting (line numbers and offending
line's content).

5.8 Crosstab - Cross-Tabulation (pivot-tables)
Cross-tabulation compares the relationship between two fields. Given the following input
file:

```
$ cat input.txt
a x 3
a y 7
b x 21
a x 40
```

Show cross-tabulation between the first field (a/b) and the second field (x/y) - counting
how many times each pair appears (note: sorting is required):

```
$ datamash -s crosstab 1,2 < input.txt
x y
a 2 1
b 1 N/A
```

The default operation is `count` - in the above example, a and x appear twice in the input
file, while b and y never appear together.

An optional grouping operation can be used instead of counting.

For each pair, `sum` the values in the third column:

```
$ datamash -s crosstab 1,2 sum 3 < input.txt
```
For each pair, list all unique values in the third column:

```bash
$ datamash -s crosstab 1,2 unique 3 < input.txt
```

```
x y
a 3,40 7
b 21 N/A
```

### 5.9 Rounding numbers

The following demonstrate the different rounding operations:

```bash
$ ( echo X ; seq -1.25 0.25 1.25 ) |
    datamash --full -H round 1 ceil 1 floor 1 trunc 1 frac 1
```

<table>
<thead>
<tr>
<th>X</th>
<th>round(X)</th>
<th>ceil(X)</th>
<th>floor(X)</th>
<th>trunc(X)</th>
<th>frac(X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.25</td>
<td>-1</td>
<td>-1</td>
<td>-2</td>
<td>-1</td>
<td>-0.25</td>
</tr>
<tr>
<td>-1.00</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>-0.75</td>
<td>-1</td>
<td>0</td>
<td>-1</td>
<td>0</td>
<td>-0.75</td>
</tr>
<tr>
<td>-0.50</td>
<td>-1</td>
<td>0</td>
<td>-1</td>
<td>0</td>
<td>-0.5</td>
</tr>
<tr>
<td>-0.25</td>
<td>0</td>
<td>0</td>
<td>-1</td>
<td>0</td>
<td>-0.25</td>
</tr>
<tr>
<td>0.00</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.25</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.25</td>
</tr>
<tr>
<td>0.50</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.5</td>
</tr>
<tr>
<td>0.75</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.75</td>
</tr>
<tr>
<td>1.00</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1.25</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0.25</td>
</tr>
</tbody>
</table>

### 5.10 Binning numbers

Bin input values into buckets of size 5:

```bash
$ ( echo X ; seq -10 2.5 10 ) |
    datamash -H --full bin:5 1
```

<table>
<thead>
<tr>
<th>X</th>
<th>bin(X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10.0</td>
<td>-15</td>
</tr>
<tr>
<td>-7.5</td>
<td>-10</td>
</tr>
<tr>
<td>-5.0</td>
<td>-10</td>
</tr>
<tr>
<td>-2.5</td>
<td>-5</td>
</tr>
<tr>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>2.5</td>
<td>0</td>
</tr>
<tr>
<td>5.0</td>
<td>5</td>
</tr>
<tr>
<td>7.5</td>
<td>5</td>
</tr>
<tr>
<td>10.0</td>
<td>10</td>
</tr>
</tbody>
</table>
5.11 Binning strings

Hash any string input value into a numeric integer. A typical usage would be to split an input file into \( N \) chunks, ensuring that all values of a certain key will be stored in the same chunk:

\[
\begin{align*}
\$ \text{cat input.txt} \\
\text{PatientA} & \quad 10 \\
\text{PatientB} & \quad 11 \\
\text{PatientC} & \quad 12 \\
\text{PatientA} & \quad 14 \\
\text{PatientC} & \quad 15
\end{align*}
\]

Each patient ID is hashed into a bin between 0 and 9 and printed in the last field:

\[
\$ \text{datamash --full strbin 1 < input.txt} \\
\text{PatientA} & \quad 10 & 5 \\
\text{PatientB} & \quad 11 & 6 \\
\text{PatientC} & \quad 12 & 7 \\
\text{PatientA} & \quad 14 & 5 \\
\text{PatientC} & \quad 15 & 7
\]

Splitting the input into chunks can be done with awk:

\[
\$ \text{cat input.txt | datamash --full strbin 1 \ }
\text{| awk '{print > $NF ".txt"}'}
\]

5.12 Extracting numeric values - using getnum

The \texttt{getnum} operation extracts a numeric value from the field:

\[
\$ \text{echo zoom-123.45xyz | datamash getnum 1} \\
123.45
\]

\texttt{getnum} accepts an optional single-letter \texttt{TYPE} option:

- \texttt{getnum:n} natural numbers (positive integers, including zero)
- \texttt{getnum:i} integers
- \texttt{getnum:d} decimal point numbers
- \texttt{getnum:p} positive decimal point numbers (this is the default)
- \texttt{getnum:h} hex numbers
- \texttt{getnum:o} octal numbers

Examples:

\[
\$ \text{echo zoom-123.45xyz | datamash getnum 1} \\
123.45
\]

\[
\$ \text{echo zoom-123.45xyz | datamash getnum:n 1} \\
123
\]

\[
\$ \text{echo zoom-123.45xyz | datamash getnum:i 1} \\
-123
\]
$ echo zoom-123.45xyz | datamash getnum:d 1
123.45

$ echo zoom-123.45xyz | datamash getnum:p 1
-123.45

# Hex 0x123 = 291 Decimal
$ echo zoom-123.45xyz | datamash getnum:h 1
291

# Octal 0123 = 83 Decimal
$ echo zoom-123.45xyz | datamash getnum:o 1
83
6 Reporting bugs

To report bugs, suggest enhancements or otherwise discuss GNU Datamash, please send electronic mail to bug-datamash@gnu.org.

For bug reports, please include enough information for the maintainers to reproduce the problem. Generally speaking, that means:

- The version numbers of Datamash (which you can find by running `datamash --version`) and any other program(s) or manual(s) involved.
- Hardware and operating system names and versions.
- The contents of any input files necessary to reproduce the bug.
- The expected behavior and/or output.
- A description of the problem and samples of any erroneous output.
- Options you gave to configure other than specifying installation directories.
- Anything else that you think would be helpful.

When in doubt whether something is needed or not, include it. It’s better to include too much than to leave out something important.

Patches are welcome; if possible, please make them with `diff -c` (see Section “Overview” in Comparing and Merging Files) and include ChangeLog entries (see Section “Change Log” in The GNU Emacs Manual). Please follow the existing coding style.
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