SENTIMENT ANALYSIS IN R: THE TIDY WAY

Tidying Shakespeare

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Data Scientist at Stack Overflow

Six Shakespearean plays

shakespeare

- title, the title of a Shakespearean play
- type, the type of play, either tragedy or comedy
- text, a line from that play

Texts available from Project Gutenberg

Six Shakespearean plays

```
> shakespeare %>%
+     count(type, title)

# A tibble: 6 x 3
     type                            title     n
    <chr>                            <chr> <int>
1  Comedy       A Midsummer Night's Dream  3459
2  Comedy          Much Ado about Nothing  3799
3  Comedy          The Merchant of Venice  4225
4 Tragedy       Hamlet, Prince of Denmark  6776
5 Tragedy          The Tragedy of Macbeth  3188
6 Tragedy The Tragedy of Romeo and Juliet  4441
```

Learning how to tidy text

```
> hamlet
# A tibble: 6,776 x 3
                       title    type                          text
                       <chr>   <chr>                         <chr>
 1 Hamlet, Prince of Denmark Tragedy  HAMLET, PRINCE OF DENMARK
 2 Hamlet, Prince of Denmark Tragedy
 3 Hamlet, Prince of Denmark Tragedy     by William Shakespeare
 4 Hamlet, Prince of Denmark Tragedy
 5 Hamlet, Prince of Denmark Tragedy
 6 Hamlet, Prince of Denmark Tragedy
 7 Hamlet, Prince of Denmark Tragedy
 8 Hamlet, Prince of Denmark Tragedy       PERSONS REPRESENTED.
 9 Hamlet, Prince of Denmark Tragedy
10 Hamlet, Prince of Denmark Tragedy Claudius, King of Denmark.
# ... with 6,766 more rows
```

Learning how to tidy text

```
> library(tidytext)
>
> hamlet %>%
+     unnest_tokens(word, text)

# A tibble: 32,068 x 3
                      title    type        word
                      <chr>   <chr>       <chr>
 1 Hamlet, Prince of Denmark Tragedy      hamlet
 2 Hamlet, Prince of Denmark Tragedy      prince
 3 Hamlet, Prince of Denmark Tragedy          of
 4 Hamlet, Prince of Denmark Tragedy     denmark
 5 Hamlet, Prince of Denmark Tragedy          by
 6 Hamlet, Prince of Denmark Tragedy     william
 7 Hamlet, Prince of Denmark Tragedy shakespeare
 8 Hamlet, Prince of Denmark Tragedy     persons
 9 Hamlet, Prince of Denmark Tragedy represented
10 Hamlet, Prince of Denmark Tragedy    claudius
# ... with 32,058 more rows
```

Tokenization

In our case,

TOKEN = SINGLE WORD

What did unnest_tokens() do?

- Other columns have been retained
- Punctuation has been stripped
- Words have been converted to lower-case

```
> library(tidytext)
>
> hamlet %>%
+     unnest_tokens(word, text)

# A tibble: 32,068 x 3
                      title    type        word
                      <chr>   <chr>       <chr>
 1 Hamlet, Prince of Denmark Tragedy      hamlet
 2 Hamlet, Prince of Denmark Tragedy      prince
 3 Hamlet, Prince of Denmark Tragedy          of
# ... with 32,065 more rows
```

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The game's afoot!

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Using count and mutate

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Positive and negative words

```
> shakespeare_sentiment %>%
+     count(title, sentiment)

# A tibble: 12 x 3
                            title sentiment     n
                            <chr>     <chr> <int>
 1       A Midsummer Night's Dream  negative   681
 2       A Midsummer Night's Dream  positive   773
 3       Hamlet, Prince of Denmark  negative  1323
 4       Hamlet, Prince of Denmark  positive  1223
 5          Much Ado about Nothing  negative   767
 6          Much Ado about Nothing  positive  1127
 7          The Merchant of Venice  negative   740
 8          The Merchant of Venice  positive   962
 9          The Tragedy of Macbeth  negative   914
10          The Tragedy of Macbeth  positive   749
11 The Tragedy of Romeo and Juliet  negative  1235
12 The Tragedy of Romeo and Juliet  positive  1090
```

Defining a new column

Using mutate():

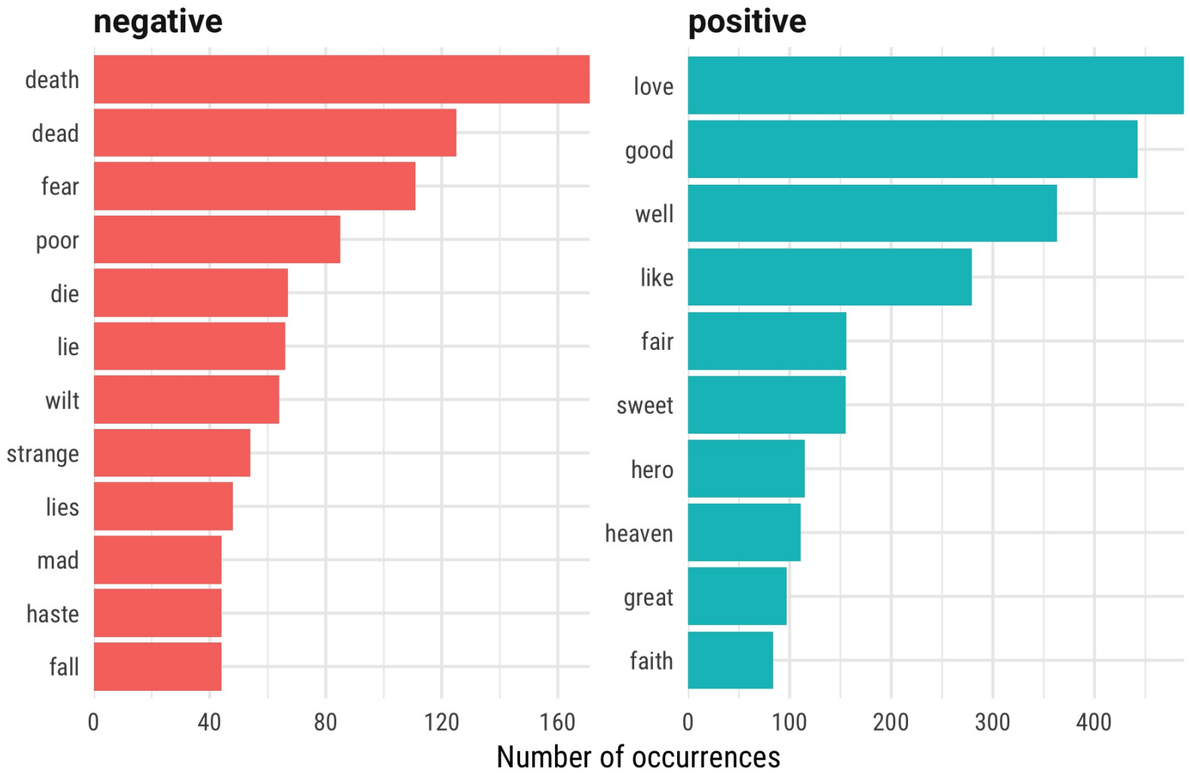
```
mutate(total = sum(n),
       percent = n / total)
```

Looking at contributions by word

```
> hamlet_sentiment %>%
+     count(word, sentiment, sort = TRUE)

# A tibble: 823 x 3
     word sentiment     n
    <chr>     <chr> <int>
 1   good  positive   109
 2   like  positive    84
 3   well  positive    78
 4   love  positive    68
 5 heaven  positive    44
 6  death  negative    38
 7    mar  negative    35
 8   dead  negative    33
 9  great  positive    26
10  sweet  positive    26
# ... with 813 more rows
```

Visualizing word contributions



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Once more unto the breach!

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Sentiment contributions by individual words

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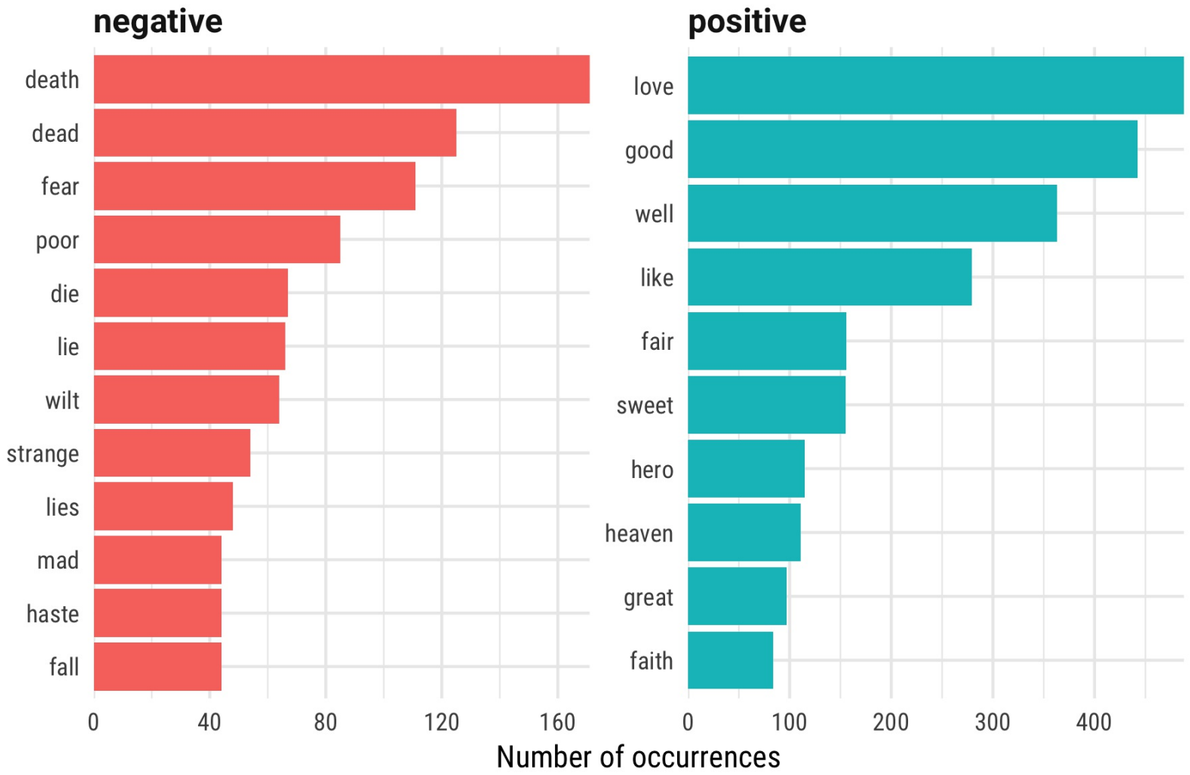
What words contribute to sentiment scores?



Back to the sentiment lexicons

```
> get_sentiments("bing") %>%
+     filter(word == "wilt")

# A tibble: 1 x 2
   word sentiment
  <chr>     <chr>
1  wilt  negative
```

Think what thou wilt

```
> library(stringr)
> shakespeare %>%
+     filter(str_detect(text, "wilt")) %>%
+     select(text)

# A tibble: 52 x 1
                                                  text
                                                 <chr>
 1                    Take it in what sense thou wilt.
 2          Which thou wilt propagate, to have it prest
 3     Thou wilt fall backward when thou hast more wit;
 4     Thou wilt fall backward when thou comest to age;
 5        Ben. An if he hear thee, thou wilt anger him.
 6          Or, if thou wilt not, be but sworn my love,
 7        Dost thou love me, I know thou wilt say 'Ay';
 8       So thou wilt woo; but else, not for the world.
# ... with 44 more rows
```

What next?

anti_join()

```
> tidy_shakespeare %>%
+     anti_join(data_frame(word = "wilt"))
Joining, by = "word"

# A tibble: 141,003 x 4
                       title    type linenumber       word
                       <chr>   <chr>      <int>      <chr>
 1 Hamlet, Prince of Denmark Tragedy       6776   multiple
 2 Hamlet, Prince of Denmark Tragedy       6761     loudly
 3 Hamlet, Prince of Denmark Tragedy       6737     upshot
 4 Hamlet, Prince of Denmark Tragedy       6736     deaths
 5 Hamlet, Prince of Denmark Tragedy       6735 slaughters
 6 Hamlet, Prince of Denmark Tragedy       6735     casual
 7 Hamlet, Prince of Denmark Tragedy       6734     carnal
 8 Hamlet, Prince of Denmark Tragedy       6732  unknowing
# ... with 140,995 more rows
```

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Let's practice!

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Which words are important in each play?

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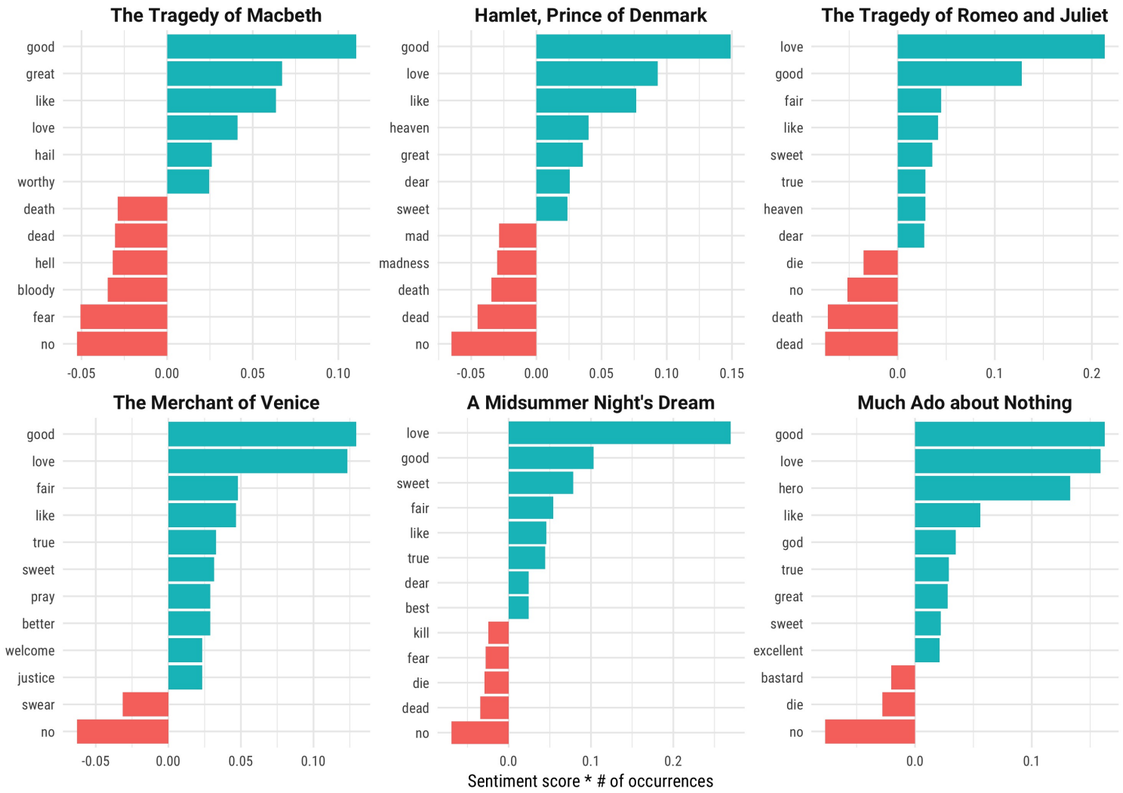
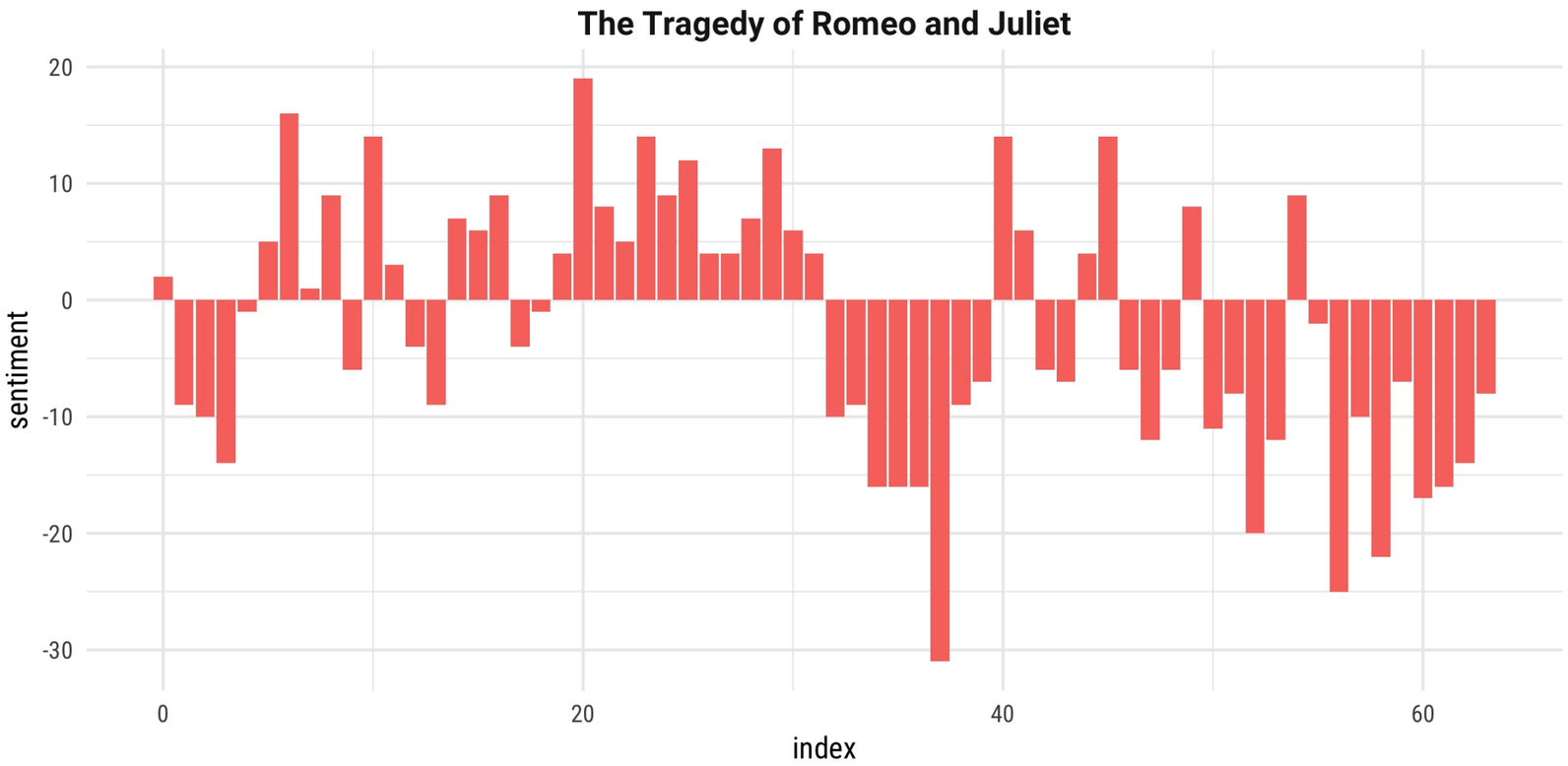
Word contributions



Which words are important?

Tidy data principles make sentiment analysis easier and more effective

Narrative arcs



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Let's practice!