

BIOE 32Q Final Project: Science of Wine Tasting

Laikh Tewari
laikh@cs.stanford.edu

May 2021

1 Introduction

Enjoying wine is a complex and multisensory experience. In its complexity, there are a multitude of factors that would affect one's perception of a wine, from its price and presentation to its age and origin. In my final project, I learned about and applied a formal framework for wine analysis.

2 Wine Tasting Guide

While wine tasting, like engaging with any art form, can be a very personal experience, I watched a masterclass by James Suckling to learn about techniques for formally evaluating a wine. Two evaluation frameworks were presented. First, Suckling discussed a 100 point grading scale. Points are awarded based on performance on 4 different attributes:

Category	points
Color	15
Aroma	25
Structure	25
Overall Quality	35

First, a wine's color may be observed by tilting the glass and holding it above a white surface. This presentation of the wine allows viewing of the deepest color in the center as well as the gradient of colors from the center out to the edge. The richness and variance in colors observed here can indicate different qualities about the wine. For example, young red wines tend to be rich in color and fade with age revealing more complex gradients. In contrast, young white wines tend to be uniformly pale and grow more yellow with age, again with more variance. Wine derives much of its color from anthocyanins, a polyphenol pigment present in the grapes, particularly in the grape skins. These compounds change with time which is why the color of a wine changes with age.

Next, a wine’s aroma can be assessed. Oxygen plays a large role in affecting the chemistry of the wine so the wine should be thoroughly swirled to both incorporate oxygen and aerosolize aroma compounds in order to enable better judgement. While different wines tend to have different primary aromatic notes such as red fruits like raspberries and currants in many reds or tropical fruits, citrus, and white flowers in whites, secondary and tertiary aromatic notes that come with purer and higher quality wines should be assessed here. Additionally, the aroma can be affected by the production process. For example, wines aged in oaked barrels may display vanilla aromas.

Then, the structure of the wine can be judged. This ”mouth-feel” category can be influenced by the presence of tannins, another type of polyphenol, in red wines which can lend a body (and also a dry mouth sensation). Other ways to assess this category include the lightness or silkiness of the wine.

Lastly, the overall quality is assessed. This is notably the most weighted category and encompasses taste along with the general experience. Per this scale, wines below 90 are subpar, wines between 90-95 are good, 95-99 are great, and 100 is a rare perfect score. Interestingly, Suckling described the wines that achieved 100 scores through the lens of the context in which they were consumed and the memories they evoked rather than objective measures. This surprised me since the class was on a formal technique but in reality the framework was only a means of expressing emotional and highly personal experiences.

Suckling also present a second assessment framework that helps to describe wines in conversation:

Category	Scale
Body	Light → Full
Fruity Dry → Sweet 25	
Acidity	Low → Tart
Bubbles/Mousse (Sparkling only)	Flat → Fizzy
Tannins (Reds only)	Sweet → Bitter
Finish	Smooth → Spicy

This framework notably differs from the 100 point scale in being a qualitative assessment. This scale also seems much more natural when describing the experience of wine rather than forcing it into quantitative buckets.

3 Experiment

I performed a blind taste test to practice using the quantitative framework and see if it would help in determining the higher quality wine. I tried to isolate as many features as possible to have the most apples-to-apples comparison. To do so, I selected two Cabernet Sauvignon wines from California produced in 2018. I used price as a heuristic for true quality. The first wine at the low price point used grapes sourced from across California and was \$8. The second wine at the high price point used grapes from Napa and was \$33 (4x the low price point). I was presented both wines in glasses and used both frameworks to assess the

quality and experience and saw if my assessment matched the ground truth labels.

The first wine I tried was relatively bright and medium ruby to medium purple in color. Tilting the glass showed the transition from deeper pomegranate color in the center to a brighter red around the edges. I realized that I did not know how to assess whether the color was good or bad, but I thought it looked nice so I gave the first wine a 13 out of 15. In contrast, the other wine was very uniform deep red in color. I gave the second wine a score of 12/15.

Next, I swirled the glass and observed the aroma. For the first wine, I found discerning aromas to be particularly difficult. I could, however, see how some fruits like dates or raspberries would be applicable. I did think that I could smell something slightly smoky like a campfire but I also was not sure if I was imaging a scent for the sake of finding another descriptor. Since I was unsure if my inability to find many secondary aromas was from my lack of experience or lack in quality, I gave the first wine a 22 out of 25. The second wine, on the other hand, was, like the color, very plain and noticeably less rich in aroma than the first. As such, I gave the second wine a 20/25.

Upon tasting the first wine, I very distinctly could tell that the wine was very tannin-rich. On paper, body seems like a strange way to describe a non-viscous liquid but the wine very clearly built a structure in my mouth. The structure, however, was not overwhelming; it felt sturdy but not harsh. I gave the wine a 23 out of 25 on structure. The second wine was similarly structured so I also gave it a 23 out of 25.

Lastly, in terms of overall quality, tasting the first wine was a very interesting experience. I wouldn't necessarily say that it was my favorite wine, but it was one that I enjoyed. In flavor, I could pick out a lot more than I could from aroma. For example, I thought I could taste a sweet spiciness to the wine like cinnamon. I was very intrigued by the complexity of the wine, so I gave it an overall quality score of 33/35. Again, the second wine was sweeter and less intense in flavor. I could more strongly taste the sweetness of fruits like strawberry, but that was about it. Since I wouldn't say that I loved the flavor of both wines, the second one, without additional complexity, was a little underwhelming. As such, I gave it a score of 31/35. In total, by the first framework, I would have scored the first wine 90 points and the second wine an 86. These scores matched up with the ground truth of the first being the higher price point wine and the second being the lower price point wine. Notably, however, the scores were really close especially given the large multiple in price.

4 Conclusion

Overall, I really enjoyed the process of evaluating the wines under a quantitative framework because it forced me to stop and consider different criteria about the wines. However, I don't think this framework is necessarily the most conducive to really enjoying the wine because I found myself worrying about the precise numerical scores rather than the overall qualities. For this reason, I find the

second framework to be a much more relaxed assessment technique. I am really curious how the stress of scoring wines affects the experience; in other words, if I weren't worried about numerical quantities, would I rank the wines in the same way? There are wide variety of questions regarding the psychology of wine experiences that can be asked. Given sample size constraints and the inability to block for non-trivial features like gender, I was unable to perform an experiment investigating these questions, though this remains an open area of interest. I am really glad I took this project on and hope to continue exploring!