**Project Proposal**

**A Machine Learning Approach to Predicting Risky Alcohol Consumption among Students**

**Course code: CSE 445**

**Course title: Machine Learning**

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**A Machine Learning Approach to Predicting Risky Alcohol Consumption among Students**

##### Introduction

Students can be challenged with difficult periods between their academic performance or socializing at any point in their life. A good balance between both is necessary for young people to grow and enjoy life. But many students resort to the use of illegal or harmful substances as enjoyment which soon becomes a misuse. Continued use of such substances has horrible effects on mental and physical health. It is therefore necessary to predict such behavior to enable early public health intervention. Machine learning models have been used to predict the relations between important features that can determine risky alcohol consumption patterns among students. In this paper, we intend to relate demographic and personal characteristics with the use of risky alcohol consumption.

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##### Brief summary of the dataset

The data were obtained in a survey of students' math and Portuguese language courses in secondary school of Portugal. It contains a lot of interesting social, gender and study information about students.

## **Attributes of the dataset:**

| 1. school - student's school (binary: 'GP' - Gabriel Pereira or 'MS' - Mousinho da Silveira) 2. sex - student's sex (binary: 'F' - female or 'M' - male) 3. age - student's age (numeric: from 15 to 22) 4. address - student's home address type (binary: 'U' - urban or 'R' - rural) 5. famsize - family size (binary: 'LE3' - less or equal to 3 or 'GT3' - greater than 3) 6. Pstatus - parent's cohabitation status (binary: 'T' - living together or 'A' - apart) 7. Medu - mother's education (numeric: 0 - none, 1 - primary education (4th grade), 2 – 5th to 9th grade, 3 – secondary education or 4 – higher education) 8. Fedu - father's education (numeric: 0 - none, 1 - primary education (4th grade), 2 – 5th to 9th grade, 3 – secondary education or 4 – higher education) 9. Mjob - mother's job (nominal: 'teacher', 'health' care related, civil 'services' (e.g. administrative or police), 'at\_home' or 'other') 10. Fjob - father's job (nominal: 'teacher', 'health' care related, civil 'services' (e.g. administrative or police), 'at\_home' or 'other') 11. reason - reason to choose this school (nominal: close to 'home', school 'reputation', 'course' preference or 'other') 12. guardian - student's guardian (nominal: 'mother', 'father' or 'other') 13. traveltime - home to school travel time (numeric: 1 - <15 min., 2 - 15 to 30 min., 3 - 30 min. to 1 hour, or 4 - >1 hour) 14. study time - weekly study time (numeric: 1 - <2 hours, 2 - 2 to 5 hours, 3 - 5 to 10 hours, or 4 - >10 hours) 15. failures - number of past class failures (numeric: n if 1<=n<3, else 4) 16. schoolsoup - extra educational support (binary: yes or no) 17. fumsup - family educational support (binary: yes or no) 18. paid - extra paid classes within the course subject (Math or Portuguese) (binary: yes or no) 19. activities - extracurricular activities (binary: yes or no) 20. nursery - attended nursery school (binary: yes or no) 21. higher - wants to take higher education (binary: yes or no) 22. internet - Internet access at home (binary: yes or no) 23. romantic - with a romantic relationship (binary: yes or no) 24. famrel - quality of family relationships (numeric: from 1 - very bad to 5 - excellent) 25. freetime - free time after school (numeric: from 1 - very low to 5 - very high) 26. goout - going out with friends (numeric: from 1 - very low to 5 - very high) 27. Dalc - workday alcohol consumption (numeric: from 1 - very low to 5 - very high) 28. Walc - weekend alcohol consumption (numeric: from 1 - very low to 5 - very high) 29. health - current health status (numeric: from 1 - very bad to 5 - very good) 30. absences - number of school absences (numeric: from 0 to 93)   These grades are related with the course subject, Math or Portuguese:   * G1 - first period grade (numeric: from 0 to 20) * G2 - second period grade (numeric: from 0 to 20) * G3 - final grade (numeric: from 0 to 20, output target) |
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**Link to the dataset-** [Student Alcohol Consumption | Kaggle](https://www.kaggle.com/datasets/uciml/student-alcohol-consumption)

# **Research questions:**

1. Does alcohol consumption have a negative impact on a student’s performance?
2. To what extent past class failures might have an impact on alcohol consumption in students?
3. Does the quality of family relationships, parents' cohabitation status have an impact on alcohol consumption?
4. Does alcohol consumption affect the relationship of an adolescent and their family?
5. Does lack of family support or educational support contribute as a factor to consuming alcohol?

# **Importance of the research questions**

Alcohol consumption has numerous health and social hazards. It also affects an individual's life in many ways. In this research we are trying to find out the relationship and the correlation on how consumption of alcohol might affect students and along with this, we will also try to find out how other factors in a students life might influence consumption of alcohol. The detailed description of the importance of our research questions are as follows.

## **Does alcohol consumption have a negative impact on a student’s performance?**

Alcohol consumption has a negative impact on cognitive function, including impairments in attention, memory, and executive functioning, which are important for academic success (Crego et al., 2009; Crews & Boettiger, 2009). Furthermore, alcohol use can lead to sleep disruption, which can further impact academic performance (Roehrs & Roth, 2001).

In addition to academic consequences, heavy drinking and binge drinking are also associated with a range of negative health and social outcomes, including increased risk of accidents, injuries, and sexual assault (Hingson et al., 2009). Students who engage in heavy drinking may also be at increased risk of developing alcohol use disorder later in life (Grant et al., 2015).

Overall, the negative impact of alcohol consumption on academic performance and other areas of functioning highlights the importance of promoting healthy behaviors and reducing risky drinking among college students. Our research will try to find out a reasonable relationship between the factors.

**Reference:**

Crego, A., Rodriguez Holguín, S., Parada, M., Mota, N., Corral, M., & Cadaveira, F. (2009). Binge drinking affects attentional and visual working memory processing in young university students. Alcoholism: Clinical and Experimental Research, 33(11), 1870-1879.

Roehrs, T., & Roth, T. (2001). Sleep, sleepiness, and alcohol use. Alcohol Research and Health, 25(2), 101-109.

Grant, B. F., Goldstein, R. B., Saha, T. D., Chou, S. P., Jung, J., Zhang, H., ... & Hasin, D. S. (2015). Epidemiology of DSM-5 alcohol use disorder: Results from the National Epidemiologic Survey on Alcohol and Related Conditions III. JAMA Psychiatry, 72(8), 757-766.

Hingson, R. W., Zha, W., & Weitzman, E. R. (2009). Magnitude of and trends in alcohol-related mortality and morbidity among US college students ages 18-24, 1998-2005. Journal of Studies on Alcohol and Drugs, (Suppl. 16), 12-20.

## **To what extent past class failures might have an impact on alcohol consumption in students?**

There is evidence to suggest that past class failures may have an impact on alcohol consumption in students. Students who have experienced academic failure may feel demotivated, stressed, and have low self-esteem, which can lead to increased alcohol consumption as a coping mechanism. This is supported by research indicating that academic stress is a predictor of heavy drinking among college students (Sher & Levenson, 2016).

Furthermore, academic success and failure are often tied to social identity, and students who struggle academically may feel isolated or stigmatized, leading them to seek solace in drinking with peers who share similar experiences. In this way, past class failures may contribute to the formation of social networks that normalize heavy drinking.

However, it is important to note that alcohol consumption is a complex behavior that is influenced by a wide range of factors, including personality traits, peer pressure, family history, and cultural norms. Therefore, while past class failures may be one factor that contributes to increased alcohol consumption, it is unlikely to be the only factor and may interact with other variables in complex ways.

Overall, further research is needed to better understand the relationship between past class failures and alcohol consumption in students and to identify effective interventions that can mitigate this relationship and promote healthier coping strategies.

**Reference:**

Sher, K. J., & Levenson, R. W. (2016). Risk and resilience: Alcohol and academic outcomes in the context of adversity. Current Directions in Psychological Science, 25(6), 477-482. doi: 10.1177/0963721416662617.

## **Does lack of family support or educational support contribute as a factor to consuming alcohol?**

Several researches have indicated that parental and educational institutions' methods of support have an impact on whether students' alcohol consumption is probable. Students spend their majority of time either at school or at home, where they are influenced by their peers and teachers, or parents. As a result, their influence has an effect on how pupils perceive the concept of alcohol intake.

As children remain under their supervision, parents play a crucial role in their lives as students. Failure has an impact on a student's life throughout the stress of academics. They seek their parents' assistance at that point. If they do not receive that support, they may seek other ways to remain diverted from their failure. That is when they may turn to alcohol consumption.

As a parent or someone in a parenting role, they influence their child’s life heavily. It is possible that they play an important role in the decision of their child to not start drinking alcohol. Indeed, children who have parents who are actively involved in their lives are less likely to resort to alcohol. (Center for Health and Safety Culture. 2018)

High school students spend most of their daytime at school and school is one of the most influential socialization domains in young people’s lives. While the primary objective of a school is to educate, it also constitutes a social context where students interact with teachers and other students and share norms and values that may implicitly or explicitly confer varying levels of approval toward alcohol use, affecting the behavior of students. Alcohol use among students has been shown to vary between schools, even when differences in the composition of students are taken into account, indicating that school factors influence youth alcohol use. In addition to school-level compositional factors, such as socioeconomic position, degree of urbanization, and concentration of students with ethnic minority background, which have been found to be associated with heavy drinking.

**Reference:**

Center for Health and Safety Culture. (2018). Why Teens Shouldn’t Drink Alcohol.Bendtsen P, Damsgaard MT, Huckle T, Casswell S, Kuntsche E, Arnold P, et al. Adolescent alcohol use: a reflection of national drinking patterns and policy? Addiction. 2014;109(11):1857–68.

## **Does the quality of family relationships, parents' cohabitation status have an impact on alcohol consumption?**

A number of studies have shown that while an unhealthy or dysfunctional family environment might raise the risk of alcohol use and abuse, a positive and supportive family environment can operate as a protective factor against alcohol use and abuse.

For example, a study published in the Journal of Studies on Alcohol and Drugs indicated that teenagers were less likely to partake in heavy drinking and other risky behaviors compared to those from less supportive home situations when they reported having good family relationships and parental support.

Another study found that adolescents who reported negative family relationships, such as conflict or lack of communication, were more likely to engage in heavy drinking and other risky behaviors.

**Reference:**

Balázs MÁ, Piko BF, Fitzpatrick KM. Youth Problem Drinking: The Role of Parental and Familial Relationships. Subst Use Misuse. 2017 Oct 15;52(12):1538-1545. doi: 10.1080/10826084.2017.1281311. Epub 2017 Apr 13. PMID: 28406347.

Barnes, Grace M., et al. “Effects of Parental Monitoring and Peer Deviance on Substance Use and Delinquency.” *Journal of Marriage and Family*, vol. 68, no. 4, 2006, pp. 1084–104.

## **Does alcohol consumption affect the relationship of an adolescent and their family?**

Research has shown that consumption of alcohol affects the relationship between parents and adolescents. A study has shown that there is extensive evidence supporting the association between the quality of the parent–child relationship (PCR) and child development. PCR refers to parent or child appraisals of the quality of the relationship between them, characterized by parental behaviors which give evidence of a warm and supporting relationship (e.g., giving emotional affection or praising, active listening, encouraging or showing respect). This construct is sometimes measured as a negative PCR expressed in rejection, criticizing ideas frequently, having frequent arguments or withholding of affection. Studies show that a negative PCR is related to externalizing problems such as aggressive and delinquent behavior. Further, a negative PCR is related to an increased likelihood of internalizing problems such as depressive symptoms and anxiety and even suicidal behavior.

**Reference:**

Visser, L., de Winter, A.F. & Reijneveld, S.A. The parent–child relationship and adolescent alcohol use: a systematic review of longitudinal studies. *BMC Public Health* 12, 886 (2012). https://doi.org/10.1186/1471-2458-12-886

## **Methodology:**

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## **Gantt chart:**