Wakefield: Random Data Set (Part II)

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This post is part II of a series detailing the GitHub package, **wakefield**, for generating random data sets. The First Post (part I) was a test run to gauge user interest. I received positive feedback and some ideas for improvements, which I'll share below.

The post is broken into the following sections:

You can view just the R code HERE or PDF version HERE

1 Brief Package Description

First we'll use the **pacman** package to grab the **wakefield** package from GitHub and then load it as well as the handy **dplyr** package.

```
if (!require("pacman")) install.packages("pacman"); library(pacman)
p_install_gh("trinker/wakefield")
p_load(dplyr, wakefield)
```

The main function in **wakefield** is `r_data_frame`. It takes `n` (the number of rows) and any number of *variable functions* that generate random columns. The result is a data frame with named, randomly generated columns. Below is an example, for details see Part I or the README

```
set.seed(10)

r_data_frame(n = 30,
    id,
    race,
    age(x = 8:14),
    Gender = sex,
    Time = hour,
    iq,
    grade,
    height(mean=50, sd = 10),
    died,
    Scoring = rnorm,
    Smoker = valid
)
```

```
## Source: local data frame [30 x 11]
##
##    ID     Race Age Gender     Time  IQ Grade Height  Died    Scoring
## 1  01    White  11   Male 01:00:00 110  90.7     52 FALSE -1.8227126
## 2  02    White   8   Male 01:00:00 111  91.8     36  TRUE  0.3525440
## 3  03    White   9   Male 01:30:00  87  81.3     39 FALSE -1.3484514
## 4  04 Hispanic  14   Male 01:30:00 111  83.2     46  TRUE  0.7076883
## 5  05    White  10 Female 03:30:00  95  80.1     51  TRUE -0.4108909
## 6  06    White  13 Female 04:00:00  97  93.9     61  TRUE -0.4460452
## 7  07    White  13 Female 05:00:00 109  89.5     44  TRUE -1.0411563
## 8  08    White  14   Male 06:00:00 101  92.3     63  TRUE -0.3292247
## 9  09    White  12   Male 06:30:00 110  90.1     52  TRUE -0.2828216
## 10 10    White  11   Male 09:30:00 107  88.4     47 FALSE  0.4324291
## .. ..      ... ...    ...      ... ...   ...    ...   ...        ...
## Variables not shown: Smoker (lgl)
```

2 Improvements

2.1 Repeated Measures Series

Big thanks to Ananda Mahto for suggesting better handing of repeated measures series and provided concise code to extend this capability.

The user may now specify the same *variable function* multiple times and it is named appropriately:

```
set.seed(10)

r_data_frame(
    n = 500,
    id,
    age, age, age,
    grade, grade, grade
)
```

```
## Source: local data frame [500 x 7]
```

```
##
##     ID Age_1 Age_2 Age_3 Grade_1 Grade_2 Grade_3
## 1  001    28    33    32    80.2    87.2    85.6
## 2  002    24    35    31    89.7    91.7    86.8
## 3  003    26    33    23    92.7    85.7    88.7
## 4  004    31    24    28    82.2    90.0    86.0
## 5  005    21    21    29    86.5    87.0    88.4
## 6  006    23    28    25    85.6    93.5    86.7
## 7  007    24    22    26    89.3    90.3    87.6
## 8  008    24    21    23    92.4    88.3    89.3
## 9  009    29    23    32    86.4    84.4    88.2
## 10 010    26    34    32    97.6    84.2    90.6
## .. ...   ...   ...   ...     ...     ...     ...
```

But he went further, recommending a short hand for `variable, variable, variable`. The `r_series` function takes a variable function and `j` number of columns. It can also be renamed with the `name` argument:

```
set.seed(10)

r_data_frame(n=100,
    id,
    age,
    sex,
    r_series(gpa, 2),
    r_series(likert, 3, name = "Question")
)
```

```
## Source: local data frame [100 x 8]
##
##     ID Age    Sex GPA_1 GPA_2        Question_1        Question_2
## 1  001  28   Male  3.00  4.00 Strongly Disagree   Strongly Agree
## 2  002  24   Male  3.67  3.67          Disagree           Neutral
## 3  003  26   Male  3.00  4.00          Disagree Strongly Disagree
## 4  004  31   Male  3.67  3.67           Neutral   Strongly Agree
## 5  005  21 Female  3.00  3.00             Agree   Strongly Agree
## 6  006  23 Female  3.67  3.67             Agree             Agree
## 7  007  24 Female  3.67  4.00          Disagree Strongly Disagree
## 8  008  24   Male  2.67  3.00   Strongly Agree            Neutral
## 9  009  29 Female  4.00  3.33           Neutral Strongly Disagree
## 10 010  26   Male  4.00  3.00          Disagree Strongly Disagree
## .. ... ...    ...   ...   ...               ...               ...
## Variables not shown: Question_3 (fctr)
```

2.2 Dummy Coding Expansion of Factors

It is sometimes nice to expand a factor into j (number of groups) dummy coded columns. Here we see a factor version and then a dummy coded version of the same data frame:

```
set.seed(10)

r_data_frame(n=100,
    id,
```

```
    age,
    sex,
    political
)
```

```
## Source: local data frame [100 x 4]
##
##     ID Age    Sex    Political
## 1  001  28   Male Constitution
## 2  002  24   Male Constitution
## 3  003  26   Male     Democrat
## 4  004  31   Male     Democrat
## 5  005  21 Female Constitution
## 6  006  23 Female     Democrat
## 7  007  24 Female     Democrat
## 8  008  24   Male   Republican
## 9  009  29 Female Constitution
## 10 010  26   Male     Democrat
## .. ... ...    ...          ...
```

The dummy coded version...

```
set.seed(10)

r_data_frame(n=100,
    id,
    age,
    r_dummy(sex, prefix = TRUE),
    r_dummy(political)
)
```

```
## Source: local data frame [100 x 9]
##
##     ID Age Sex_Male Sex_Female Constitution Democrat Green Libertarian
## 1  001  28        1          0            1        0     0           0
## 2  002  24        1          0            1        0     0           0
## 3  003  26        1          0            0        1     0           0
## 4  004  31        1          0            0        1     0           0
## 5  005  21        0          1            1        0     0           0
## 6  006  23        0          1            0        1     0           0
## 7  007  24        0          1            0        1     0           0
## 8  008  24        1          0            0        0     0           0
## 9  009  29        0          1            1        0     0           0
## 10 010  26        1          0            0        1     0           0
## .. ... ...      ...        ...          ...      ...   ...         ...
## Variables not shown: Republican (int)
```

2.3 Factor to Numeric Conversion

There are times when you feel like a factor and the when you feel like an integer version. This is particularly useful with Likert-type data and other ordered factors. The `as_integer` function takes a `data.frame` and allows the user t specify the indices (`j`) to convert from factor to numeric. Here I show a factor `data.frame` and then the integer conversion:

```
set.seed(10)

r_data_frame(5,
    id,
    r_series(likert, j = 4, name = "Item")
)
```

```
## Source: local data frame [5 x 5]
##
##   ID          Item_1   Item_2          Item_3            Item_4
## 1  1         Neutral    Agree        Disagree           Neutral
## 2  2           Agree    Agree         Neutral   Strongly Agree
## 3  3         Neutral    Agree Strongly Agree              Agree
## 4  4        Disagree Disagree         Neutral              Agree
## 5  5 Strongly Agree   Neutral           Agree Strongly Disagree
```

As integers...

```
set.seed(10)

r_data_frame(5,
    id,
    r_series(likert, j = 4, name = "Item")
) %>%
    as_integer(-1)
```

```
## Source: local data frame [5 x 5]
##
##   ID Item_1 Item_2 Item_3 Item_4
## 1  1      3      4      2      3
## 2  2      4      4      3      5
## 3  3      3      4      5      4
## 4  4      2      2      3      4
## 5  5      5      3      4      1
```

2.4 Viewing Whole Data Set

dplyr has a nice print method that hides excessive rows and columns. Typically this is great behavior. Sometimes you want to quickly see the whole width of the data set. We can use `View` but this is still wide and shows all columns. The `peek` function shows minimal rows, truncated columns, and prints wide for quick inspection. This is particularly nice for text strings as data. **dplyr** prints wide data sets like this:

```
r_data_frame(100,
    id,
    name,
    sex,
    sentence
)
```

```
## Source: local data frame [100 x 4]
##
```

```
##     ID     Name    Sex
## 1  001   Gerald   Male
## 2  002    Jason   Male
## 3  003 Mitchell   Male
## 4  004      Joe Female
## 5  005   Mickey   Male
## 6  006   Michal   Male
## 7  007   Dannie Female
## 8  008   Jordan   Male
## 9  009     Rudy Female
## 10 010   Sammie Female
## .. ...      ...    ...
## Variables not shown: Sentence (chr)
```

Now use `peek`:

```
r_data_frame(100,
    id,
    name,
    sex,
    sentence
) %>% peek
```

```
## Source: local data frame [100 x 4]
##
##     ID    Name    Sex   Sentence
## 1  001     Jae Female Excuse me.
## 2  002 Darnell Female Over the l
## 3  003  Elisha Female First of a
## 4  004  Vernon Female Gentlemen,
## 5  005   Scott   Male That's wha
## 6  006   Kasey Female We don't h
## 7  007 Michael   Male You don't
## 8  008   Cecil Female I'll get o
## 9  009    Cruz Female They must
## 10 010  Travis Female Good night
## .. ...     ...    ...        ...
```

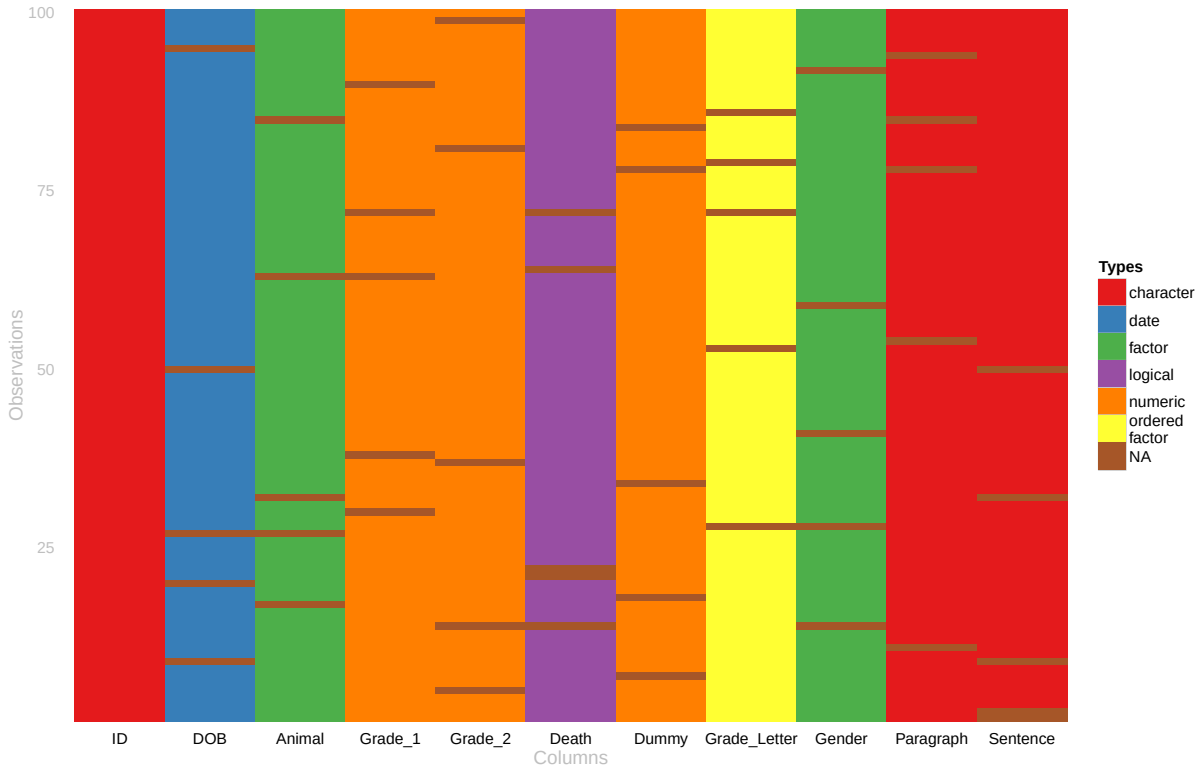
2.5 Visualizing Column Types and NAs

When we build a large random data set it is nice to get a sense of the column types and the missing values. The `table_heat` (also `plot` for `tbl_df` class) does this. Here I'll generate a data set, add missing values (`r_na`), and then plot:

```
set.seed(10)

r_data_frame(n=100,
    id,
    dob,
    animal,
    grade, grade,
    death,
```

```
    dummy,
    grade_letter,
    gender,
    paragraph,
    sentence
) %>%
   r_na() %>%
   plot(palette = "Set1")
```



3 Table of Variable Functions

There are currently 66 **wakefield** based *variable functions* to chose for building columns. Use `variables()` to see them or `variables(TRUE)` to see a list of them broken into variable types. Here's an HTML table version:

% latex table generated in R 3.2.0 by xtable 1.7-4 package % Wed Apr 29 22:48:34 2015

age	dice	grade_letter	level	normal	smokes
animal	died	grade_level	likert	normal_round	speed
answer	dna	group	likert_5	paragraph	speed_kph
area	dob	hair	likert_7	pet	speed_mph
birth	dummy	height	lorem_ipsum	political	state
car	education	height_cm	lower	primary	string
children	employment	height_in	lower_factor	race	upper
coin	eye	income	marital	religion	upper_factor
color	gender	internet_browser	military	sat	valid
date_stamp	gpa	iq	month	sentence	year
death	grade	language	name	sex	zip_code

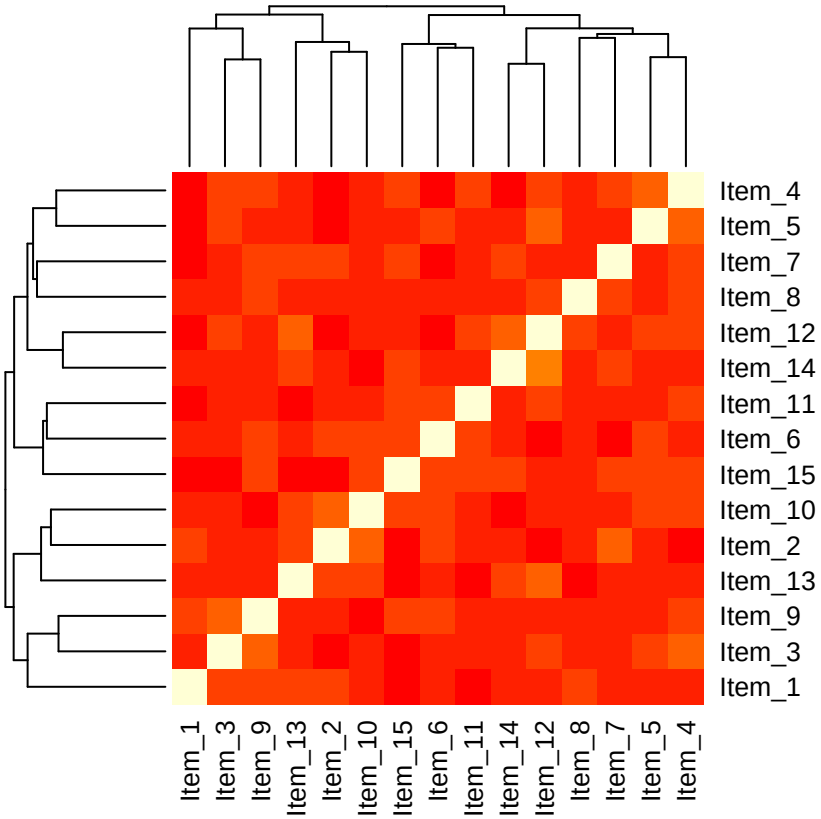
4 Possible Uses

4.1 Testing Methods

I personally will use this most frequently when I'm testing out a model. For example say you wanted to test psychometric functions, including the `cor` function, on a randomly generated assessment:

```
dat <- r_data_frame(120,
    id,
    sex,
    age,
    r_series(likert, 15, name = "Item")
) %>%
    as_integer(-c(1:3))

dat %>%
    select(contains("Item")) %>%
    cor %>%
    heatmap
```



4.2 Unique Student Data for Course Assignments

Sometimes it's nice if students each have their own data set to work with but one in which you control the parameters. Simply supply the students with a unique integer id and they can use this inside of `set.seed`

with a **wakefield** `r_data_frame` you've constructed for them in advance. Viola 25 instant data sets that are structurally the same but randomly different.

```
student_id <- ## INSERT YOUT ID HERE

set.seed(student_id)

dat <- function(1000,
    id,
    gender,
    religion,
    internet_browser,
    language,
    iq,
    sat,
    smokes
)
```

4.3 Blogging and Online Help Communities

wakefield can make data sharing on blog posts and online hep communities (e.g., TalkStats, StackOverflow) fast, accessible, and with little space or cognitive effort. Use `variables(TRUE)` to see *variable functions* by class and select the ones you want:

```
variables(TRUE)
```

```
## $character
## [1] "lorem_ipsum" "lower"       "name"        "paragraph"   "sentence"
## [6] "string"      "upper"       "zip_code"
##
## $date
## [1] "birth"      "date_stamp" "dob"
##
## $factor
##  [1] "animal"           "answer"           "area"
##  [4] "car"              "coin"             "color"
##  [7] "dna"              "education"        "employment"
## [10] "eye"              "gender"           "grade_level"
## [13] "group"            "hair"             "internet_browser"
## [16] "language"         "lower_factor"     "marital"
## [19] "military"         "month"            "pet"
## [22] "political"        "primary"          "race"
## [25] "religion"         "sex"              "state"
## [28] "upper_factor"
##
## $integer
## [1] "age"      "children" "dice"     "level"    "year"
##
## $logical
## [1] "death"  "died"   "smokes" "valid"
##
## $numeric
##  [1] "dummy"        "gpa"          "grade"        "height"
```

```
##  [5] "height_cm"    "height_in"    "income"       "iq"
##  [9] "normal"       "normal_round" "sat"          "speed"
## [13] "speed_kph"    "speed_mph"
##
## $`ordered factor`
## [1] "grade_letter" "likert"       "likert_5"     "likert_7"
```

Then throw the inside of `r_data_fame` to make a quick data set to share.

```
r_data_frame(8,
    name,
    sex,
    r_series(iq, 3)
) %>%
    peek %>%
    dput
```

5 Getting Involved

If you're interested in getting involved with use or contributing you can:

1. Install and use **wakefield**
2. Provide feedback via comments below
3. Provide feedback (bugs, improvements, and feature requests) via wakefield's Issues Page
4. Fork from GitHub and give a Pull Request

Thanks for reading, your feedback is welcomed.

**Get the R code for this post HERE*
Get a PDF version this post HERE