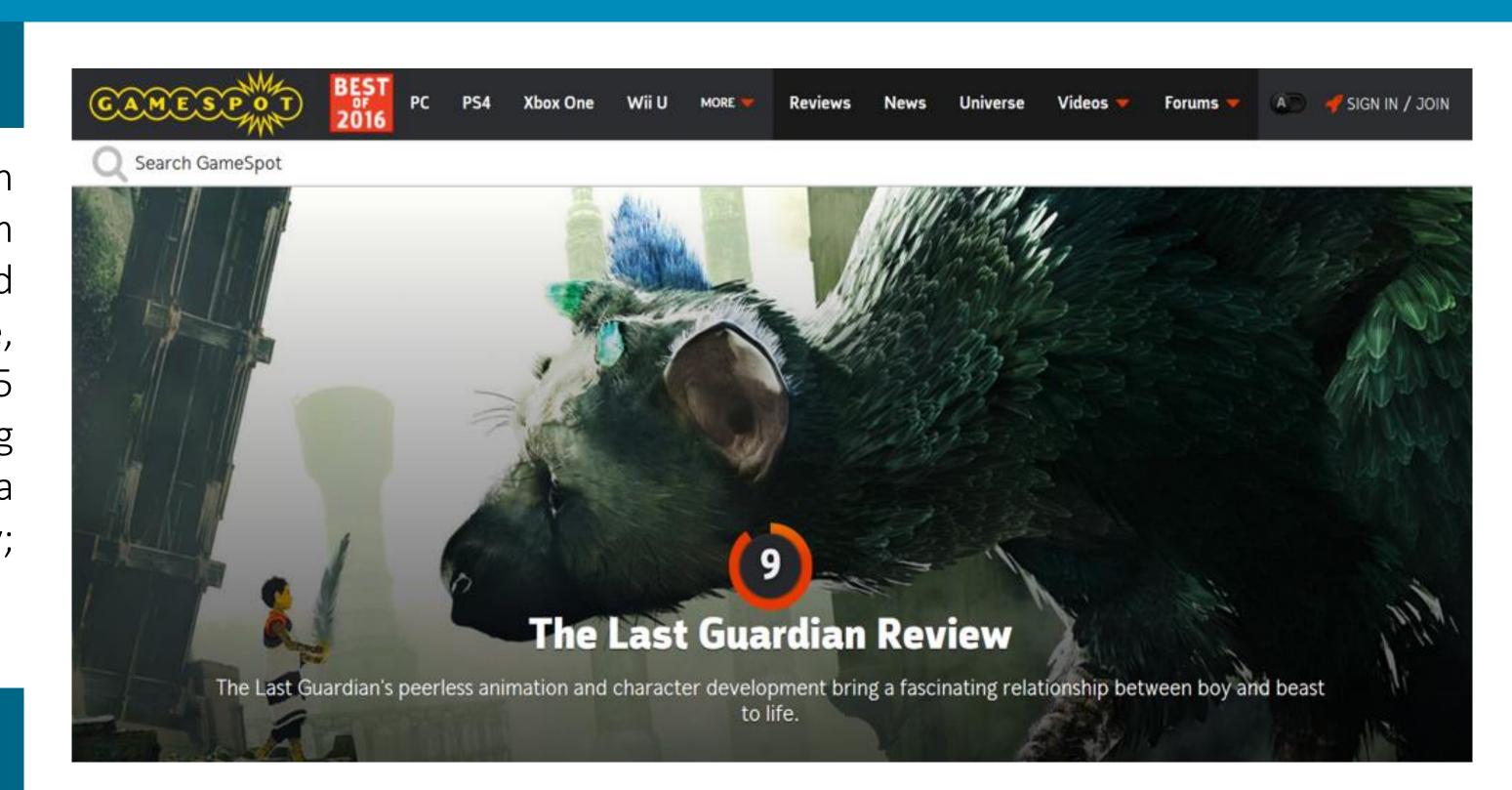
How can subjective experiences be classified? In the gaming industry, where quantifiable metrics such as game specifications, graphic quality tend to serve as selling points for games, we posit that what gamers really want are games that match the experiences they seek. Game genre (first-person shooters, role-playing, puzzles) may serve as one simplistic manner of categorization; but the genre is hardly indicative of the rich depth of in-game experiences that one may be exposed to as a player. The social game (pun unintended) we are interested in examining is the kind of projections of social life that different players are motivated to seek out in the form of in-game experiences. For example, some seek domination over others; others customization, or management simulation.

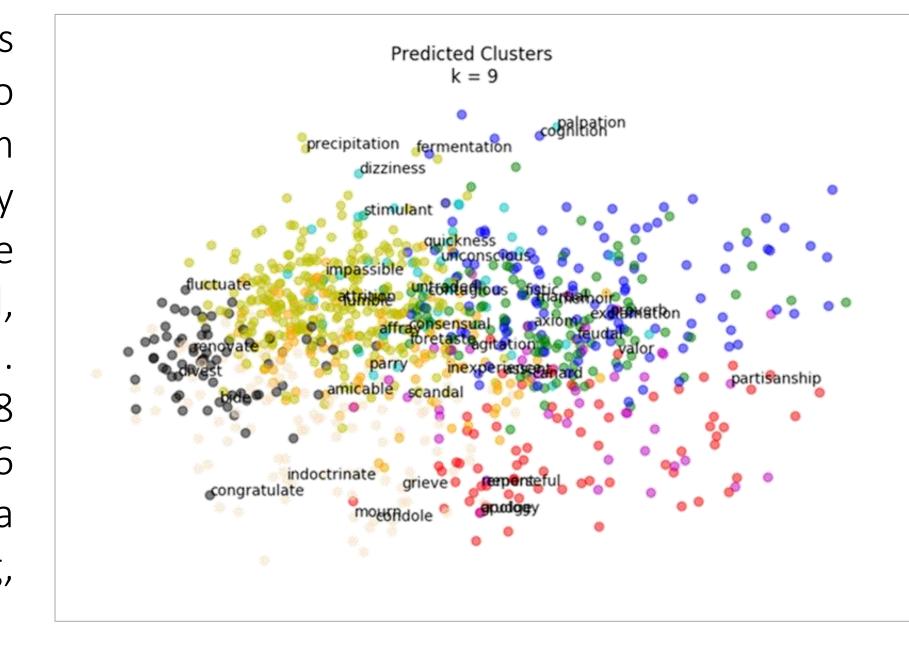
## Collecting Game Expert Reviews

Since we cannot possibly play every existing game in the universe, we rely on expert reviews. 11,022 game reviews covering 9,805 unique games from Gamespot were extracted. Launched in 1996, this video gaming site received more than 60 million visitors in 2008. More than evaluating the value of a game, reviews help to convey in-game experiences to its readers. A total of 16,643,915 words were analyzed. The length of reviews averaged 1,170 words — meaning that on average, 1,170 words capture the essence of in-game experiences in a game. Stopwords were removed using the *NLTK* English stopword dictionary; and we performed sentence-based word embedding — acquiring 300 features.



# Identifying Experiential Words

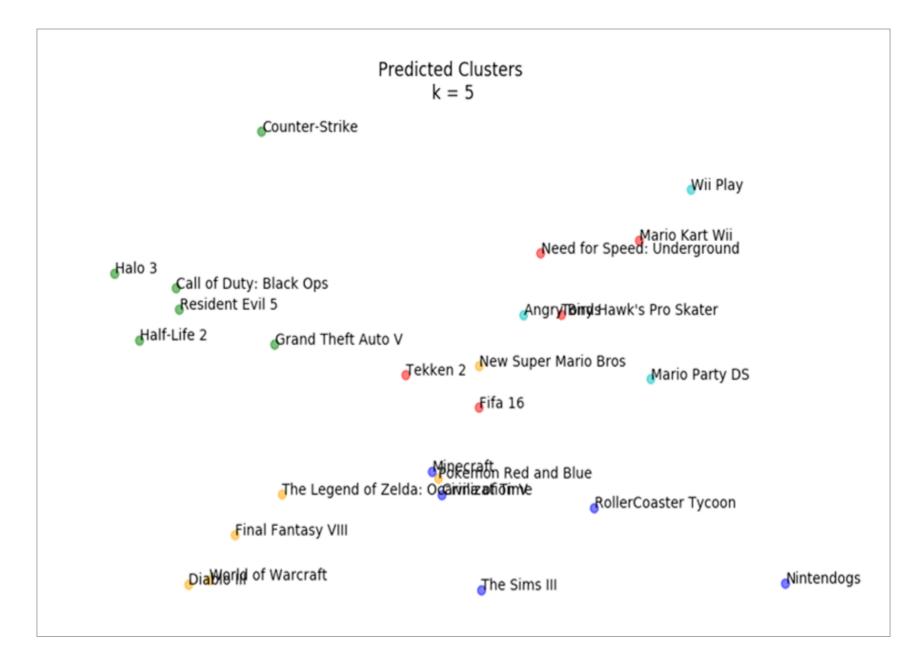
Our first task was to identify words related to in-game experiences. To do so, we searched through Merriam Webster's dictionary to identify words whose definitions include the following descriptions: emotion, feel, experience, encounter, sensation. Our search provided us with 1,168 words, which we trimmed to 1,166 after cleaning the data. we used a Google News word2vec embedding, pretrained by 100 billion words from



a Google News dataset, to locate the 300 features of 950 words in this vector space. Using the features, we then clustered the 950 words with *Ward* and *K-means*.

# Clustering Core Games from Triplet Embedding

To determine a good "similarity function" between objects — a kernel was built to help with clustering. To do this, surveys that employ t-Distributed Stochastic Triplet Embedding (t-STE) were used. The advantage of t-STE is that it reveals an underlying data structure by questioning annotators about the relative similarity of a to b & c. In a survey, participants select 5/25 games they know of and compare

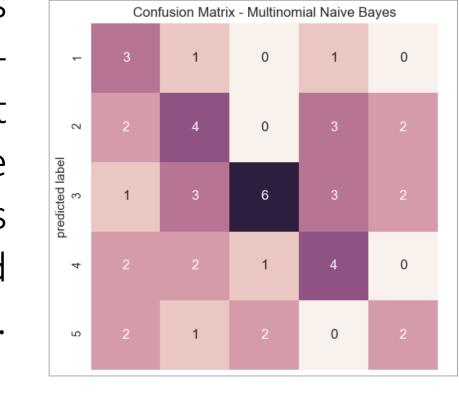


them with others for constructing the embedding. For e.g. "based on your in-game experiences, is Half-Life 2 more similar to RollerCoaster Tycoon or Metal Gear Solid? The survey is conducted through Mturk with 135 respondents and 2,690 pair-wise comparisons to ensure a 25-core-game-model robust. *K-means* is then employed to produce recognizable clusters. We used the hand-picked core games to tag the clusters

by in-game experience contained in their reviews. This fills the clusters with features – like filling meat to the skeletal structure with the goal of predicting the cluster location of all remaining games. In the game review embedding space, we tested doc vectors (300 features), distances between doc vectors and each keyword group (9 features), and distances between doc vectors and each keyword (around 600 features) as input for the model. We found that the third approach yielded the most accurate results.

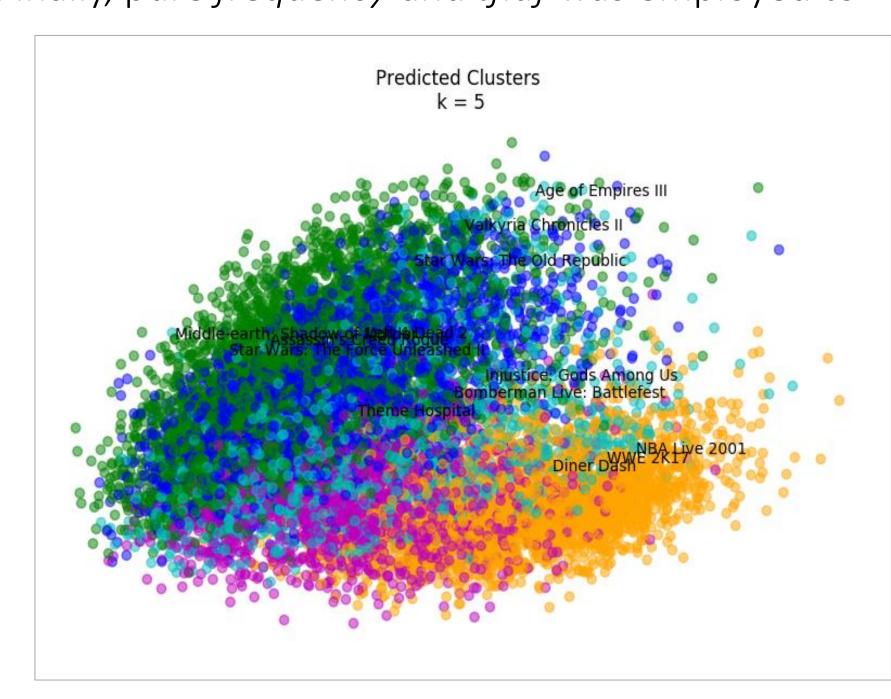
### Building Model and Classifying All Games

Next, models were built using numerous approaches: using SVM, Neural Nets (Multilayer Perceptron (MLP)), Random Forest and Naive Bayes (multinomial). To test these models' accuracy, we trained the models with 70% of the core games' reviews and tested them on the remaining 30%. According to the coefficients and the



confusion matrices; the Naïve Bayes method was most accurate, and we used it to build our predictive model for the classification of the remaining reviews. Finally, pure *frequency* and *tfidf* was employed to

identify the most important keywords for each cluster of games. With this new set of keywords that are particular to a specific cluster, we can engage in theory-building to identify separate clusters and the relevant keywords.



#### Results

Bartle (2006) theorized of four classifications for games:

Killers, Killers, Achievers, Explorers and Socializers. At first sight, they correspond with Cluster 1, 2, 3 and 4 respectively, tentatively supporting

Bartle's classification.

But Cluster 5, which does not sit neatly into

Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Half-Life 2	The Legend of Zelda: Ocarina of Time	The Sims III	Mario Party DS	Tekken 2
Resident Evil 5	Final Fantasy VIII	Minecraft	Angry Birds	FIFA 16
Halo 3	Diablo III	Civilization V	Wii Play	Need for Speed: Underground
Counter-Strike	World of Warcraft	Nintendogs		Mario Kart Wii
Grand Theft Auto V	Pokemon Red and Blue	RollerCoaster Tycoon		Tony Hawk's Pro Skater
Call of Duty: Black Ops	New Super Mario Bros			

one of the four categories, offering potential for theory building. Do the clusters make sense? Traditional classifications of games according to genre would group most games within Cluster 1 as First-Person Shooters (FPS). But notice not all games in Cluster 1 are FPS. More specifically, Cluster 5 games are traditionally classified as: fighting, sport simulation, and racing, and will not typically be grouped into one. The most intuitive explanation that unifies these games can only be derived through examining their individual gaming experiences; experiences of: physicality, thrill, competition, and nervous tension.

The figure on the left bottom describes the nine keyword clusters we derived from features of our 1,168 experience-based words. The labeled words are the top five words for every cluster. We believe the clusters also fit our intuition. For example, the words contained within a specific cluster were: sensuality, consciousness, loneliness, mood, and hunger. These words describe words related to the self. Other clusters contained words: fermentation, dizziness, stimulant, and unconscious. These words describe responses to certain actions or are actions that provoke a reaction.

Our final goal is to predict the cluster locations of the other games in the universe. Our results also appear positive. Diner dash, WWE 2K17 and NBA Live 2001 were clustered together — these are games that emphasize speed and physicality. Notice also that the two Star Wars games belong to different clusters. One possible explanation is that Star Wars: The Old Republic is an online roleplaying game, and central to its gaming experience is player-vs-player battles and also, collaborations and interactions with players for purposes such as defeating in-game bosses etc. Similarly, Age of Empires III has a popular online multiplayer mode.

#### Conclusion

This model has a potential to classify the remaining games in the universe. The classification then can serve as a basis of recommendation systems to the end video game players as well as critical design references to the game developers. Further surveys can be conducted to continue training the model to make more robust. We believe that it also has similar possible applications to other experience-based products like movies and books.