WORKING WITH DATES AND TIMES IN R

Taking differences of datetimes

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Instructor

Arithmetic for datetimes

- datetime_1 - datetime2: Subtraction for time elapsed
- datetime_1 + (2 * timespan): Addition and multiplication for generating new datetimes in the past or future
- timespan1 / timespan2: Division for change of units

Subtraction of datetimes

```
> releases <- read_csv("rversions.csv")
> last_release <- filter(releases, date == max(date))

> Sys.Date() - last_release$date
Time difference of 99 days

> difftime(Sys.Date(), last_release$date)
Time difference of 99 days
```

time1 - time2 is the same as difftime(time1, time2)

difftime()

units = "secs", "mins", "hours", "days", or "weeks"

```
> difftime(Sys.Date(), last_release$date, units = "secs")
Time difference of 8553600 secs

> difftime(Sys.Date(), last_release$date, units = "weeks")
Time difference of 14.14286 weeks
```

now() and today()

```
> today()
[1] "2017-10-07"

> str(today())
 Date[1:1], format: "2017-10-07"

> now()
[1] "2017-10-07 09:44:52 PDT"

> str(now())
 POSIXct[1:1], format: "2017-10-07 09:44:59"
```

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Let's practice!

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Time spans

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Time spans in lubridate

PERIOD

- Human concept of a time span
- datetime + **period** of one day =

  same time on the next date
- variable length

DURATION

- Stopwatch concept of a time

  span
- datetime + **duration** of one day

  =

  datetime + 86400 seconds
- fixed number of seconds

Creating a time span

```
> days()
[1] "1d 0H 0M 0S"

> days(x = 2)
[1] "2d 0H 0M 0S"

> ddays(2)
[1] "172800s (~2 days)"
```

Arithmetic with time spans

```
> 2 * days()
[1] "2d 0H 0M 0S"

> days() + days()
[1] "2d 0H 0M 0S"

> ymd("2011-01-01") + days()
[1] "2011-01-02"
```

Functions to create time spans

Time span	Duration	Period
Seconds	dseconds()	seconds()
Minutes	dminutes()	minutes()
Hours	dhours()	hours()
Days	ddays()	days()
Weeks	dweeks()	weeks()
Months	-	months()
Years	dyears()	years()

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Intervals

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Creating intervals

datetime1 %--% datetime2, or
interval(datetime1, datetime2)

```
> dmy("5 January 1961") %--% dmy("30 January 1969")
[1] 1961-01-05 UTC--1969-01-30 UTC

> interval(dmy("5 January 1961"), dmy("30 January 1969"))
[1] 1961-01-05 UTC--1969-01-30 UTC
```

Operating on an interval

```
> beatles <- dmy("5 January 1961") %--% dmy("30 January 1969")

> int_start(beatles)
[1] "1961-01-05 UTC"

> int_end(beatles)
[1] "1969-01-30 UTC"

> int_length(beatles)
[1] 254620800

> as.period(beatles)
[1] "8y 0m 25d 0H 0M 0S"

> as.duration(beatles)
[1] "254620800s (~8.07 years)"
```

Comparing intervals

```
> hendrix_at_woodstock <- mdy("August 17 1969")

> hendrix_at_woodstock %within% beatles
[1] FALSE

> hendrix <- dmy("01 October 1966") %--% dmy("16 September 1970")

> int_overlaps(beatles, hendrix)
[1] TRUE
```

Which kind of time span?

Use:

- **Intervals** when you have a *start* and *end*
- **Periods** when you are interested in human units
- **Durations** if you are interested in seconds elapsed

Monarchs of England

Monarchs of Britain:
https://en.wikipedia.org/wiki/List_of_monarchs_in_Britain_by_length_of_reign

```
> monarchs
# A tibble: 131 x 4
                          name       from         to       dominion
                         <chr>     <dttm>     <dttm>          <chr>
 1                 Elizabeth II 1952-02-06 2017-10-07 United Kingdom
 2                     Victoria 1837-06-20 1901-01-22 United Kingdom
 3                     George V 1910-05-06 1936-01-20 United Kingdom
 4                    George III 1801-01-01 1820-01-29 United Kingdom
# ... with 127 more rows
```

Halley's comet

Halley's comet:
https://en.wikipedia.org/wiki/Halley%27s_Comet#Apparitions

```
> halleys
# A tibble: 27 x 6
      designation  year perihelion_date start_date   end_date distance
            <chr> <int>          <date>     <date>     <date>    <chr>
 1   1P/66 B1, 66    66      0066-01-26 0066-01-25 0066-01-26     <NA>
 2 1P/141 F1, 141   141      0141-03-25 0141-03-22 0141-03-25     <NA>
 3 1P/218 H1, 218   218      0218-04-06 0218-04-06 0218-05-17     <NA>
 4 1P/295 J1, 295   295      0295-04-07 0295-04-07 0295-04-20     <NA>
# ... with 23 more rows
```

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