AE 05: Model Conditions

Songs on Spotify

Driver: _____, Reporter: _____, Gopher: _____

2024-09-11

> **!** Important
>
> - Open RStudio and create a subfolder in your AE folder called "AE-05"
> - Go to the Canvas and locate your `AE 05` assignment to get started.
> - Upload the `ae-05.qmd` and `spotify-popular.csv` files into the folder you just created. The `.qmd` and PDF responses are due in Canvas no later than Monday, September 16 at 11:59pm.

```
library(tidyverse)
library(ggformula)
library(broom)
library(knitr)
library(patchwork) #arrange plots in a grid
```

Data

The data set for this assignment is a subset from the Spotify Songs Tidy Tuesday data set. The data were originally obtained from Spotify using the **spotifyr** R package.

It contains numerous characteristics for each song. You can see the full list of variables and definitions here. This analysis will focus specifically on the following variables:

variable	class	description
track_id	character	Song unique ID
track_name	character	Song Name
track_artist	character	Song Artist
track_popularity	double	Song Popularity (0-100) where higher is better

variable	class	description
energy	double	Energy is a measure from 0.0 to 1.0 and represents a perceptual measure of intensity and activity. Typically, energetic tracks feel fast, loud, and noisy. For example, death metal has high energy, while a Bach prelude scores low on the scale. Perceptual features contributing to this attribute include dynamic range, perceived loudness, timbre, onset rate, and general entropy.
valence	double	A measure from 0.0 to 1.0 describing the musical positiveness conveyed by a track. Tracks with high valence sound more positive (e.g. happy, cheerful, euphoric), while tracks with low valence sound more negative (e.g. sad, depressed, angry).

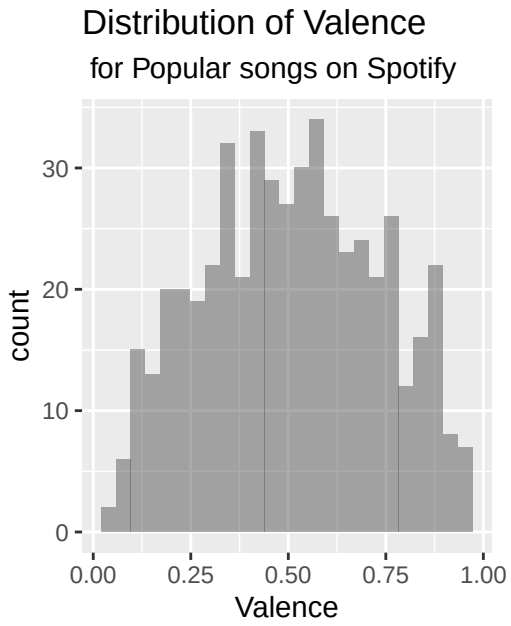
```
spotify <- read_csv("data/spotify-popular.csv")
```

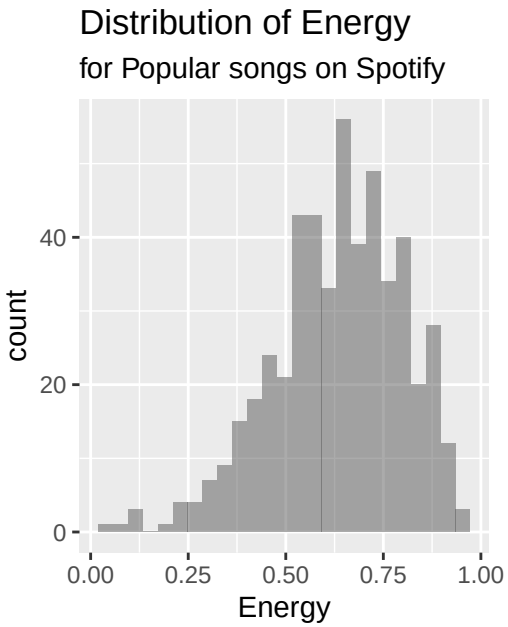
Are high energy songs more positive? To answer this question, we'll analyze data on some of the most popular songs on Spotify, i.e. those with `track_popularity >= 80`. We'll use linear regression to fit a model to predict a song's positiveness (`valence`) based on its energy level (`energy`).

Below are plots as part of the exploratory data analysis.

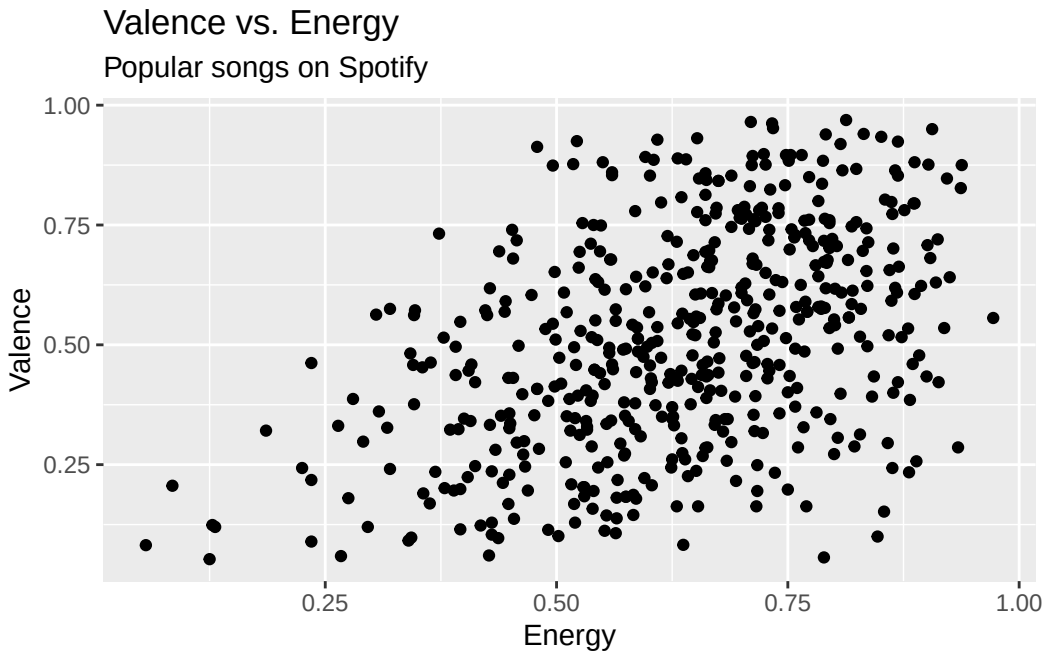
```
p1 <- gf_histogram(~valence, data = spotify) |>
  gf_labs(title = "Distribution of Valence",
       subtitle = " for Popular songs on Spotify",
       x = "Valence")

p2 <- gf_histogram(~energy, data = spotify) |>
  gf_labs(title = "Distribution of Energy",
       subtitle = "for Popular songs on Spotify",
       x = "Energy")
p1 + p2 # The patchwork package will arrange your plots for you
```






```
gf_point(valence ~ energy, data = spotify) |>
  gf_labs(title = "Valence vs. Energy",
       subtitle = "Popular songs on Spotify",
       x = "Energy",
       y = "Valence")
```



Exercise 1

Fit a model using the `energy` of a song to predict its `valence`, i.e. positiveness. Include the 90% confidence interval for the coefficients, and display the output using 3 digits.

```
## add code
```

Exercise 2

Let's check the model conditions before doing any inference. Fill in the code below to use the `augment()` function to create a new data frame containing the residuals and fitted values (among other information)

> **!** Important
>
> Note: Remove `#|eval: false` from the code chunk after you have filled in the code.

```
spotify_aug <- augment(_____)
```

Exercise 3

Make a plot of the residual vs. fitted values.

```
# add code here
```

Exercise 4

Fill in the code to make a histogram of the residuals and a normal QQ-plot.

```
resid_hist <- gf_histogram(~____, data = ____)) |>
  gf_labs(x = "_____",
       y = "_____",
       title = "____")

resid_qq <- gf_qq(~____, data = ____)  |>
  gf_qqline() |>
  gf_labs(x = "_____",
       y = "_____",
       title = "____")
```

```
resid_hist + resid_qq
```

Exercise 5

Assess the four model conditions. Use the plots from the previous exercises to help make the assessment.

- Linearity
- Constant variance
- Normality
- Independence

Exercise 6

Calculate R^2 and interpret this value in the context of the data.

Exercise 7

Calculate RMSE and interpret this value in the context of the data.

> **!** Important
>
> To submit the AE:
>
> - Render the document to produce the PDF with all of your work from today's class.
> - Push all your work to your `ae-06` repo on GitHub. (You do not submit AEs on Gradescope).