Classification of Single Malt Scotch Whiskey

Overview

A man after a long day of work enters a local whisky bar. The man asks the bartender for a whisky recommendation. Bartender started listing different types of whisky distilleries asking if he had a preference. A man, new to the world of whisky, simply asks for a smoky drink and then the bartender pulled out a whisky from the Islay region of Scotland.

How does whisky experts classify single malt Scotch whisky based on different flavor descriptions? Throughout the history of single malt whisky, there has been multiple attempts to create faceted classification based on flavor descriptions. There has also been attempts to overlay geographical classification on top of the flavor faceted classification to help cluster whisky based on flavor and location. In this case study, I will explore how the past faceted classification and geographical classification were corrected by a modern flavor classification of single malt whisky.

What is being organized?

It is crucial to understand that in the modern days there are a plethora of different types of whiskeys from different sectors of the world. This case study will be focusing only on single malt Scotch whisky. First, Scotch whisky refers to an alcoholic liquor from Scotland obtained by distillation of a fermented starchy compound and also whiskies approved by the Scotch Whisky Regulation (2011). Of the multiple different types of Scotch whiskies, this case study focuses on the single malt whiskies. A single malt whisky, according to the Scotch Whisky Regulation 2011, refers to whisky that is made solely from malted barley and is produced at a single distillery.

Understanding the scope of the word single malt Scotch whisky, there are 120 active distilleries in Scotland producing around a total of 300 different types of single malt whiskies. During the classification, whisky experts group 300 different types of single malt whiskies by distilleries (120 categories). They are able to cluster different types of single malt into distilleries because each distillery produce whisky using the same fermentation process and distillation process. The 300 different single malt whisky is derived from the wood barrel aging process. This case study will only focus on the original single malt whiskies that was aged around 10 years. This limitation was set in order to accurately compare each distillery’s most common whisky with each other, generalizing that the original label provides an accurate flavor characteristic of the distillery.

Why is it being organized?

For more than hundreds of years, blended Scotch whiskies accounted for a large amount of Scotch whiskies sold in the market. However, famous blended Scotch whiskies were merely a recipe and did not carry its own provenance. Therefore, distilleries started to turn their focus on single malt Scotch because single malt Scotch embodies distillery’s unique flavor and history. As distilleries turned their focus on single malts, distilleries tried to invent single malt whisky with provenance. As single malt whiskies gained popularity, whisky experts created an organizing system to classify 120 different types of single malt scotch. There were two main reasons why whisky experts created the organizing system based on flavor map.
Since single malt whisky reflects its distillery’s flavor characteristic, whisky experts wanted an organizing system that would allow them to categorize each single malt whisky into their respective flavor clusters. Whisky experts first organized whisky by location of the distilleries. However, geographical classification was not an accurate reflection of flavor because whiskies from a single region had different flavors according to distilleries and some whiskies from different regions had overlapping flavor values. Therefore, whisky experts developed a clustering system for flavor and then provided a general relation between flavor and location (only Islay region’s whisky clustered in flavor classification and other regions had overlaps, more explained in “How much is it being organized”).

Second, the organizing system was created to provide guidelines to people new to the world of whisky. Since recommending a whisky based on location does not mean much to the new comers, whisky experts created the organizing system in order to provide better recommendation of based on preferred flavors.

**How much is it being organized?**

With the introduction to single malt scotch, whisky experts classified whisky based on six different Scotland districts: Highlands, Lowlands, Islay, Islands, Speyside, and Campbeltown. This location-based classification was whisky experts’ initial organizing system because location based classification was predefined by the Scottish Whisky Regulations and did not require further decomposition of the single malts. However, this location-based classification provided no description of the flavor of each single malt whiskies.

In 1980, starting with Michael Jackson’s “Whiskey: The Definitive World Guide”, whisky experts began to define different flavors of whiskey. Michael Jackson’s description of single malt whisky consisted of 450 different adjectives. The wide range of flavor descriptions were later reduced by Charles MacLean’s whisky analysis group (figure 1).

![Charles MacLean’s Tasting Wheel](image)

However, even with Charles Maclean’s tasting wheel, there were many whisky descriptors that needed to either be grouped into a single facet value or decomposed into multiple different facet values. This work was done by David Wishart and Scotch Whisky Heritage Centre members. They would reduce the 450 different adjectives twelve cardinal flavors on a 5-point scale (figure 2). For example, Maclean’s tasting wheel included “smoky” and “medicinal” under “peaty” category. However, “medicinal” whiskies were a
common facet value for Islay whiskies while Speyside whiskies can also be “smoky” yet not “medicinal”. Therefore, they decomposed “peaty” into two unique facet values, “medicinal” and “smoky”. Also, flavor descriptions like “woody and toasted” were grouped under a single face value, “spicy”.

David Wishart and the members of the Scotch Whisky Heritage Centre rated the 120 single malt whiskies using the Wishart Nosing Chart and performed a k-means clustering analysis on the 120 single malt whiskies dataset. They discovered that the flavor data of single malt whisky produced 10 clusters (k = 10). Then David Wishart proceeded principle component analysis (PCA) in order to identify which characteristics explain most of the variance in each of the ten clusters, narrowing down the information into more comprehensible comparisons (possibly reducing 10 dimensions into smaller dimension). Before proceeding the PCA, we have to note that location was not a facet value during the cluster analysis because locations are not orthogonal values (dividing Scotland into 6 sectors means that each location is depend of the adjacent locations). Different zones of Scotland are not independent of each other; therefore, they can never be facet values.

During PCA, David Wishart noticed that 46% of the variance could be explained by the first two components. The first component ranging from “smoky” and “medicinal” to “fruity, honey, and winey”. The second component separating from “light / delicate” (low body score) from “full-bodied / rich” (high body score). These two components were key facet values that distinguished each distillery’s flavor profile (upon classifying a new whisky by flavor, an expert can simply follow figure 3). Therefore, these two components simplified the cluster analysis into two-dimensional view of the flavor map (figure 4). Below are 3rd and 4th components of the PCA:

- **Third component accounting for 10% variance:** “tobacco, malty, and floral” vs “nutty (cereal flavor)”. Wishart noted that his variance is simply due to young whiskies not being able to mature in cask for a long duration.
- **Forth component account for 9% variance:** “spicy” vs “sweetness”. Wishart noted that this difference came from the type of cask a distillery used to age whisky.
Whisky experts realized that the ten clusters and location do not have a strong correlation. For example, cluster I included whiskies from both the Islands, Highlands, and Campbelltown. These whiskies from three different regions were clustered together due to their smoky and rich nature. The smoky flavor in whisky is create by peat, and peat is not a special ingredient for a specific region of distilleries. Therefore, any distillery that uses peat would likely produce a smoky flavored whisky. However, there was one region that matched exactly one cluster: Islay. The Islay region whiskies were rated 5 in the “medicinal” category due to the regions unique style of drying technique. Since this was the only region with such unique style, Islay whiskies got clustered into one single cluster (J).

**When is it being organized?**

Since experts created the ten clusters of whiskies, other whisky experts will follow Wishart’s nosing chart to create a data of a new single malt whisky and, then following Wishart’s cluster analysis and PCA, organize the new single malt whisky into the flavor group. Perhaps, in the future, whisky experts can gather at an Expo to redefine the clusters using newly developed statistical models.

Single malt Scotch whisky is organized differently in different time frames depending on the purpose of organization. At a distillery level, each distillery will classify its single malt into different flavor categories upon creating a new label. Since their fermentation and distillation processes are going to be identical with their original labels, the new label will have a similar flavor, yet, for marketing and identification purposes, distilleries will categorize their new whisky’s flavor into the flavor map.

Single malt is also categorized when new label is initially received by whisky experts. Whisky experts have a tasting session in order understand the flavor themselves. Whisky experts create a flavor profile by themselves upon receiving a new bottle because of two reasons. First, whisky experts will check if the flavor profile they create agrees with the distillery’s profile, and try to understand how the new label’s
flavor compares to original labels’ flavor. Second, based on their flavor profile, whisky experts with bars will store the new label along with whiskies within the same flavor cluster.

**How or by whom is it being organized?**

Single malt flavor categorization was refined throughout history starting in 1980. In 1980, Michael Jackson was the first whisky expert to describe the flavors of single malt whisky using rich and diverse words. Based on these description (consisted of 450 adjectives), MacLean categorized these flavor descriptors into 32 different flavor components (8 core flavor components). David Wishart and the Scotch Whisky Heritage Centre refined the MacLean’s 32 different flavor components into 12 different facet values (Wishart Nosing Chart). Using the Wishart Nosing Chart, David Wishart and the members create a data set compiled of 120 different single malt whiskies. With this data set, David Wishart created the final modern whisky flavor map that was derived after cluster analysis and PCA. David Wishart’s modern two-dimensional flavor map is still accepted by whisky experts these days. There are still continuous studies to create a more objective whisky flavor map as we speak, but there has yet to be a better model.

**Other Considerations**

Single malt Scotch whisky flavor classification is a continuously studied field. The current experts rely on Wishart’s flavor classification map; however, it is crucial to understand that Wishart’s flavor classification contains bias. Flavor do not have a definitive measurement yet it is a descriptor defined by one’s culture and past experiences. Some experts even reject the Wishart’s Nosing Chart values saying that Wishart’s perception of flavor disagrees with one’s flavor descriptions.

Single Malt Scotch classification via flavor will face changes upon development of better clustering algorithms or even new statistical classification models. It is whisky expert’s job to continue to study and develop possibly a more objective single malt whisky faceted classification.
Reference Pages


