Application of Decision Tree to Decide Which Team to Support in F1 2023 Based on Personal Preferences

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Abstract—**Formula One (or simply known as F1) is currently the biggest motorsport competition on the planet. Liberty Media (F1's current owner) plays a huge role of that by creating a Netflix show titled *Drive to Survive (DTS)* which resulting into F1 gaining millions of new fans each year. Just like other sports in the word, it is not a surprise that people want to support a certain team in that sport, even if they just dived into that particular sport for the first time. This paper is written with an intention to help new fans to find an F1 team that they can support for F1 2023, based on their personal preferences.**

Keywords—**Decision Tree, F1, Preferences, Teams.**

I. INTRODUCTION

Formula One (commonly known as F1) is currently the biggest motorsport competition on the planet. With its glamorous nature and great social media management, it is not a big surprise that people are getting interested in F1.

Despite the big fan base F1 currently has, they have been losing supporters in the early 2010s compared to the 2000s, with one of the main reasons being the race becoming way more boring as time passes by, and F1 changing its engine from the noisy V8 to the way more silent Hybrid V6 engine. F1's turning point came in 2017 when Liberty Media takes F1 ownership from Bernie Eccelstone. Liberty Media's approach was way more different than Eccelstone, with Liberty Media focusing on getting younger audiences to start watching the sport. They're able to do this by changing the landscape of F1's social media, becoming way more connected to the fans and fans can repost F1 clips without being scared of getting copyrighted.

One of Liberty Media's most successful campaigns to attract younger audiences is by creating a Netflix series called Drive to Survive (DTS). The series' first season was released in early 2019, just a week before the start of the F1 2019 season, with the premise of the series being to relieve all the highlights of F1's previous season (in this case, 2018). Liberty Media's idea was beautifully executed, and millions of people became interested in the sport.
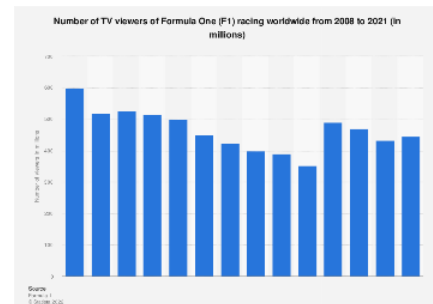

Figure 1.1. Number of TV viewers of F1 worldwide from 2008 to 2021 in millions
(Source: https://www.statista.com/statistics/480129/cable-or-broadcast-tv-networks-formula-one-f1-racing-watched-within-the-last-12-months-usa/)

From the chart above, it can be seen that F1 was losing millions of viewers each year ever since 2011, until came in 2018, when Liberty Media takes F1 ownership, and the number of viewers rises by more than 100 million in that year alone.

With lots of new fans joining the F1 community, it is no wonder that many are interested to support a certain team. Most new fans are having little to no idea about the sport, like the history of the sport, the rules, etc. which is why most of them will mainly support their favorite teams based on their personal preferences.

II. THEORETICAL BASIS

A. Tree

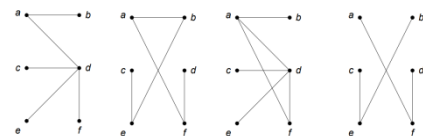Tree, in discrete mathematics, is a non-directional connected graph that has no circuits.

Figure 2.1. Example of trees and non-trees
(Source:https://informatika.stei.itb.ac.id/~rinaldi.munir/Matdis/2022-2023/matdis22-23.htm)

The leftmost and the second-leftmost graph in the figure are trees. The third-leftmost graph in the figure is not a tree since it

has a circuit (a-d-f), and the rightmost graph in the figure is not a tree since the graph is not connected.

B. Tree Property/Definition

If G = (V, E) is a simple non-directional graph and it has n amount of nodes. Then, all of these statements are equivalent:
1. G is a tree.
2. Every pair or node in G are connected with a single path.
3. G connected and has m = n – 1 amount of edges.
4. G has no circuits and has m = n – 1 amount of edges.
5. G has no circuits and an additional of one edge at the graph will only create one circuit.
6. G connected and all of the edges are bridges.

C. Rooted Tree

A Rooted tree is a tree such that one of its nodes being treated as a root and each of the root's edges are having a direction.
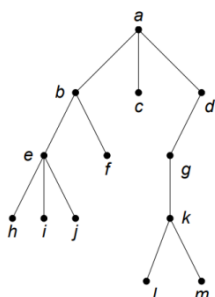

Figure 2.2. Example of rooted tree.
(Source:https://informatika.stei.itb.ac.id/~rinaldi.munir/Matdis/2022-2023/matdis22-23.htm)

There are some terminologies in a rooted tree, those terminologies are (all terminologies are using figure 2.2. as the reference):
1. Children and parent
   b, c, and d are the children of a, a is the parent of b, c, and d.
2. Path
   The path from a to j is a, b, e, j. The path length from a to j is 3.
3. Sibling
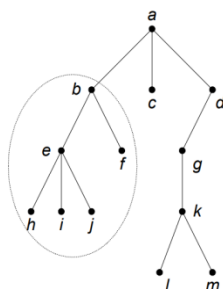   f and e are siblings. g and e are not siblings, because they are having different parent.
4. Subtree

Figure 2.3. Subtree of Figure 2.2 are circled in the image.
(Source:https://informatika.stei.itb.ac.id/~rinaldi.munir/Matdis/2022-2023/matdis22-23.htm)

5. Degree
   The degree of a node is equivalent to the number of children the node has. The degree of a is 3, b is 2, c is 0, and d is 1. The maximum degree of all nodes is the degree of the tree (for figure 2.2., the degree is 3).
6. Leaf
   A leaf is a node that has a degree of 0. For figure 2.2., the leaves are c, f, h, i, j, l, and m.
7. Internal nodes
   Every node (excluding the root of the tree, in this case, is a) that has at least a child, is defined as an internal node. b, d, e, g, and k are internal nodes.
8. Level
   Level 0 is a. Level 1 is b, c, and d. Level 2 is e, f, and g. Level 3 is h, i, j, and k. Level 4 is l and m.
9. Height/depth
   The height/depth of a tree is equivalent to the maximum level of that tree. For figure 2.2., the height/depth is 4.

D. Ordered Tree

An ordered tree is a rooted tree in which the children's order are important.

E. n-ary Tree

A tree that each of its branch nodes has at most n amount of children is being defined as n-ary tree. An n-ary tree is being called full if each of its nodes have exactly n amount of children.
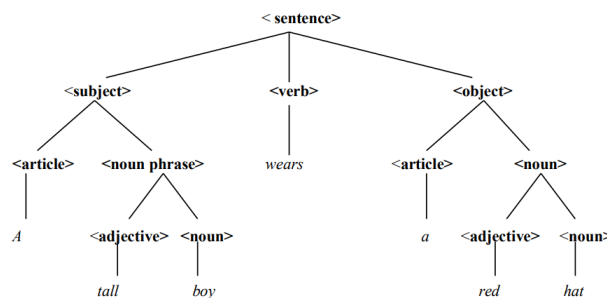

Figure 2.4. Parsing tree of a sentence "A tall boy wears a red hat". The tree is a 3-ary tree.
(Source:https://informatika.stei.itb.ac.id/~rinaldi.munir/Matdis/2022-2023/matdis22-23.htm)

F. Binary Tree

The binary tree is a tree with each of its nodes having at most two children. This tree is considered as the most important one because of how many applications this tree has. Each of the children are being distinguished by left child and right child. And since there's a difference between the child's order, binary tree is an ordered tree.
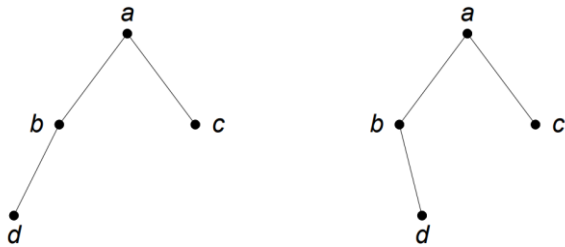
Figure 2.5. Example of two different binary trees.
(Source:https://informatika.stei.itb.ac.id/~rinaldi.munir/Matd is/2022-2023/matdis22-23.htm)

G. Decision Tree

The decision tree is one of many applications related to binary trees. As the name states, a decision tree is used as a way to make a decision about some kind of process.
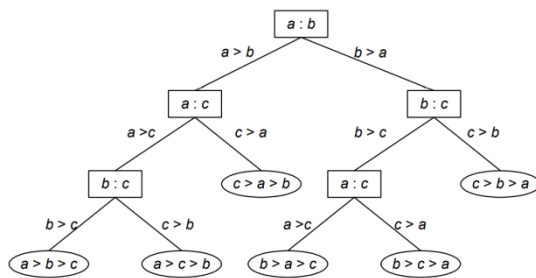

Figure 2.6. Example of decision tree to place 3 elements in descending order.
(Source:https://informatika.stei.itb.ac.id/~rinaldi.munir/Matd is/2022-2023/matdis22-23.htm)

III. TEAMS

In Formula 1, there are 10 teams that will compete for the 2023 season. A brief explanation for each team, in alphabetical order, are as follows:

A. Alfa Romeo

Figure 3.1. Alfa Romeo C42.
(Source: https://www.racefans.net/2022/02/27/which-f1-team-has-the-best-looking-car-for-2022/)

Alfa Romeo joined F1 at its inaugural season, back in 1950. The team won 10 out of 15 races in its first two years in the sport. Alfa Romeo would not compete as a team after that,

until a brief period between 1979-1985. The team will experience another break until 2019, returning to the sport after taking over Sauber.

B. Alpha Tauri

Figure 3.2. Alpha Tauri AT03.
(Source: https://www.racefans.net/2022/02/27/which-f1-team-has-the-best-looking-car-for-2022/)

Before to the name "Alpha Tauri", the team name prior to 2020 was "Toro Rosso". The intention for the naming change was to promote the parent company Red Bull's fashion label of the same name. Since 2020, Alpha Tauri's best result in a race was the 2020 Italian GP, where Pierre Gasly won the race and gave Alpha Tauri its first victory. The team's best year came in 2021 when they were able to collect 142 points and finished 6th in the World Constructor Championship (WCC).

C. Alpine

Figure 3.3. Alpine A521.
(Source: https://www.racefans.net/2022/02/27/which-f1-team-has-the-best-looking-car-for-2022/)

Alpine is a part of the French automotive company *Groupe Renault*, the company themselves already raced in F1 for a long time, traced back to the 80s, under names like Toleman, Benetton, Lotus, and Renault. After 2020, the company decides to change the team name, from Renault to Alpine, with the intention to promote the Alpine brand. Alpine's best result in a race was the 2021 Hungarian GP, where Esteban Ocon won the race and gave Alpine its first victory in F1. 2022 become Alpine's best season so far with 173 points and finishing 4th in the WCC.

D. Aston Martin

Figure 3.4. Aston Martin AMR22.
(Source: https://www.racefans.net/2022/02/27/which-f1-team-has-the-best-looking-car-for-2022/)

Aston Martin used to race in F1 back in 1959-1960, although only starting 5 races. Aston Martin makes a comeback to F1 in 2021 after Racing Point's owner, Lawrence Stroll makes an investment into Aston Martin, and is able to take 16.7% stake into the company. The investment resulting into commercial rebranding, replacing the current existing team at the time, Racing Point. Their comeback year proven to be their best year so far, with the team able to take a podium and finishing 7th in the WCC.

E. Ferrari

Figure 3.5. Ferrari F1-75
(Source: https://www.racefans.net/2022/02/27/which-f1-team-has-the-best-looking-car-for-2022/)

Ferrari starts their F1 journey back in 1950, the same year as Alfa Romeo debuted in F1, although Ferrari just joined F1 at the 2nd race of the year. Ferrari is the most experienced team in the grid, as the team never miss any season since the start of F1 back in 1950. Ferrari also won the most Constructors' Championships (16) and the most Drivers' Championships (15), more than any other team in F1 history.

F. Haas

Figure 3.6. Haas VF-22
(Source: https://racingnews365.com/why-haas-fell-to-the-back-of-the-grid-in-australian-gp-practice)

Haas is the youngest team on the F1 2023 grid, joined F1 back in 2016 (remember that Alpha Tauri and Alpine are successors from another team, not an entirely new one). Haas is mainly known as the only American team on the grid, with most of their motorsports experience prior to F1 came from NASCAR Cup Series. 2018 proven to be their best season to date, with 93 points collected and finishing 5th in the WCC.

G. McLaren

Figure 3.7. McLaren MCL36.
(Source: https://www.racefans.net/2022/02/27/which-f1-team-has-the-best-looking-car-for-2022/)

The team was founded in 1963 by New Zealand racing driver, Bruce McLaren, after creating his own team back in 1960 to compete in the Australasian Tasman Series with custom-built Cooper cars. Bruce McLaren then debuted the team at the 1966 Monaco GP, retiring from the race after an oil leak on lap 9. After that, McLaren F1 Team wins a total of 8 WCCs and 12 WDCs, making them the 2nd most successful team in F1 history based on the number of championships they got (20), just behind Ferrari with 31.

H. Mercedes

Figure 3.8. Mercedes W13.
(Source: https://www.racefans.net/2022/02/27/which-f1-team-has-the-best-looking-car-for-2022/)

Mercedes began their journey in F1 back in 1954 and 1955, with the team able to win 9 out of 12 races they entered, and Juan Manuel Fangio takes the World Driver Championship (WDC) in both seasons. After that, they only supply engines to other teams since the 90s. Mercedes rejoin F1 as a team back in 2010, after they purchased the 2009 WCC-winning team,

Brawn GP. Since 2010, the team wins 6 WDCs and a record-breaking 8 consecutive WCCs.

I. Red Bull

Figure 3.9. Red Bull RB18.
(Source: https://www.racefans.net/2022/02/27/which-f1-team-has-the-best-looking-car-for-2022/)

Red Bull started their project as a team in F1 after they purchased Jaguar Racing, which is up for sale after the 2004 season. Red Bull debuted in F1 in 2005, with the company purchasing Minardi at the end of the season, replacing the team to *Toro Rosso*, which is essentially Red Bull's "B-Team". *Toro Rosso* started their first F1 season in 2006, just a year after their parent's first F1 season. Red Bull will later be winning 6 WDCs and 5 WCCs, including a 4-year of domination, winning both WDC and WCC from 2010 until 2013.

J. Williams

Figure 3.10. Williams FW44.
(Source: https://www.racefans.net/2022/02/27/which-f1-team-has-the-best-looking-car-for-2022/)

Williams Racing was formed back in 1977 by Frank Williams. The team itself is the successor of *Frank Williams Racing Cars*, Frank Williams' earlier unsuccessful F1 team. Williams was acquired by American investment group, Dorilton Capital, back in August 2020. Despite the change of ownership, the name of the team stays as "Williams Racing" after an agreement between the Williams family and Dorilton Capital. Over its long career in F1, Williams achieves a grand amount of 9 WCCs and 7 WDCs.

IV. Implementation

For a new F1 fan, it is unsurprising that they will support a team simply based on their preferences. Taking on author's personal experience on picking which team to support for the first time, there will be three main focus explained in this paper; Livery color, drivers, and team's nationality.

A. Livery Color

The first one on the list is a team's livery. Fans will prefer that the team they are supporting has a beautiful-looking livery. Team's livery are not constant each year, they can change, either minor or major changes applied, depend on the team's main sponsor. But, since there are no teams that has revealed their livery for the 2023, we will take F1 2022 team's liveries as the main reference for this part of the paper. From figure 3.1. until figure 3.10., each team's livery description are listed into the table below.

Table I. Each team's livery description.

No.	Team	Livery Description
1	Alfa Romeo	Red-white
2	Alpha Tauri	Dark blue, white stripes
3	Alpine	Blue with some pink
4	Aston Martin	Green
5	Ferrari	Fully red-theme
6	Haas	White
7	McLaren	Orange
8	Mercedes	Silver
9	Red Bull	Dark blue, no white stripes
10	Williams	Blue without pink

A decision tree can be created by taking all the information from the table above. The depiction of the tree is as follows:
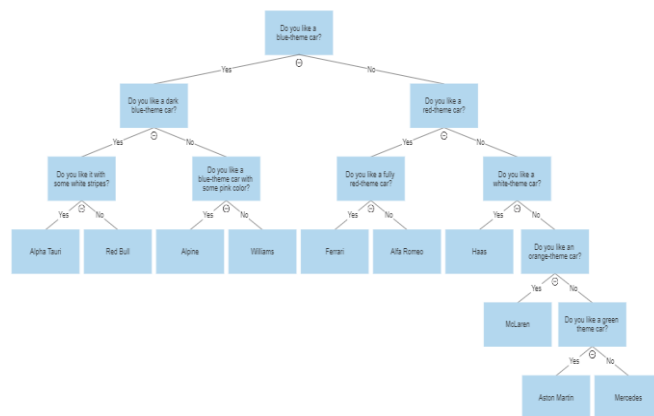

Figure 4.1. Implementation of a decision tree based on the data collected from Table I.
(Source: local library)

B. Drivers

The second one on the list is coming from the drivers. When becoming a newbie to the sport, most F1 fans are cheering drivers first over the teams, mainly because of how each drivers are bringing their own personality to the sport, which makes fans thinking that one of these drivers is way more "relatable" than the other drivers, to each fans' personality.

This gets into a point where fans are supporting a team just because their favorite driver is in that team, which means that

if the driver moves to another team, the fans will also change the team they are supporting. One example related to the 2023 is Fernando Alonso, who drivers for Alpine this year, will move to Aston Martin in 2023. Alonso's fans, following their idol's move, also changing their support from Alpine to Aston Martin. Each team's drivers are listed in the table below.

Table II. Each team's drivers.

No.	Team	Drivers
1	Alfa Romeo	Valtteri Bottas & Zhou Guanyu
2	Alpha Tauri	Nyck de Vries & Yuki Tsunoda
3	Alpine	Pierre Gasly & Esteban Ocon
4	Aston Martin	Fernando Alonso & Lance Stroll
5	Ferrari	Charles Leclerc & Carlos Sainz Jr.
6	Haas	Nico Hülkenberg & Kevin Magnussen
7	McLaren	Lando Norris & Oscar Piastri
8	Mercedes	Lewis Hamilton & George Russell
9	Red Bull	Sergio Pérez & Max Verstappen
10	Williams	Alexander Albon & Logan Sargeant

The decision tree idea here is very simple, it gives two options, either you support the driver in question or not. If you support the driver in the question, then your team will be the driver's team. Else, go to the next question. Depiction of the tree is as follows:
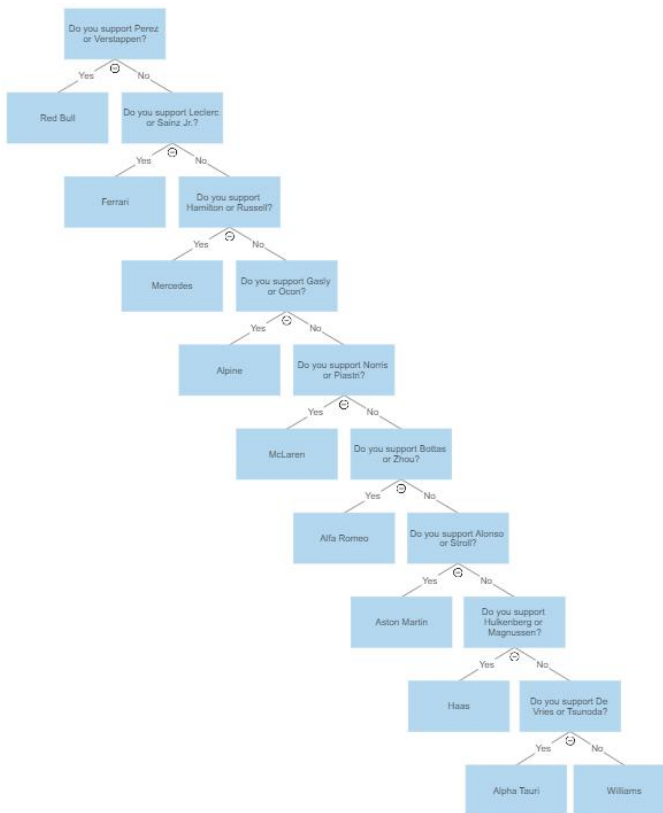

Figure 4.2. Implementation of a decision tree based on the data collected from Table II.
(Source: local library)

C. Team's Nationality

The last one here is the nationality of a team. In the course

of history, people tend to support or against something based on it's nationality, with examples like social, culture, politic, and so forth. Formula 1 itself is no different, with people tend to support drivers based on their nationality, and even teams. Fans might support a team based on their nationality under such occasion that either they are having the same nationality as the team, is a descendant from the same country as the team, or simply having a support on a country the team is coming from.

Now, there are some teams that having the same nationality between each other. To solve this case, author will also put the city where each of these teams are based on. Each team's base city and nationality are listed in the table below.

Table III. Each team's base city and nationality.

No.	Team	Nationality
1	Alfa Romeo	Switzerland
2	Alpha Tauri	Faenza, Italy
3	Alpine	France
4	Aston Martin	Silverstone, UK
5	Ferrari	Maranello, Italy
6	Haas	USA
7	McLaren	Surrey, UK
8	Mercedes	Germany
9	Red Bull	Austria
10	Williams	Oxfordshire, UK

To make the decision tree looks shorter, the author has placed a question at the root of the tree as "Strong relation with either UK or Italy?" so that countries with multiple teams will be at the left side of the tree, while countries with a single team will be at the right side. Implementation of the tree is as follows:
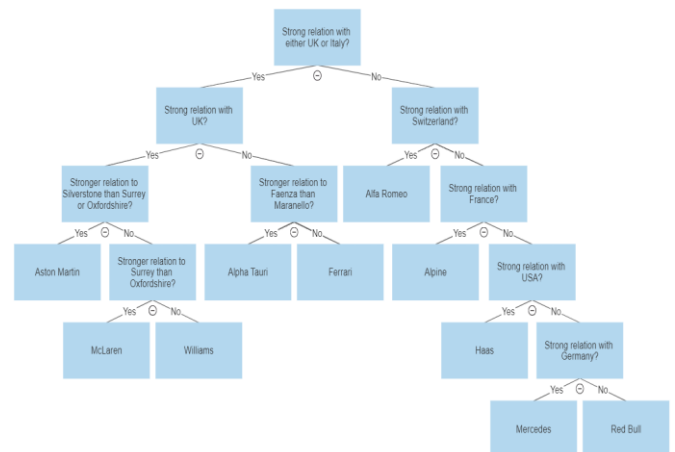

Figure 4.3. Implementation of a decision tree based on the data collected from Table III.
(Source: local library)

V. CONCLUSION

Decision tree is a really useful concept to decide on something that has lots of variable and takes many steps on taking the decision. In this paper, the decision tree is used to decide on which F1 team to support for the 2023 season, based

on personal preferences alone.

After creating three different decision trees on three separated topics, it is proven that the effectiveness of decision tree helps new fans who are still unsure which team to support for F1 2023.

VI. ACKNOWLEDGMENT

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PERNYATAAN

Dengan ini saya menyatakan bahwa makalah yang saya tulis ini adalah tulisan saya sendiri, bukan saduran, atau terjemahan dari makalah orang lain, dan bukan plagiasi.

Bandung, 12 Desember 2022

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