Predicting Difficulty of Stepmania Charts

With Machine Learning

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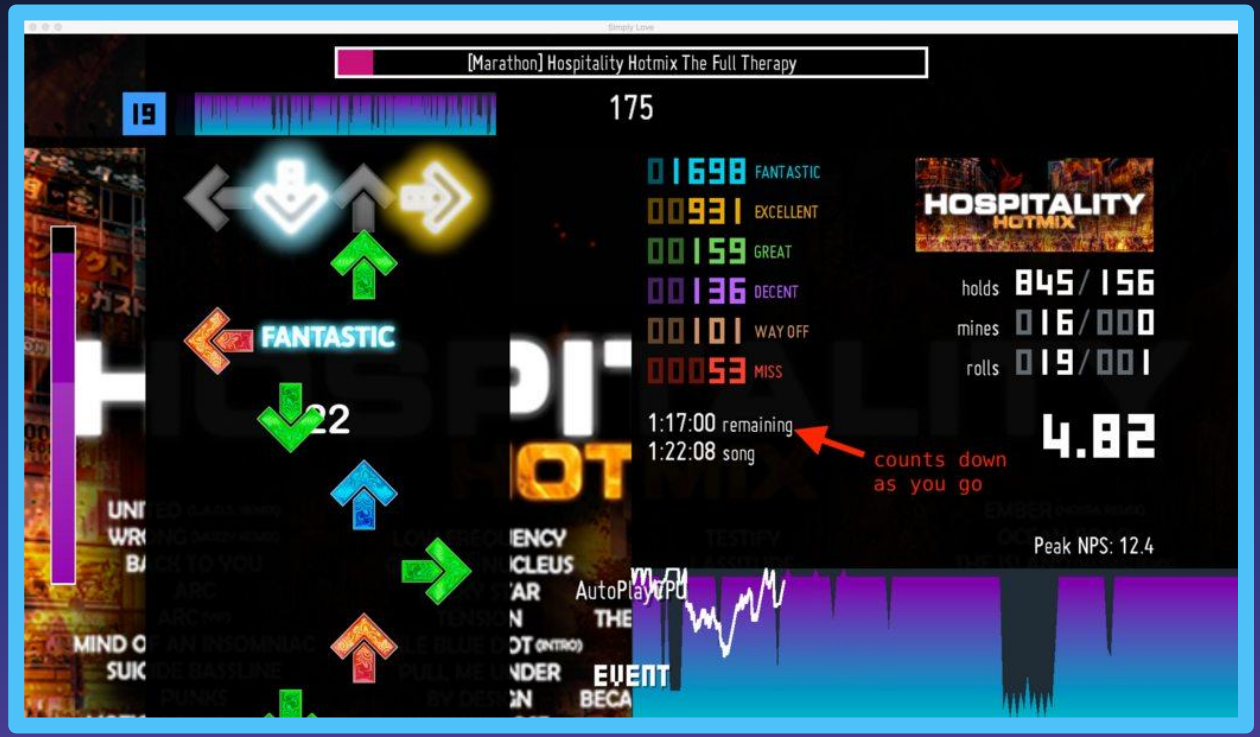
What is Stepmania?

- Open-source software for music games, created in 2005
- Endlessly customizable
- Most popular for “4-panel” dance games (think Dance Dance Revolution)



Credit:
SimplyLove by
quietly-turning
and hurtpiggypig

02

Data Collection

ITGPACKS.COM - community-driven spreadsheet

Chart parser built by Tim Murphy, fellow dance-gamer and software engineer

3200 Technical songs
2250 Stamina songs

Technical vs. Stamina Data

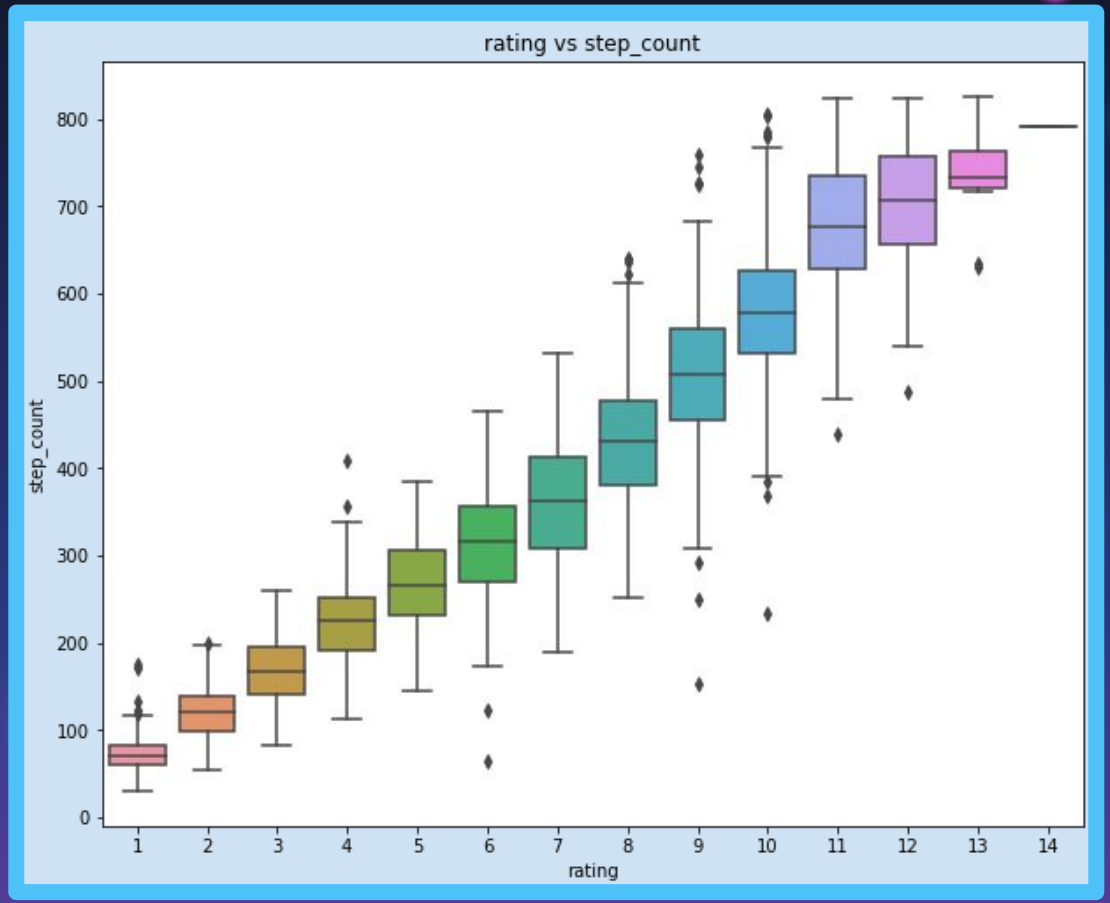
Technical
- Pattern complexity - more technical features
- Shorter songs

Target: rating - numerical difficulty

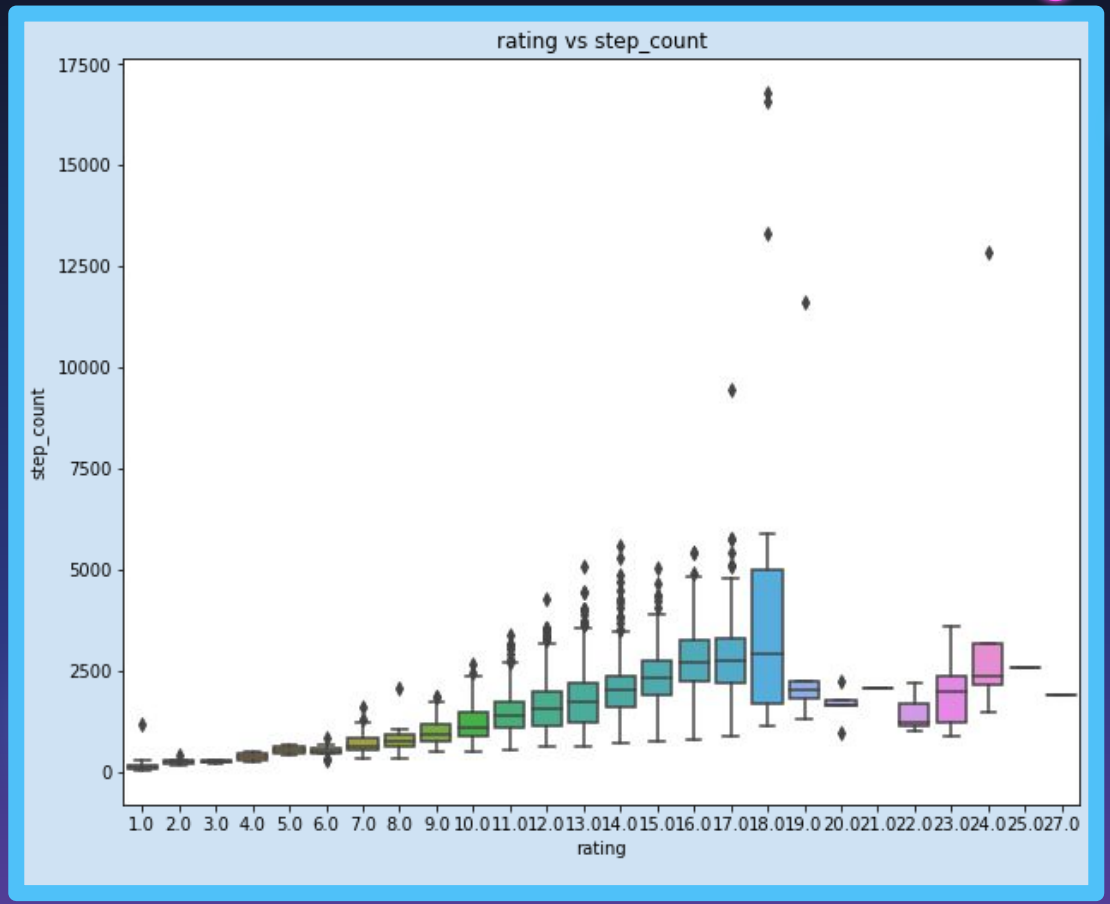
Key features: step count, song NPS, stream total

Stamina
- Larger distribution - song lengths & difficulties
- Less pattern complexity

Technical


rating vs step_count
step_count
rating
0
100
200
300
400
500
600
700
800
1
2
3
4
5
6
7
8
9
10
11
12
13
14

Stamina


rating vs step_count
step_count
17500
15000
12500
10000
7500
5000
2500
0
1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 27.0
rating

03 First Simple Model

Tech

Linear Regression

R-squared: .951

MSE: .642

Stamina

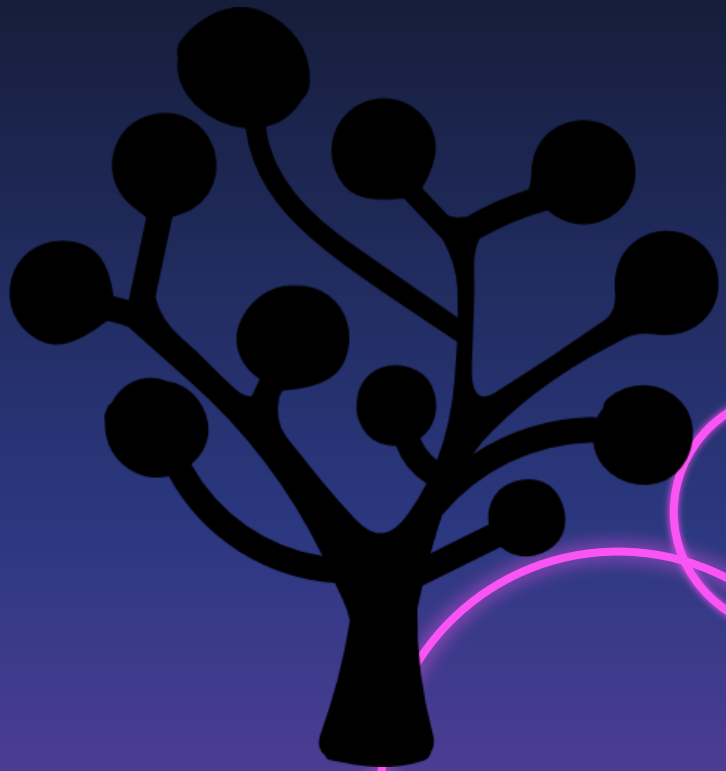
Linear Regression

R-squared: .958

MSE: .502

XGBoost Regressor

- Decision tree-based Regression Model
- Uses multiple models, adding sequentially

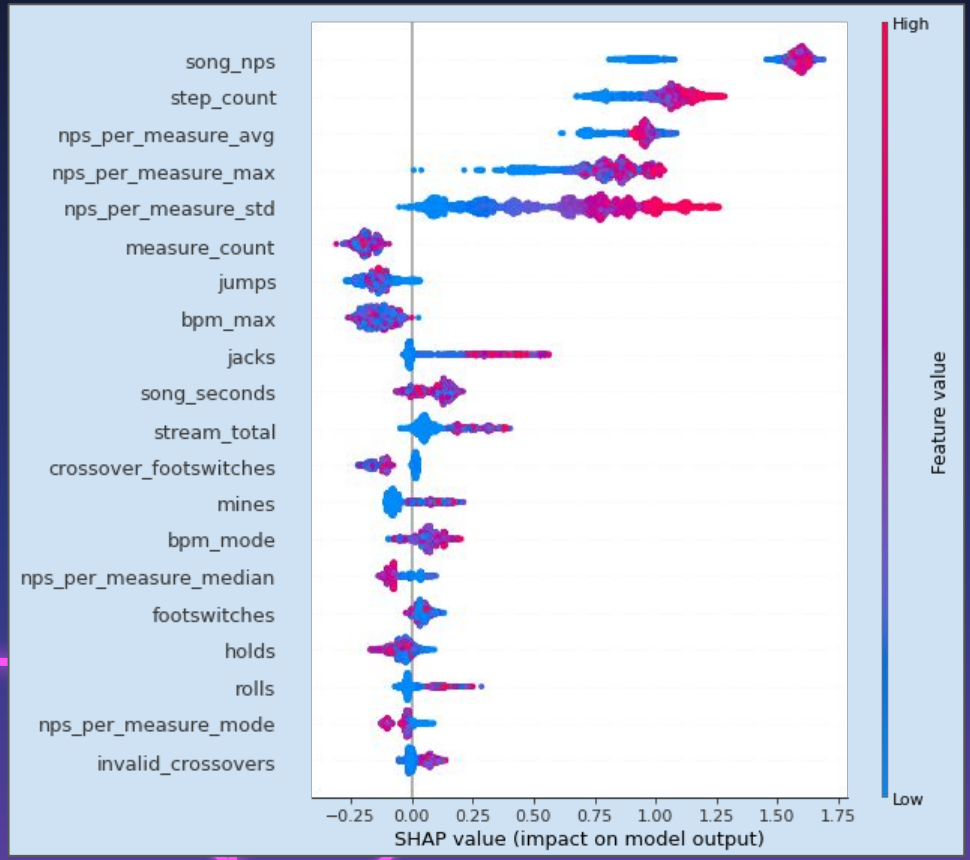


Final Model - Technical

XGBoost Regressor

R-squared = .968
MSE = .404

learning rate = .1
depth = 5
gamma = 0
lambda = .1

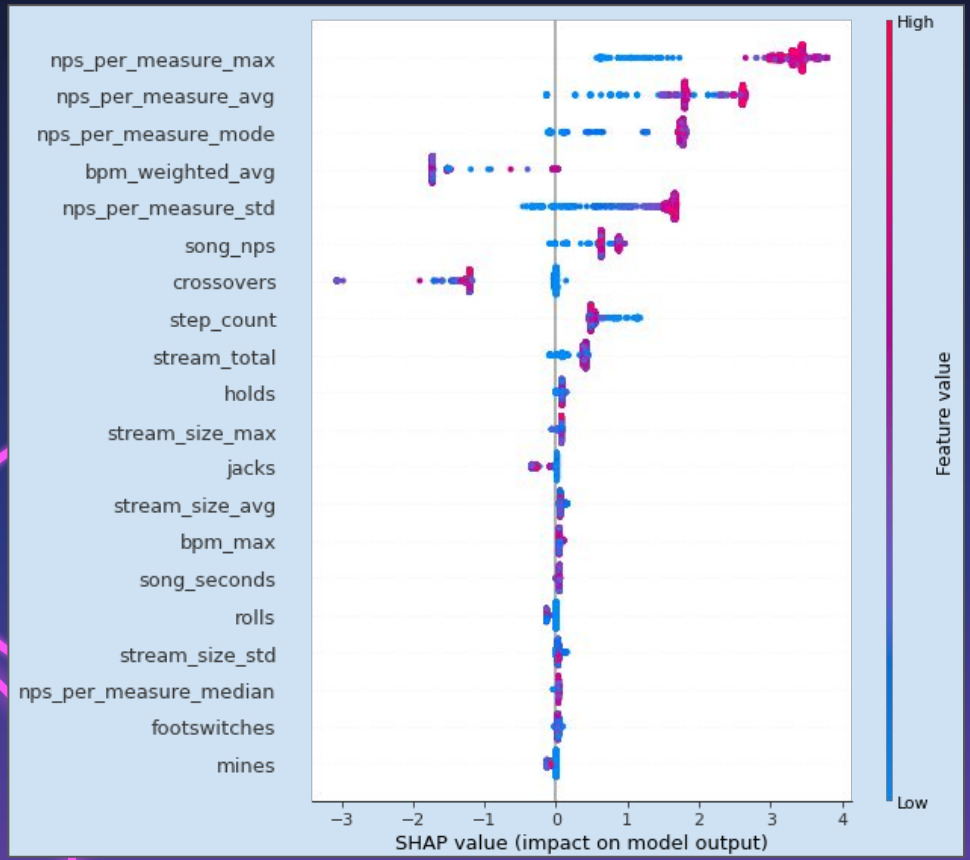


Final Model - Stamina

XGBoost Regressor

R-squared = .979
MSE = .282

learning rate = .1
depth = 5
gamma = .5
lambda = 5



04 Next Steps

- Web app: allow the user to upload pure .sm or .ssc files (.csv required currently)
- Tune a classification model for Stamina vs. Tech
- Further data acquisition

THANK YOU!

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