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MATHEMATICAL RANKING OF FORMULA 1 DRIVERS BASED ON RACE AND QUALIFYING RESULTS

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BACHELOR THESIS

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THESIS TASK

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Thesis main objectives:

1. Formulation of driver rankings by race results
2. Formulation of driver rankings by qualifying, and combining these two
3. Verification of ranking by comparison with existing models

Thesis tasks and time schedule:

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2.	Obtaining and formulating average finish positions of drivers	06.04
3.	Making a matchematical model to compose the rankings	30.04
4.	Comparing the results	25.05
5.	Writing background information	31.05

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CONTENTS

PREFACE

This paper composed a ranking of Formula 1 drivers racing between 2010 and 2024. Teammate comparisons were used to assess drivers based on their time in equal machinery. The data was processed with a Python algorithm, ranking drivers according to their race and qualifying performances, with a final combined ranking including them both as equal factors. Max Verstappen was found to be the standout best driver of the reviewed era, with Charles Leclerc, Fernando Alonso, Pierre Gasly and Lando Norris composing the next tier, separated by small gaps.
Keywords: Formula 1, Mathematical modelling, Python, Graph analysis

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1. INTRODUCTION

The Formula 1 world championship was inaugurated in 1950 and 776 drivers have taken part to date. This paper aims to rank the 59 drivers taking part from 2010 to 2024 in order of performance. The matter of finding the greatest F1 driver of all time is a contentious topic among fans, journalists and historians.

As the pinnacle of motorsport, Formula 1's ever-evolving technology makes assessing drivers across eras challenging, with strong arguments supporting Michael Schumacher, Lewis Hamilton, Juan Manuel Fangio, Ayrton Senna, Alain Prost and Jim Clark [1]. Each of these drivers achieved dominance due to their talent and superior machinery, but their driving ability was often demonstrated when faced with mechanical unreliability or factors outside their control.

The debate of the best Formula 1 driver has been investigated by several studies. In 2016, an academic study ranked the top 50 drivers between 1950 and 2014 using mathematical modelling to evaluate driver ability independently of car performance [2]. In 2020, a team working for AWS ranked the fastest drivers across the sport’s history based solely on qualifying pace [3]. Several fan-made rankings also exist, including the F1metrics model [4], which looked for the best 3-season average race performance. F1-analysis [5] placed more emphasis on the team-mate comparison and created mechanisms to account for experience, age and reliability issues.

This paper seeks to combine the valuable aspects of these models, assess drivers based on both race and qualifying performances and combine them into an overall ranking. The objective is to compose a fair, purely mathematical logic to quantify a driver’s performance against teammates. Once the ranking is finalized, comparisons with existing models will also be made to assess the trustworthiness of the obtained results.

Throughout the history of the sport, successful drivers have been known to sacrifice qualifying pace to have an optimal set-up for race day when the points are scored. Niki Lauda, a three-time world champion, implemented this strategy when facing a young Alain Prost. In turn, Prost employed similar techniques to outscore his future team-mate Ayrton Senna [6], regarded as the best qualifier of all time by the AWS model [3].

Seasons with two well-performing drivers in equal machinery are rare, as teams tend to prefer to build their team around one star driver, with the second car being driven by a reliable points-scorer. When such a team can develop a superior car, the identity

of the championship winner becomes predictable. In 2023, Max Verstappen won 19 of 22 races, while Lewis Hamilton, statistically the most successful driver of all time, failed to win any [7]. In 2021, the two had a more balanced contest in similarly performing machinery, with Verstappen winning ten races to Hamilton's eight [8]. This study aims to eradicate the performance differences caused by external factors and produce a definitive ranking of drivers.

The background information on Formula 1 and its inner workings will be given in Chapter 2, as well as an overview of existing rankings. Chapters 3 and 4 will describe the practical aspects, namely data processing and methodology. Chapter 5 will include a review of the rankings, as well as a study of the effect of some alterations. Furthermore, the results will be compared to the existing rankings.

2. Background

Most individual sports provide a clear assessment of athlete performance and skill, as they can be considered directly proportional to the results. In Formula 1, finding the best driver requires more observation and data. The machinery at the driver's command and the team around them plays a crucial part in delivering the victories. Formula 1 world champion Nico Rosberg estimated the driver only contributes 20% to the results, with the rest being a combination of the car's capability and team synergy [9].

The premise of this paper is to compare drivers who were in the same team, taking all other factors out of the equation. They have identical machinery at their command and should therefore have been granted the same opportunities to perform throughout a season. That has not always been the case, as several teams focused on one star driver in the past, for example Ayrton Senna at Lotus or Nelson Piquet at Brabham in the 1980s [10].

These days, every move drivers make on track can be compared to their teammate through data. A team of engineers assigned to each driver is constantly searching for the smallest of gains on the other car, while closely monitoring similar progress on the other side of the garage [10]. Additionally, prize money is paid according to the team results, which counts points scored by both cars. All that makes having two strong drivers in both cars more beneficial than ever [11]. While teams might still hire drivers with the assumption of them beating their teammate, it is by no means a given.

The series below Formula 1 on the motorsport ladder use identical cars, which provides a meritocratic assessment of driver performance [12]. There are small differences between teams regarding experience and professionalism, but the real talents usually find a way to shine. In Formula 1, every championship in the reviewed period was won by either Mercedes or Red Bull and the driver's championship by one of their drivers [13]. Therefore, only a select few drivers get to show their full potential of winning championships.

Drivers rarely stay with one team for their whole career, but changing team means adapting to a new environment while putting their trust in a new project and the collective. Changes in a team's driver line-up also mean more drivers can be compared [14], as will be done in this paper.

Once data has been gathered for all pairings, almost every driver who raced during the research period can be connected to every other through teammates. This paper intends to do just that, using an algorithm to compare the race and qualifying performances of teammates and finding out who would theoretically perform the best in equal cars.

2.1 The essence of Formula 1

The Formula 1 world championship is held across seasons, happening every year, with race meetings taking place between March and December [15]. During almost every Grand Prix round in the chosen period (see Fig. 2.1, standard weekend), three practice sessions were held throughout Friday and Saturday, helping the drivers familiarize themselves with the circuit and find the most optimal mechanical set-up for the car in conjunction with their team. On Saturday, a qualifying session is held, which is split to 3 parts [16].

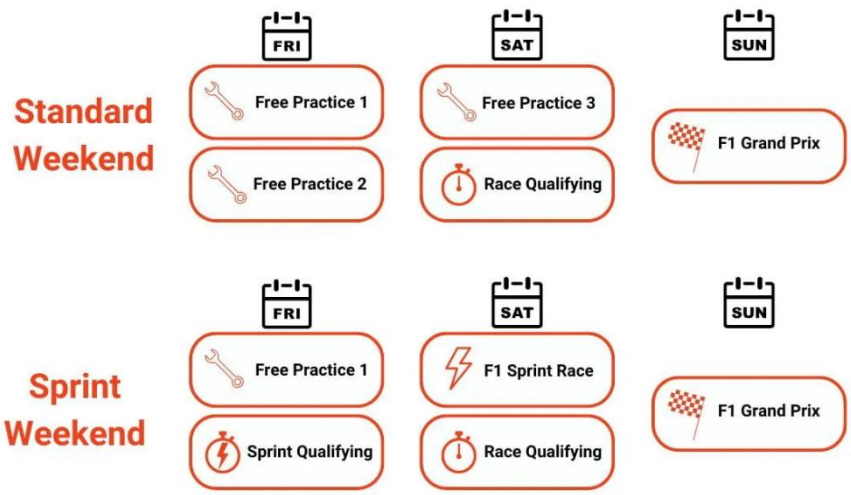

Figure 2.1. Formula 1 weekend schedule [17]

In the first part of qualifying, every driver attempts to set the fastest lap, but only the 15 quickest are allowed to join the second part, and 5 more are eliminated before the third part. This system was established in 2006, but until 2009, the times in the final part had to be set on race fuel loads [16].

Teams could get low on fuel to set the fastest time, but no fuel was allowed to be added before the race. The weight of the fuel has a considerable effect on car performance and handling balance [18], which made that a strategic decision. Teams who went low on fuel in qualifying would have to pit earlier than others and potentially compromise their entire race.

A similar system had been in place since 2003, relegating the qualifying times between 2003 and 2009 unrepresentative of a car's ultimate lap time potential. In 2010, refuelling during the race was banned, and the car was once again allowed to be fuelled between or after qualifying sessions. From then on, teams usually run the cars as light as possible in qualifying, often even refuelling it between the qualifying segments. [16]

Between 1996 and 2002, the grid was decided by a 1-hour session, with each driver getting a maximum of 12 laps to set their time. Before that, two hour-long qualifying sessions were held on Friday and Saturday, and the driver who set the overall fastest time would start the race first. That system had been in place since the first Formula 1 season in 1950. The starting order for Formula 1 races is called the grid, with the person starting in first being awarded the pole position. The full order from qualifying determines the positions from which drivers start the race on Sunday. [16]

In 2021, the sprint format was introduced to Formula 1 (see Fig.1 for a comparison with a standard weekend). For the first two years, the sprint races used the order that had been set by the qualifying session and the result of the sprint would determine the grid for the main race on Sunday. In 2023 and 2024, the sprint became a standalone event, with a separate qualifying session and no effect on the Sunday race. Formula 1 races take place over 305 km or 2 hours, whichever is completed first. The exception is the Monaco street circuit where the race distance is defined as 260 km due to the low-speed nature of the race course. [16]

In every race, the drivers who cross the line among the first 10 are awarded points (see Chapter 3.1), and the driver with the most points at the end of the season is crowned world champion. Scoring points is a crucial goal for each team, therefore the mechanical reliability of the cars is a major focus of development. In recent years, most drivers have only had a few issues across the whole season, so it's becoming less of a differentiator among the teams. [19]

However, after the new regulations were introduced in 2014, several teams had issues with their freshly developed power units (engine and electrical components). Renault and Honda, who joined as McLaren's engine supplier in 2015, had the biggest struggle [20]. The reliability factor will be considered in the formation of the rankings (see Chapter 4.1).

The circuits used in the championship are another important factor. Formula 1 mostly races on permanent courses created for the sole purpose of motorsport. The historical exceptions are Monaco and Circuit Gilles Villeneuve in Canada, which are made up of public roads and are converted for racing use for a few weekends every year. In recent years, more street circuits have been added to bring racing closer to the fans, so now they make up a third of the calendar. [21]

On the 2025 calendar, the lengths of the racetracks vary between 3,3 and 7 km. This means lap times are also different across the rounds, ranging between just over a minute in Austria to over two minutes in Belgium when it rains. These differences were normalized for the purpose of this ranking, as will be explained in Chapter 3.2.

2.2 Existing rankings

Table 2.2.1. shows some of the Formula 1 driver rankings that have been composed in the past, including their key characteristics and research periods.

Table 2.2.1. Overview of existing rankings

Ranking	Bell et al	Amazon Web Services (AWS)	F1metrics	F1-Analysis
Published	2016	2020	2020	2024 (still updated)
Years covered	1950-2014	1983-2019	1950-2019	1950-2024
Race or qualifying	Race	Qualifying	Race	Race (and separate for qualifying)
Specialty	Defining team performance	Only using qualifying	Three-year segments	Predictive team-mate comparison

The most recent academic paper ranking of Formula 1 drivers throughout history was published in 2016. The team from universities across the United Kingdom introduced a scoring system for all drivers taking part in a race, and accounted for team performance, weather conditions and track characteristics while composing the rankings. [2]

The scope of their research extends beyond this paper but has some crucial limitations. Attempting to define team performance, which is heavily fluctuating across seasons, is a difficult task as it is usually influenced by mathematically unquantifiable external factors. As the authors describe, weather conditions and track characteristics have little effect on the ranking [2]. While there is certainly value in attempting to define and

include such factors, using the results with no added context was deemed most appropriate for the purpose of the present study.

The qualifying component was studied by the AWS model, using similar practices to this paper to assess drivers. Lap time differences across the rounds caused by circuit variation were equalized, and drivers with five or more qualifying sessions driving for the same team were compared. Unlike the current model, linear regression was used to rate drivers and compute the strength of the links. [3]

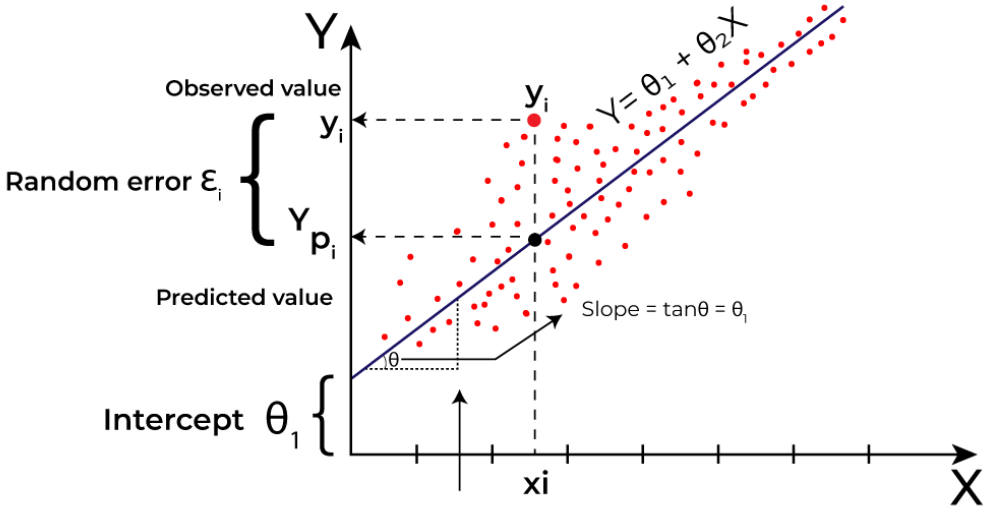

Figure 2.2.1 Graphical representation of linear regression [22]

Linear regression is a statistical method which attempts to define a mathematical function to describe the given values [22]. The main limitations of the AWS ranking are the exclusion of race results, as well as the use of linear regression instead of averaging out the lap times [3]. The purpose of this study was to assess the results on face value. Linear regression is a prediction tool, any result obtained through it is an estimation, making its use undesirable for the current purpose.

The F1metrics model has merits of its own, mostly the age and experience factor it corrects for, as well as the developing a points system down to the top 20 finishers in each race, mirrored by the current study. However, qualifying rankings are notably missing from the conclusion and using only 3-year periods instead of a driver's full career, as f1metrics does, excludes a large portion of relevant data [4].

The premise of the F1-analysis model is similar, with all factors mentioned in relation to F1metrics also being considered. Furthermore, F1-analysis also composed a qualifying

ranking, but awarded race points for qualifying rather than studying the percentage gaps relative to the fastest times. Their approach is a good way to quantify drivers' ability to deliver qualifying results but provides less insight to their capabilities. [5]

The margins between drivers in qualifying can vary greatly. For example, Ayrton Senna took pole position for McLaren at the 1988 Monaco Grand Prix by beating his teammate Alain Prost by 1,4 seconds. The next closest driver was Ferrari's Gerhard Berger, 2,7 seconds behind Senna. [23] Conversely, there have been two occasions in Formula 1 history where an identical fastest time was set by more than one driver, but the driver who finished their lap first was awarded the pole position [24]. The solution used by F1-analysis awards losing over 1 second to your team-mate with the same points as a driver who delivered the fastest time but later, leading to unrepresentative results.

Overall, all the existing models provide a comprehensive and strong assessment of Formula 1 drivers for the periods from which they composed the ranking. Where this model stands out is the inclusion of qualifying in the final ranking, as well as the robust and simple ranking mechanism. Instead of ranking the drivers on being able to achieve outright results, the presently used teammate comparisons give a different angle on driver performance, while achieving a comparable result.

Most importantly, the addition of qualifying as an equal component in a driver's rating allows to extend the assessment of a driver beyond the race. The rankings of the AWS, F1metrics and F1-analysis will be compared to the result obtained by the current ranking in Chapter 5. The comparison with the Bell et al model was not deemed useful, as the two rankings only overlap in 5 years.

3. Data processing

The chosen research period is 2010-2024, as the regulations around refuelling, scoring and qualifying were consistent. The race and qualifying results were accessed through the F1 website, which holds records of all official championship races [25]. Table 3.1 [25] shows the number of races that took place in each of the covered seasons. Results from all races were used in formation of the ranking, except for the 2021 Belgian Grand Prix, which was called off after only three laps completed, both behind the safety car [26].

Table 3.1 The round counts and entry sizes for the investigated seasons

Seasons	Rounds	Entries
2010-11	19	24
2012	20	24
2013-14	19	22
2015	19	20
2016	21	22
2017	20	20
2018-19	21	20
2020	17	20
2021-23	22	20
2024	24	20

While there is an almost 30% difference between the longest and shortest season, it was decided to give all the seasons equal weight for the present analysis. The real interest lies in assessing how a driver performs across their whole career, and more races in a season makes the data more accurate.

Drivers were assessed based on their average points scored per race, mitigating the impact of mechanical failures or incidents beyond a driver's control. In the same way, the use of average points per race enabled the assessment of incomplete seasons. In a few of the years under review, teams elected to change their driver line-up midway through the season [27]. These cases should not be considered in the same vein as complete seasons but still provide valuable data. All such cases were included in the

ranking, but received a lower coefficient, the formation of which is explained in Chapter 4.1.

For every qualifying session, all drivers were judged against the fastest time set across the 3 sessions (see chapter 2.1). The best time set by each driver in any of the sessions was used. Drivers' lap times often improve throughout the qualifying rounds, as they gain confidence and experience about present track conditions. With more rubber falling on the track, the surface gains grip allowing the car to go faster. Additionally, teams often tweak the setup (aerodynamic balance) of their cars between the runs, helping the driver. [28]

Tho combination of all these factors means the ultimate lap time is almost always achieved in the final qualifying session. Therefore, judging drivers who were eliminated in earlier sessions against lap times achieved in conditions they never drove in may be considered unfair. However, execution is a fundamental factor in Formula 1, and if a driver is unable to turn their speed into a fast lap time while their team-mate in equal machinery is, that should count against them.

3.1 The points system

The current Formula 1 points system remained consistent throughout the analysed period. Between 2019 and 2024, a point was given out to the driver that set the fastest lap in every race, but those were omitted from the overall score in this paper to give all scored results equal importance. The current system only rewards points to the top 10 finishers [19]. Since the aim was to compare all drivers relative to their teammates, irrespective of their car's competitiveness, a new scoring system was developed for this thesis.

The basis of the new system was the IndyCar Series, racing primarily in the United States. In IndyCar, points are awarded to every finisher [29] allowing fair assessment of drivers beyond the top 10. In contrast, the current Formula 1 awards a driver who crashes out of the race on lap one equally to another finishing the race in 11th place. For better evaluation of such cases, it was decided to give out points to the top 20 finishers in this paper. The resulting scheme provides more points for each race like IndyCar but follows the weight of each position set in the Formula 1 system.

In a handful of races earlier in the research period, more than 20 cars finished races, with as many as 24 cars being entered between 2010 and 2012 (see Table 2). After the Manor team disbanded before the 2017 season, 20 cars have been entered for every

race [30]. However, the effect of those races and the minor extra points drivers would have scored was judged to be negligible, so giving out points to the top 20 for every race remained the chosen solution.

As stated above, Formula 1 awards points to the top 10 highest finishers in every race. Per the Formula 1 rules, if a driver completed more than 90% of the race distance, they are classified as a finisher. That means a car does not strictly need to be running at the end of the race, but they need to have completed an overwhelming majority of the laps [31]. The cases where this affects the top 10, enabling a driver who retired from the race to score points are rare, and no such cases happened during the investigated period.

However, if the number of scoring finishers is extended to 20, the described situation occurs multiple times every season. For the purpose of this study, all drivers classified as finishers received points for the position they were given in the official Formula 1 results. The extended scores for each position, used to compose the input data, can be seen in Table 3.1.1.

Table 3.1.1 Points systems

Position	F1	Indycar	Difference to F1	Custom	Difference to F1
1st	25	50	2	50	2
2nd	18	40	2,22	40	2,22
3rd	15	35	2,33	35	2,33
4th	12	32	2,67	30	2,5
5th	10	30	3	26	2,6
6th	8	28	3,5	22	2,75
7th	6	26	4,33	19	3,17
8th	4	24	6	16	4
9th	2	22	11	14	7
10th	1	20	20	12	12
11th		19		10	
12th		18		9	
13th		17		8	

Table 3.1.1 continued

Position	F1	Indycar	Difference to F1	Custom	Difference to F1
14th		16		7	
16th		14		5	
17th		13		4	
18th		12		3	
19th		11		2	
20th		10		1	
21st		9			
22nd		8			
23rd		7			
24th		6			
25th-33rd		5			

The difference between the chosen solution and the Indycar system can be seen in the respective columns of Table 3.1.1. The custom system created for the purpose of this thesis sets out to increase the amount of scoring drivers while keeping the weight of each position close to the current F1 points system. Currently, the differences between points scoring positions in F1 are 7, 3, 3, 2, 2, 2, 2, 2 and 1. A similar structure of 10, 5, 5, 4, 4, 3, 3, 2, 2, 2 and 1 from then on was used in the custom solution applied in this paper.

3.2 Scoring drivers and omitted results

As stated above, points are given out to the top 20 drivers who finished each race. If there were less than 20 classified finishers, points are given up to the last race finisher. An example of a data table for a season can be seen in Appendix 1. Similar tables were formed for all 15 seasons that were reviewed for this paper. However, not all drivers were deemed to be relevant for the rankings.

Certain drivers were excluded from the final dataset as they only competed against a single teammate, forming isolated intra-team comparisons. These drivers include Sebastien Buemi and Jamie Algersuari at Toro Rosso in 2010 and 2011, Timo Glock and Lucas di Grassi at Virgin in 2010, Giedo van der Garde and Charles Pic at Caterham in 2013. All Marussia drivers between 2011 and 2015, including Glock, Pic, Jerome

d’Ambrosio, Jules Bianchi, Max Chilton, Will Stevens and Roberto Merhi were omitted for the same reason.

Had the dataset been extended to include 2009, Glock and his teammates di Grassi, d’Ambrosio and Pic, as well as Pic’s teammate van der Garde, could have been included. That comes from Timo Glock being teammates with Jarno Trulli in 2009. He is present in the ranking, making including all drivers connected to Glock and his teammate possible. However, qualifying was run on race fuel loads in 2009 (see Chapter 2.1) and adding one year with different regulations to the rankings could skew the results.

Rob Smedley from the AWS team (see Chapter 2.2 for more and Chapter 5.3 for comparison with their ranking) commented on the same issue, saying teams usually ran similar fuel strategies on both cars, with the minor differences evening out across the season [32]. However, as the points system and in-race refuelling regulations also changed for 2010, that season was deemed a good cut-off for the purpose of this ranking. The added value of appending the results by a few little-connected drivers would be negligible.

Additionally, drivers who scored points in fewer than five races during a season were also excluded from the scoreboard for that season. As an exception, Pierre Gasly scored on five occasions in 2017, so he could theoretically have been included. However, as he was paired up with Carlos Sainz for two of those occasions, and Brendon Hartley for the other three, no meaningful results could be obtained. Therefore, Gasly was excluded from the rankings for that year.

Qualifying sessions affected by rain were excluded from the data as no fair comparison could be made between the eliminated drivers and the top 10 as the track conditions were significantly different across the three sessions. Furthermore, luck, timing and team strategy play a much bigger role in the result of rain-affected qualifying sessions. All qualifying results were used as percentages relative to the fastest time, as that way the length of the circuit has no effect on the time used for the ranking. An example qualifying table can be seen in Appendix 2.

4. Methodology

The ranking in this paper is based on team-mate comparisons. The chosen solution, also implemented by most of the other models described in Chapter 2.2, stems from the fact that the two cars entered by the same team are considered equal. Therefore, the two drivers in each team are judged to be granted the same opportunities to win races and qualify fastest. Across a season, the mechanical issues and strategy affecting the results achieved by the two cars can also be considered comparable.

Before conducting the comparisons, the data was compacted into tables including only the necessary information for the ranking (see Appendix 3 for an example). To analyse the data, a Python program was written. The program went through the results each season and found all teammate connections for each driver and combined all relevant information into the results. These steps are described in more detail below, and results are presented and analysed in Chapter 5.

4.1 Data preparation

Not all 20 drivers scored points in every race they took part in, and some had to retire the car early more often than others. To assess the extent of issues for each driver, the percentage of races they scored points in was found for every season. Those percentages were compared within team-mate pairings to assess if their team was the underlying cause for a small number of point-scoring races.

When the average percentage of races drivers scored in for a given team-mate pairing was close to 75, 50 or 25%, the respective number became the pairing's coefficient for that season. This mechanism accounts for reliability issues a team could have been suffering from in a particular season or a car with difficult characteristics, for example handling imbalance or wind sensitivity, causing the drivers to make mistakes. Mid-season driver changes were handled in a similar fashion.

4.2 Data processing in the program

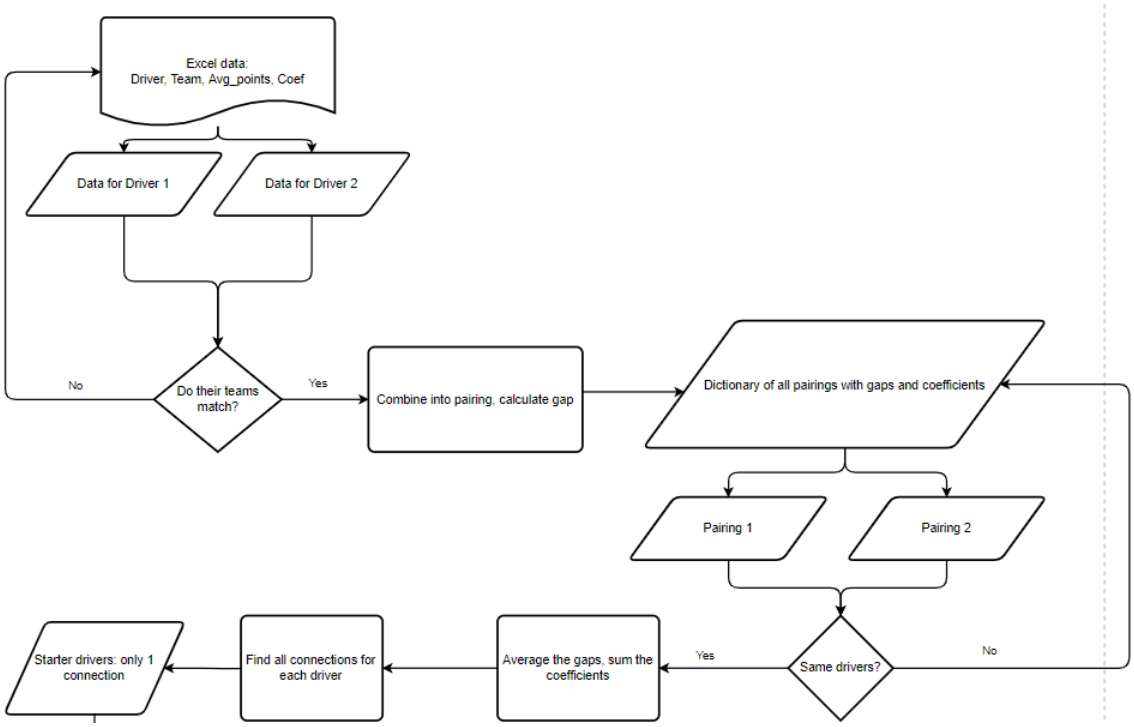

Figure 4.2.1 Data processing in the program

The full data procession logic used in the algorithm is shown on Figure 4.2.1. For the first step of processing, the data is read into the program from Excel sheets, each containing the driver's name, team, average points score and coefficient. The code (see Appendix 4) moves through the dataset and finds drivers who were a part of the same team. They are combined into driver pairings.

For further analysis, dictionaries are used. In programming, a dictionary is a data structure which includes keys and items. Every item is assigned to a specific key, which can have several of these items. For the present purpose, the driver pairings are stored as keys, and the corresponding items include the gap between the drivers and the coefficient assigned to them that season. The gap is obtained through dividing their average points scored across a season, while the formation of the coefficient in explained in Chapter 4.1.

The Excel sheets were season-specific, so longer-lasting driver pairings appear multiple times in the above dictionary. For proper analysis, they must be combined as more seasons as teammates gives more data to compare the drivers, making the average gap used in this ranking more relevant.

Therefore, all instances of unique pairings were combined into another dictionary holding the driver pairings as keys, and the average percentage and combined coefficient of their time spent together as items. An illustrative scheme of all the driver connections investigated in this paper can be seen below in Figure 4.2.2.

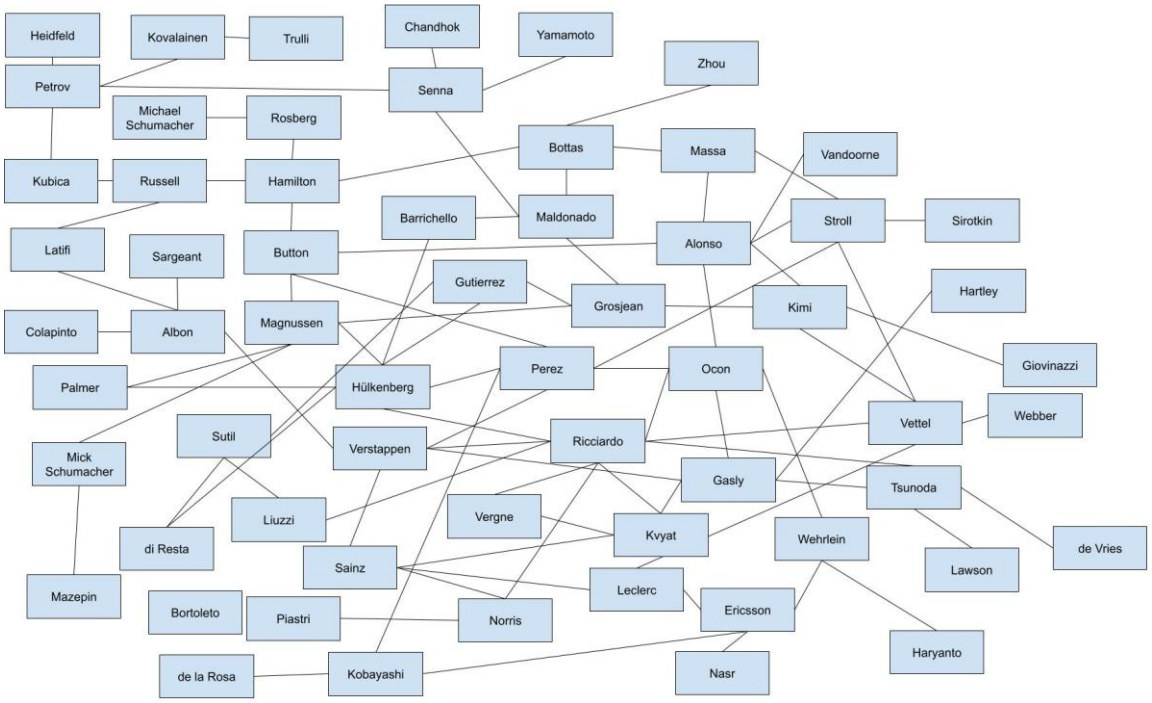

Figure 4.2.2 Graphical representation of team-mate connections in 2010-2024

As the final step of data processing, another dictionary (connections) is created to include every driver as a key and all their team-mates as corresponding items. This data will later be used to traverse the shortest possible path from a given starting driver to any others.

4.3 Calculation of gaps and ranking the drivers

To begin with, drivers the ranking would be started from were determined from the connections dictionary. Every driver who only had one team-mate connection throughout the years under review would be used as a starting point. The drivers matching the description are Mark Webber, Michael Schumacher, Jarno Trulli, Nick Heidfeld, Narain Karthikeyan, Felipe Nasr, Stoffel Vandoorne, Brendon Hartley, Sergei Sirotkin, Antonio Giovinazzi, Nikita Mazepin, Zhou Guanyu, Oscar Piastri, Logan Sargeant, Nyck de Vries, Liam Lawson and Franco Colapinto.

If a specific starter or a few of them were picked, the choice would have a significant effect on the final ranking. Referring to the teammate connections in Figure 4.3.1, the drivers around the starting point have the biggest influence on the results, as they will be present in most paths that are used to reach every other driver. Starting from every possible point negates this effect. Each of these drivers becomes a starting point for a ranking relative to them, to reduce the effect choosing one of them would have on the result.

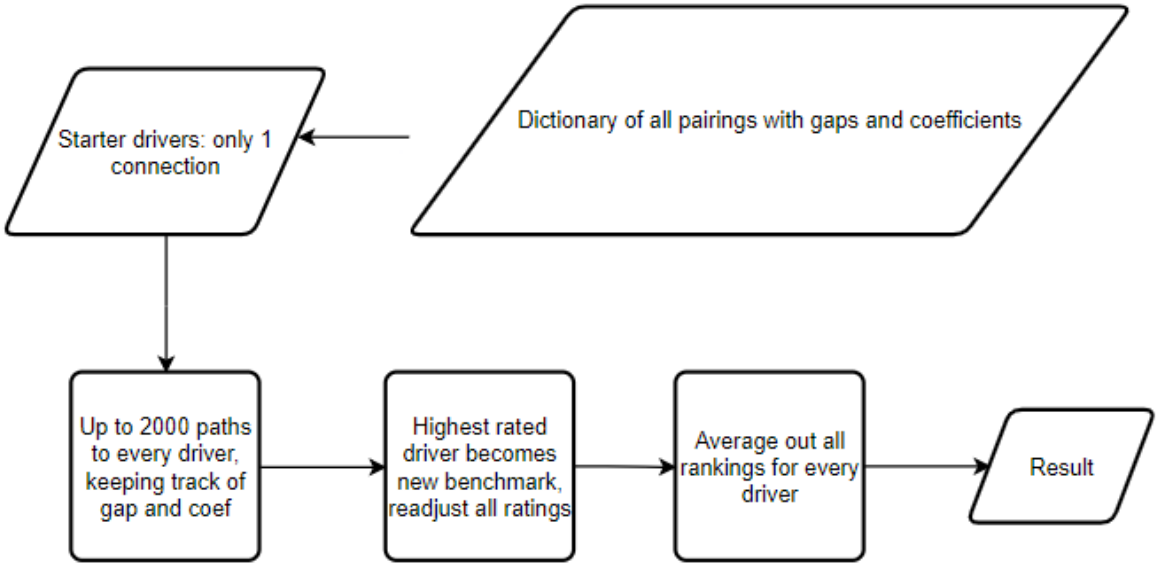

Figure 4.3.1 Calculation process

For each starter, a shortest path algorithm, essentially a simplified Dijkstra's algorithm [34], was used to find up to 2000 paths to each other driver in the network. During the traversal, the gap between the starter, who was fixed in the beginning, and the driver being reviewed was updated at every step, along with the coefficient.

Once all the relations were calculated, the results are looped through (see Appendix 4), and the driver with the highest score is found. All the other scores are updated accordingly, meaning the top driver is found for each starter, with all the other scores being relative to them. The starter-based rankings of every driver are combined into one final ranking, where the combined average ranking is found for every driver.

For the qualifying ranking, some small tweaks must be made. Instead of scoring points based on finishing position, each driver was compared against the outright fastest qualifying time for each event. The median value of those was found and included in the code input file along with a coefficient, formed similarly to the ones in the race data. As the numbers for each driver are already percentages, the difference between teammates is found by subtraction, not division.

During the ranking, the starting point is fixed, and every other driver is compared against them. Drivers whose median result was better receive a corresponding negative delta value, and the quickest driver in each starter's ranking will be the one with the biggest one. Once they are found, the updated time delta for each driver is calculated by adding their existing delta to 100 and dividing it by the fastest delta added to 100.

5. Results

The top 20 drivers in Formula 1 between 2010 and 2024, as ranked by the model designed in this paper, can be seen in Table 5.1. The full ranking is in Appendix 5.

Table 5.1. Top 20 ranking

O/A Rank	Driver	Q Rank	R Rank	Race wins [33]	Podiums [33]	Years [33]	Average
1	Verstappen	1	1	63	112	10	1
2	Leclerc	2	5	8	43	7	0,8845
3	Gasly	3	2	1	5	7	0,875
4	Alonso	5	3	11	53	13	0,8505
5	Norris	6	4	4	26	6	0,8265
6	Hamilton	5	7	92	185	15	0,818
7	Barrichello	9	6	0	0	2	0,7915
8	Sainz	10	8	4	27	10	0,763
9	Russell	8	11	3	15	6	0,7275
10	Hülkenberg	16	10	0	0	11	0,671
11	Ricciardo	11	17	8	32	12,5	0,6665
12	di Resta	7	21	0	0	3	0,659
13	Vettel	15	13	48	113	13	0,6435
14	Button	26	9	8	26	7	0,617
15	Wehrlein	20	15	0	0	2	0,6145
16	Rosberg	17	19	23	55	7	0,605
17	Nasr	29	12	0	0	2	0,5835
18	Sutil	14	30	0	0	4	0,582
19	Bottas	12	33	10	67	12	0,5815
20	Albon	19	22	0	2	5	0,5805

Table 5.1 shows each driver's position in the qualifying (Q Rank) and race (R rank) rankings, as well as their statistics from the investigated period. Max Verstappen, who has won the championship in the last 4 years, is on top in both metrics, owing to him beating all but one of his team-mates comfortably. A considerable advantage in both

categories puts Verstappen in a league of his own as the greatest driver in the last 15 years, and considering the high level of the current grid, perhaps the greatest ever.
The tier below includes Charles Leclerc, driving for Ferrari, the most successful team in Formula 1 history, in second. He beat well-rated driver Sebastian Vettel and Carlos Sainz at Ferrari to establish himself as their lead driver. Third but not far behind is Pierre Gasly, just ahead of Fernando Alonso. The two have the same score for race performances, something Alonso is renowned for. Alonso is widely considered deserving of more championship titles, with both of his titles coming before the viewed period.

Gasly beating Alonso, 7-time world champion Lewis Hamilton and 4-time world champion Sebastian Vettel is surprising, considering he has only one race win to his name. However, he performed well against Daniil Kvyat (30th) and Esteban Ocon (21st), both well-rated drivers in the ranking.

Nico Hülkenberg, the most experienced Formula 1 driver who has not scored a podium finish, is also included in the top 10 ahead of Vettel. Having never had the machinery to compete for wins, Hülkenberg has a reputation of being a safe pair of hands, but nothing special [35]. Considering his ranking, this assessment may have been false.

World champions Jenson Button and Nico Rosberg are also notably low, owing to their close connection to Lewis Hamilton, who is likely to have been underrated by the model considering his record as the most successful driver ever. Button and Rosberg are rated similarly to drivers with little career achievements, Paul di Resta and Pascal Wehrlein. The ranking of these two is related to well-rated teammates they had during their brief time in Formula 1. Paul di Resta matched up well against Hülkenberg for two years, and Wehrlein beat a rookie Ocon and Ericsson, who is directly connected to the second-best ranked driver Charles Leclerc.

Remarkable exclusions include current (25.05.2025) Formula 1 championship leader Oscar Piastri, who struggled to match team-mate Lando Norris in his first two seasons, and 7-time world champion Michael Schumacher. Schumacher's exclusion and low rating come off the back of being beaten by Nico Rosberg in his three years in the research period, during which time he only added a single podium to his then-unmatched tally.

The obtained ranking is by no means definitive but provides a good picture of the general level of most drivers whose whole careers took place during the investigated period. To investigate the causes of some unexpected rankings, some simple adjustments to the

model will be studied below, as well as differences with the existing models mentioned in Chapter 2.1.

5.1 Addition of the current season

At the time of writing, exactly one third of the planned Grands Prix have taken place for the 2025 season. To prove the model's modularity and robustness, as well as introduce some crucial new comparisons to the equation, the results were added to the data pool.

At Ferrari, Lewis Hamilton replaces Carlos Sainz, providing us with a direct comparison between the second and sixth highest ranked drivers. The comparison between Sainz and his new teammate Albon will also provide interesting data, as will the match-up between the leader of the ranking, Max Verstappen, and Yuki Tsunoda at Red Bull.

Table 5.1.1 Rating and ranking differences with the 2025 data added

O/A Rank	Driver	R rating	Q rating	2025 rank	Driver	R rating	Q rating
1	Verstappen	0,9	100,159	1	Verstappen	0,914	100,122
2	Leclerc	0,852	100,226	2	Alonso	0,878	100,28
3	Gasly	0,869	100,271	3	Gasly	0,852	100,264
4	Alonso	0,869	100,304	4	Leclerc	0,826	100,223
5	Norris	0,855	100,31	5	Norris	0,797	100,201
6	Hamilton	0,834	100,282	6	Hamilton	0,807	100,239
7	Barrichello	0,842	100,333	7	Russell	0,779	100,277
8	Sainz	0,824	100,338	8	Sainz	0,794	100,349
9	Russell	0,794	100,33	9	Barrichello	0,765	100,305
10	Hülkenberg	0,795	100,409	10	Ricciardo	0,759	100,314
11	Ricciardo	0,759	100,347	11	Hülkenberg	0,756	100,311
12	diResta	0,743	100,327	12	Wehrlein	0,782	100,388
13	Vettel	0,774	100,407	13	Vettel	0,765	100,384
14	Button	0,799	100,49	14	diResta	0,72	100,299
15	Wehrlein	0,773	100,444	15	Ocon	0,768	100,403
16	Rosberg	0,752	100,418	16	Hadjar	0,7	100,274
17	Nasr	0,778	100,496	17	Antonelli	0,734	100,36
18	Sutil	0,727	100,402	18	Kovalainen	0,73	100,361

Table 5.1.1 continued

O/A Rank	Driver	R rating	Q rating	2025 rank	Driver	R rating	Q rating
19	Bottas	0,718	100,386	19	Bearman	0,75	100,418
20	Albon	0,742	100,432	20	Rosberg	0,73	100,388

As Red Bull and Racing Bulls swapped drivers after the second race of the season, the four drivers affected received a coefficient of 0,25, while everyone else was given 0,33. Jack Doohan only finished 4 of the 6 races he took part in, which meant he and teammate Gasly were excluded from the 2025 rankings.

The most notable change is Alonso gaining 2 positions to end up second on the list. However, Alonso, Leclerc and Gasly were already very close on the average ratings, so this should not be an indication of any improvement on Alonso's side this season.

On the contrary, it could be argued that Alonso is losing outright qualifying speed, as he is now over 40 years old and has the most race starts in Formula 1 history. As Alonso is a very highly rated driver, making the top 4 in both rankings while Stoll does not appear in the top 50, this downfall of an all-time great should be studied carefully.

The other interesting inclusions in this top 20 are rookies Isack Hadjar, Andrea Kimi Antonelli and Oliver Bearman, who have taken different paths to be granted these positions. Hadjar has considerably outperformed Liam Lawson, Antonelli has been impressively close to well-rated George Russell and Bearman has matched Ocon.

Normally rookies take a season or two to show their full potential. However, Hadjar just finished 6th in Monaco, Antonelli took a sprint pole position in Miami and Bearman was 7th on debut for Ferrari last year, having never driven the car before that weekend and been granted only one practice sessions. This new generation of drivers looks set to climb these rankings in years to come.

In Formula 1, the whole season should always be considered to get the full picture of a driver's performance. Therefore, these changes in ratings and new inclusions are very provisional. Overall, there are not too many differences between these rankings, which is to be expected based on the low coefficient that was placed on the comparisons that were carried out with the new results.

5.2 Rookie seasons

First-year Formula 1 drivers, commonly referred to as rookies, are at an obvious disadvantage to their teammates. The support series (see Chapter 2.1) do not race at some circuits and the cars in Formula 1 are faster and more complex to operate than any junior series. In attempt to negate this effect somewhat, the model is re-run with the coefficients for every rookie and their respective teammate halved.

If both drivers in a team were rookies, they were considered on equal footing and the coefficient remained unchanged. As an exception, the coefficient of the Williams teammates in 2019, George Russell and Robert Kubica, was also retained. Russell was a rookie, but Kubica had been out of Formula 1 since the 2010 season, so their lack of recent experience was considered comparable.

Rookie drivers who only raced for half a season were excluded from the rankings, along with their respective teammates. Their coefficients of 0,25 would be insufficient for a proper assessment. The excluded drivers include Yuki Tsunoda's 2023 and 2024 teammates Liam Lawson and Nyck de Vries, as well as Franco Colapinto and Alexander Albon at Williams in 2024. For the same reason all line-ups including rookies were also removed from the 2025 data created in Chapter 5.1.

Table 5.2.1 Rating and ranking comparison with rookie season considerations

O/A Pos	Driver	R rank	Q Rank	Rookie pos	Driver	R Rank	Q Rank
1	Verstappen	0,9	100,159	1	Verstappen	0,887	100,17
2	Leclerc	0,852	100,226	2	Norris	0,824	100,182
3	Gasly	0,869	100,271	3	Alonso	0,842	100,318
4	Alonso	0,869	100,304	4	Gasly	0,831	100,301
5	Norris	0,855	100,31	5	Leclerc	0,807	100,252
6	Hamilton	0,834	100,282	6	Hamilton	0,794	100,26
7	Barrichello	0,842	100,333	7	Sainz	0,779	100,366
8	Sainz	0,824	100,338	8	Russell	0,764	100,334
9	Russell	0,794	100,33	9	Ricciardo	0,754	100,344
10	Hülkenberg	0,795	100,409	10	Kovalainen	0,727	100,317
11	Ricciardo	0,759	100,347	11	Wehrlein	0,758	100,385
12	diResta	0,743	100,327	12	Heidfeld	0,717	100,31

Table 5.2.1 continued

O/A Pos	Driver	R rank	Q Rank	Rookie pos	Driver	R Rank	Q Rank
13	Vettel	0,774	100,407	13	Vettel	0,767	100,417
14	Button	0,799	100,49	14	Hülkenberg	0,748	100,378
15	Wehrlein	0,773	100,444	15	diResta	0,708	100,32
16	Rosberg	0,752	100,418	16	Ocon	0,75	100,45
17	Nasr	0,778	100,496	17	Rosberg	0,723	100,406
18	Sutil	0,727	100,402	18	Barrichello	0,757	100,48
19	Bottas	0,718	100,386	19	Nasr	0,752	100,47
20	Albon	0,742	100,432	20	Piastri	0,705	100,428

The key difference between the two rankings is Lando Norris going up to second with the updated rookie rating system being implemented. This lessens the effect of him being beaten by Carlos Sainz as a rookie in 2019, particularly in the races as by his second season his average qualifying was ahead of Sainz and they were well-matched in the races.

Norris effectively swapped places with Charles Leclerc, who dropped to fifth in the new ranking. With Vettel and Sainz's rankings getting worse, as well as the reduce effect of Leclerc beating Ericsson in his first year, this makes sense. Sainz's rating is directly related to Norris, and with the influence of Sainz's best results against him in 2019 being reduced that would also change Leclerc's ranking.

Strangely, Heikki Kovalainen and Nick Heidfeld are up to tenth and twelfth, despite not having direct relations to rookie in the period under review. The high placings are driven by the qualifying ranking, but no good direct explanation can be found for it.

The current Formula 1 championship leader Oscar Piastri's position is much easier to explain, as the combination of Norris' improvement and the reduced effect of his tough rookie season against Lando means Piastri's rating improves. Additionally, his strong start to 2025 now has a proportion in the formation of his rating.

Barrichello's ranking moves in the opposite direction as he loses 11 positions. It can be concluded that his high position in the earlier ranking was based on him beating a rookie Hülkenberg, which now holds a smaller importance.

5.3 Comparison with the AWS model

The AWS model for ranking Formula 1 driver qualifying performance was published in 2020 and covered all seasons between 1983 and 2019. Notably, former Jordan, Ferrari and Williams engineer Rob Smedley was involved in the process.

Like the model developed in this paper, the drivers were connected through being part of the same team, as that negates the car factor. Lap times are also said to have been normalized for different circuits. Across a season, median times are used; and differences between team-mates that went over 2 seconds are removed from the ranking. The comparison between the two models can be seen in Table 5.3.1.

Table 5.3.1 Comparison with AWS model

Ranking	Driver	Time Delta	Ranking	Driver	Quali delta
1	**Senna**	0.000s	1	Verstappen	100,103
2	**Michael Schumacher**	0.114s	2	Leclerc	100,223
3	Hamilton	0.275s	3	Norris	100,262
4	Max Verstappen	0.280s	4	Alonso	100,282
5	Alonso	0.309s	5	Hamilton	100,284
6	Nico Rosberg	0.374s	6	**Russell**	100,287
7	Leclerc	0.376s	7	Sainz	100,313
8	Kovalainen	0.378s	8	Hülkenberg	100,324
9	Trulli	0.409s	9	Gasly	100,331
10	Vettel	0.435s	10	Bottas	100,353
11	**Barrichello**	0.445s	11	di Resta	100,354
12	Hulkenberg	0.456s	12	Sutil	100,378
13	Bottas	0.457s	13	Ricciardo	100,38
14	Sainz	0.457s	14	Kovalainen	100,39
15	Norris	0.459s	15	**Colapinto**	100,4
16	Ricciardo	0.461s	16	Vettel	100,411
17	Button	0.462s	17	Rosberg	100,415
18	Kubica	0.463s	18	Barrichello	100,426
			19	Wehrlein	100,457

Table 5.3.1 continued

Ranking	Driver	Time Delta	Ranking	Driver	Quali delta
			20	**Albon**	100,461
			21	Ocon	100,468
			22	Kubica	100,473
			23	Button	100,494

The drivers who were excluded or less represented in the other ranking are brought out in bold. Ayrton Senna raced in Formula 1 between 1985 and 1994 and was therefore not included in the ranking developed in this paper. The majority of Michael Schumacher and Rubens Barrichello's F1 career was in the 1990s and 2000s, but they were included in this paper's ranking off the back of taking part in a couple of the first included seasons. However, their rankings should be considered incomplete.

Beyond these differences regarding older drivers, the lists are largely similar. Every driver included in the top 18 of the AWS ranking is also present in the top 23 of this paper's ranking. When the AWS ranking was formed, Lando Norris and George Russell had only taken part in one Formula 1 season and had not yet been faced with two well-rated drivers, Daniel Ricciardo and Lewis Hamilton, that established their place within Formula 1's elite. Franco Colapinto's 15th position in my ranking is only based on his half-season alongside Alexander Albon in 2024 so before more data is gathered, his placement is tentative at best.

5.4 Comparison with the F1metrics model

The comparison between the F1metrics model, which used the best 2-year performances for each driver to rank them are seen below. As the system development was stopped after 2019, the results of this paper's model from the year beyond that have been removed. Figure 5.4.1 shows the differences.

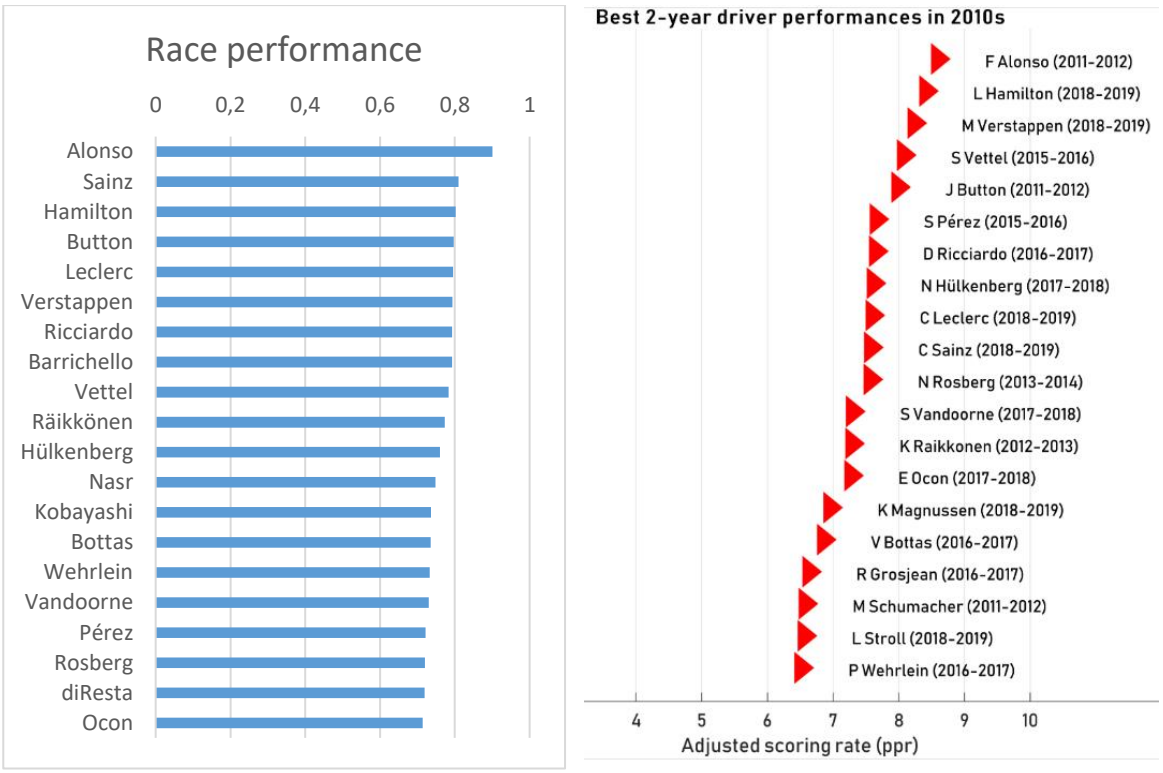

Figure 5.4.1 Top 20 comparison with F1metrics (right)

The drivers in bold did not drive for two consecutive seasons and were therefore excluded from the F1metrics model. The obtained rankings have major differences, but Fernando Alonso remains on top, standing out on top of the rankings. Lewis Hamilton, who won five of his seven championships during this period, is also high up on both rankings. Jenson Button is fourth in both rankings, as the models both consider him a decent match for Hamilton and Alonso, both of whom he faced during this period.

This paper's model continues to underrate Sebastian Vettel, which provides insight into the causes for his low position in the overall rankings. Vettel's relatively weak results against Leclerc and Stroll in the 2020s do not appear to have been the main cause for his low position in the general ranking in Chapter 5. His struggles against Ricciardo in 2014 and inability to beat Räikkönen by as much as Alonso did seem to have been the key factors instead.

Rubens Barrichello is ranked eighth by this paper's model, while he isn't included in the F1metrics list. The experience consideration made by F1metrics is the likely cause of this difference. However, rerunning the code with the rookie driver changes made in Chapter 5.2 does not change Barrichello's ranking.

Felipe Nasr is also not included on the F1metrics rankings, potentially explained by the lower rating for Charles Leclerc in their model. Nasr was only ever up against Marcus Ericsson, who was comfortably beaten by Leclerc in 2018. As Leclerc is only ninth in the f1metrics model, compared to fifth and very close to second in this paper's ranking, the exclusion of Nasr is the likely consequence of these differences.

5.5 Comparison with the F1analysis model

The author of F1-analysis has published full-grid rankings for 2008, 2014 and 2021-2024. However, their breakdown of the best drivers of each era does provide some room for comparison with the current model.

Table 5.5.1 F1-analysis top5 drivers across their defined eras

F1-analysis position	2007-2013	2014-2018	2019-2023
1	Alonso	Alonso	Verstappen
2	Hamilton	Verstappen	Leclerc
3	Vettel	Ricciardo	Norris
4	Rosberg	Vettel	Sainz
5	Button	Rosberg	Hamilton

Due to the relatively short eras defined by F1-analysis, this paper's model was not able to form definitive comparisons. For 2010-2013, Fernando Alonso, Sebastian Vettel and Kimi Räikkönen are all considered equally strong as they were undefeated by teammates during this period. Robert Kubica, Nico Rosberg and Lewis Hamilton are narrowly behind. Kubica, while unmentioned in Table 5.5.1, is considered to have been a match for Rosberg and Button before his accident ruled him out of competition at the eve of the 2011 season.

In 2014-2018, Hamilton was unbeaten, so he naturally tops the ranking. Of the drivers who competed in more than one season Alonso, Verstappen and Sainz come up next, along with Nico Hülkenberg. Daniel Ricciardo, rated as the third best by F1-analysis ends up seventh, behind everyone mentioned and Valtteri Bottas.

For the final era, Verstappen topped the ranking in this model as well, ignoring the undefeated Räikkönen and his teammate Giovinazzi. In second, this model's inexplicable confidence in Pierre Gasly shone through again. The rest of the top contingent is similar, with Leclerc coming in third, Russell fourth and Hamilton fifth. Norris is rated significantly lower as he was beaten by Sainz in race performances, the only metric used

for this ranking. However, as shown in Chapter 5.2, reducing the weight of his rookie season elevates his ranking, putting him closer to the rest.

SUMMARY

The goal of this thesis was to rank the drivers taking part in Formula 1 between 2010 and 2024. Unlike any of the previous rankings, this paper assessed drivers' race and qualifying performances. First, some background information was given to introduce the topic to an unfamiliar reader. A selection of previous rankings was also reviewed, and the shortcomings compared to the ranking that would be composed in this paper were outlined.

Before formulating the ranking, some considerations were needed. The current Formula 1 points system only awards the top 10 finishers, which could disadvantage drivers in less competitive machinery. Therefore, a new points system that would score the top 20 was devised and applied to the results for all 15 seasons under investigation. With regards to qualifying, rain-affected sessions were removed from the dataset as they tend to give an unrepresentative reading on pure driver performance.

The race ratings for each driver were calculated by dividing their total points across a season with the number of races they finished in the top 20. This mechanism allowed to account for frequent mechanical issues affecting a particular team or and mid-season changes in a team's driver line up. Drivers' qualifying performance was assessed by dividing their time by the best time achieved in the whole qualifying session.

The resulting data was processed in a Python program, which combined drivers driving for the same team at the same time into pairings. According to the premise of this thesis, the drivers driving for the same team have equal machinery, and their results relative to each other should provide a picture of their respective abilities. The drivers within the pairings would be compared in their race and qualifying performances. All drivers included in the rankings can be connected through their teammates, and that is exactly what was done to achieve the complete ranking.

Every driver who had only one teammate during the reviewed period was used as a starting driver. A shortest path algorithm was used to reach every other driver included, and the paths were used to assess every driver relative to the starter. Longer-lasting teammate connections carried more weight. Once rankings relative to all starting drivers were composed, they were combined into a final ranking.

According to the algorithm, Max Verstappen is the best driver throughout the period in both race and qualifying performances. Looking at his domination of all his teammates

after 2019, this is no surprise. Earlier in his career, he also compared well against Carlos Sainz and Daniel Ricciardo, both also present in the top 12 of the rankings. Behind Verstappen, the next tier of drivers includes Charles Leclerc, Fernando Alonso, Pierre Gasly and Lando Norris. The position of Leclerc, Alonso and Norris is logical as they are regarded as some of the best racing talents of this century and beat very highly regarded drivers during the years under review.

Gasly, who has won only one race during his career, is a more surprising inclusion. He was Verstappen's teammate during the first half of 2019 and was unable to get anywhere close to the best-rated driver in this ranking. Since then, he has never been in a front-running team again but has beaten strong drivers like Daniil Kvyat (30th), Yuki Tsunoda (41st) and Esteban Ocon (21st) by large margins.

The most successful drivers during this period, Lewis Hamilton (6th) and Sebastian Vettel (13th) are not as well-ranked as their statistics would warrant. Hamilton is not far away from the group behind Verstappen, but his status as the statistically most successful driver in the history of the sports should put him at least next to Verstappen. The author considers this assessment of Hamilton, and by extension all of his teammates, to be a slightly unfair result. The inclusion of the first three years of his career, where he beat Alonso in his first year and comprehensively outscored Heikki Kovalainen (22nd), could help elevate his position.

As for Sebastian Vettel, his position a level or two below his greatest rivals Alonso and Hamilton is understandable. Vettel was beaten by Ricciardo (11th) at Red Bull and was unable to be as far ahead of Kimi Räikkönen (25th) as Alonso had been. Some of the drivers between him and Hamilton in the ranking like Nico Hülkenberg (10th) and Paul di Resta (12th) never had an opportunity to show their class in a front-running car. Others, like Sainz (8th) and Russell (9th) have compared better against highly rated drivers.

The main improvements that could be made to this ranking would be the inclusion of every Formula 1 season going back to 1950 and creating a mathematical quantification for driver experience. The first would increase the pool of data, while enabling the assessment of driver's full careers. The obtained ranking was compared to other models, and the similarities in the results indicated the underlying logic is sound. Alongside the comparisons, an attempt was made to quantify the experience by halving the effect of first seasons in a driver's full ranking. However, a more robust assessment of the experience factor needs to be considered for a definitive ranking of F1 drivers.

KOKKUVÕTE

Selle lõputöö eesmärk oli koostada vahemikus 2010-2024 võistlenud Vormel 1 sõitjate paremusjärjestus. Erinevalt eelmistest sellistest järjestustest, hinnati nii võistlussõitude kui ka kvalifikatsioonitulemusi. Alustuseks anti veid taustainfot, et teemat väheste teadmistega lugejale tutvustada. Samuti tehti ülevaade mõnedest eelnevatest järjestustest, ja näidati, kuidas käesolev järjestus neid edasi arendab.

Enne hindamise algust tuli mõelda mõnele asjaolule. Praegune Vormel 1 puntisüsteem hindab vaid kümmet esimest lõpetajat, mis võib halvemates autodes sõitjaid negatiivselt mõjutada. Seetõttu loodi uus punktisüsteem, mis hindab esimest 20 lõpetajat, ja kasutati seda kõikide 15 vaatluse all oleva hooaja ümber hindamiseks. Kvalifikatsiooni puhul jäeti valimist välja vihmased sessioonid, sest seal saavutatud tulemused ei anna adekvaatset pilti sõitjate tõelisest võimekusest.

Iga sõitja reiting arvutati jagades nende kogu punktisumma hooaja jooksul sõitude arvuga, kus nad olid 20 esimese seas. Tänu sellele meetodile oli võimalik arvestada mingit kindlat tiimi mõjutavate sagedaste meahaaniliste probleemide ja hooajasiseste sõitjavahetustega tiimides. Sõitjate kvalifikatsiooni esitusi hinnati, jagades nende aja kogu sessiooni parima ajaga.

Saadud andmete analüüsiks kasutati Pythoni programmi, mis kombineeris sama tiimi sõitjad paaridesse. Üheks selle lõputöö eeldustest oli, et sama tiimi sõitjate käsutuses on sama hea auto, seega peaksid nende tulemused andma ülevatte kummagi sõitja võimetest. Iga paari sõitjaid võrreldi võistlussõitude ja kvalifikatsioonide tulemuste alusel. Kõik sõitjad, kes kuulusid valimisse, saab omavahel nende tiimikaaslaste kaudu ühendada, mis oligi lõpliku järjestuse aluseks.

Igast sõitjast, kellel oli uuritaval perioodil ainult üks tiimikaaslane, sai stardipunkt. Seejärel kasutati lühima tee algoritmi, et jõuda temast iga teisi sõitjani, ja neid võimalikke teid kasutati iga sõitja hindamiseks stardipunkti suhtes. Pikemat aega seotud olnud tiimikaaslaste ühendused olid hindamisel suurema kaaluga. Kui kõigi stardipunktide suhtes järjestused tehtud olid, kombineeriti nad lõplikuk paremusjärjestuseks.

Algoritmi alusel leiti, et uuritava perioodi parim sõitja oli Max Verstappen, nii võistlussõitude kui ka kvalifikatsioonide arvestuses. Vaadates, kuidas ta alates 2019.aastast oma tiimikaaslasi domineerinud on, pole see üllatus. Samuti esines ta

varasematel aastatel edukalt Carlos Sainzi ja Daniel Ricciardo vast, kes on samuti paremusjärjestuse esitosinas. Verstappeni järel moodustavad järgmise taseme Charles Leclerc, Fernando Alonso, Pierre Gasly ja Lando Norris. Leclerci, Alonso ja Norrise kõrge positsioon on loogiline, sest neid peetakse selle sajandi parimateks talentideks, samuti on nad kõik oma karjääri jooksul mitmeid väga kõrgelt hinnatud sõitjaid võitnud.

Gasly, kes on oma karjääri jooksul võitnud vaid ühe sõidu, kõrge positisoon on üllatavam. 2019.aasta esimeses pooles oli ta Verstappeni tiimikaaslane ja ei suutnud käesoleva järjestuse parimat sõitjale sõitjale ligilähedalegi jõuda. Peale seda pole ta enam võiduvõimelises tiimis võimalusi saanud, kuid ta on pika puuga edestanud häid sõitjaid nagu Daniil Kvyat (30.koht), Yuki Tsunoda (41.koht) ja Esteban Ocon (21.koht).

Lewis Hamilton (6.koht) ja Sebastian Vettel (13.koht), kõige edukamad sõitjad uuritaval perioodil, pole järjestuses nii kõrgel kui nende statistilised tulemused näitavad. Hamilton pole Verstappenile järgnevast grupist kaugel, kuid tema status statistiliselt kõige edukama Vormel 1 sõitjana ajaloos lubaks ta vähemalt Verstappeni kõrvale paigutada. Autori arvates on Hamiltoni ja seeläbi ka tema tiimikaaslaste hinnang veidi ebaaus tulemus. Hamiltoni karjääri esimese kolme aasta, kus ta võitis esimesel aastal Alonsot ja ületas tugevalt Heikki Kovalainenit (22.koht), uuritavasse perioodi kaasamine võiks tema positisiooni parndada.

Sebastian Vetteli puhul on tema madal asetus võrreldes suurte rivaalide Alonso ja Hamiltoniga mõistetav. Vettel kaotas Red Bullis Ricciardole (11.koht) ja edastas Kimi Räikköneni (25.koht) vähemaga, kui Alonso. Mõned sõitjad tema ja Hamiltoni vahel, nagu Nico Hülkenberg (10.koht) ja Paul di Resta (12.koht) ei saanud kunagi võimalust ennast võiduvõimelises autos tüestada. Teised, nagu Sainz (8.koht) ja Russell (9.koht) on kõrgelt hinnatutd sõitjatega võrreldes paremini esinenud.

Põhilised paranduskohad saadud paremusjärjestusele hõlmaksid kõikide VOrmel 1 hooaegade alates 1950.aastast valimisse kaasamist ja sõitjate kogemuste matemaaatilist kvantifitseerimist. Esimene neist suurendaks andmete hulka ja lubaks hinnata sõitjate kogu karjääri. Leitud paremusjärjestust võrreldi olemasolevate teiste mudelitega, ja leitud sarnasused näitavad, et loodud loogika peab vett. Lisaks neile võrdlustele üritati tulemuste puhul ka veidi kogemust arvesse võtta, poolitades sõitjate esimeste hooaegade mõju nende reitingule. Kuid tõelise paremusjärjestuse leidmiseks peaks kogemuse hindamiseks looma robustsema hindamisloogika.

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APPENDIX 1

Driver	Team	AUT	STY	HUN	GBR	70A	ESP	BEL	ITA	TUS	RUS	EIF	POR	EMI	TUR	BHR	SKH	ABU	Overall	Races	Points/race
Lewis Hamilton	Mercedes	30	50	50	50	40	50	50	19	50	35	50	50	50	50	50		35	709	16	44,31
Valtteri Bottas	Mercedes	50	40	35	10	35	35	40	26	40	50		40	40	7	16	16	40	520	16	32,5
Max Verstappen	Red Bull		35	40	40	50	40	35			40	40	35		22	40		50	467	12	38,92
Daniel Ricciardo	Renault		16	16	30	7	10	30	22	30	26	35	14	35	12	19	26	19	347	16	21,69
Sergio Pérez	Racing Point	22	22	19			26	12	12	26	30	30	19	22	40	3	50		333	14	23,79
Alexander Albon	Red Bull	8	30	26	16	26	16	22	6	35	12		9	6	19	35	22	30	318	16	19,88
Lando Norris	McLaren	35	26	8	26	14	12	19	30	22	6		8	16	16	30	12	26	306	16	19,13
Carlos Sainz Jr.	McLaren	26	14	14	8	8	22		40			26	22	19	26	26	30	22	303	14	21,64
Charles Leclerc	Ferrari	40		10	35	30		7		16	22	19	30	26	30	12		8	285	13	21,92
Pierre Gasly	AlphaTauri	19	6		19	10	14	16	50		14	22	26		8	22	10	16	252	14	18
Lance Stroll	Racing Point		19	30	14	22	30	14	35					8	14		35	12	233	11	21,18
Esteban Ocon	Renault	16		7	22	16	8	26	16		19		16		10	14	40	14	224	13	17,23
Daniil Kvyat	AlphaTauri	9	12	9		12	9	10	14	19	16	6	2	30	9	10	19	10	196	16	12,25
Sebastian Vettel	Ferrari	12		22	12	9	19	8		12	8	10	12	9	35	8	9	7	192	15	12,8
Kimi Räikkönen	Sauber		10	6	4	6	7	9	8	14	7	9	10	14	6	6	7	9	132	16	8,25
Antonio Giovinazzi	Sauber	14	7	4	7	4	5		5		10	12	6	12		5	8	5	104	14	7,43
George Russell	Williams		5	3	9	3	4		7	10	3		7		5	9	14	6	85	13	6,54
Romain Grosjean	Haas		8	5	5	5	2	6	9	9	4	14	4	7					78	12	6,5
Nicholas Latifi	Williams	10	4	2	6	2	3	5	10		5	7	3	10		7		4	78	14	5,57
Kevin Magnussen	Haas		9	12			6	4			9	8	5		4	4	6	3	70	11	6,36

Appendix 2

		Austria	Hungary	Great B	F1 70	Spain	Belgium	Monza	Mugello	Russia	Germany	Portugal	Imola	Bahrain	Sakhir	AbuDhabi	Median
	Fastest	62,939	73,447	84,303	85,154	75,584	101,252	78,887	75,144	91,304	85,269	76,652	73,609	87,264	53,377	95,246	
Hamilton	Mercedes	100,019	100	100	100,074	100	100	100	100	100	100,142	100,243	100,132	100		100,09	100
Bottas	Mercedes	100	100,146	100,371	100	100,078	100,505	100,082	100,079	100,714	100	100	100	100,331	100	100,026	100,078
Verstappen	Red Bull	100,855	101,909	101,212	101,2	100,937	100,519	101,132	100,435	100,617	100,233	100,539	100,77	100,474	100,105	100	100,617
Albon	Red Bull	101,282	103,088	102,505	101,747	101,912	100,929	101,492	101,025	101,866	100,912	101,233	101,308	101,157	101,216	100,341	101,282
Ricciardo	Renault	101,722	103,014	102,024	101,342	102,135	100,799	101,238	101,463	101,001	100,97	101,324	101,238	101,321	100,925	101,218	101,321
Ocon	Renault	102,707	103,093	102,261	102,181	102,624	101,13	101,708	101,534	101,446	101,141	101,498	102,163	101,324	101,158	101,169	101,534
Norris	McLaren	101,092	102,068	101,754	101,907	101,985	101,388	101,183	101,991	101,69	101,228	101,115	101,637	101,465	101,531	100,264	101,531
Sainz	McLaren	101,64	102,151	101,971	102,265	101,709	101,171	101,024	101,834	101,365	101,281	100,935	101,769	101,961	100,826	100,597	101,64
Leclerc	Ferrari	101,563	101,865	101,333	101,715	101,811	101,612	101,757	101,498	102,119	100,898	100,814	101,368	102,178	100,442	100,72	101,563
Vettel	Ferrari	101,892	101,807	102,415	102,259	102,096	101,874	102,87	102,281	102,525	101,723	101,896	102,413	102,16	101,495	101,454	102,096
Gasly	AlphaTauri	102,196	102,806	102,266	101,608	101,609	101,364	101,296	102,636	101,858	101,769	100,969	101,213	101,357	101,057	101,046	101,608
Kvyat	AlphaTauri	102,371	103,754	102,741	103,215	102,127	101,349	101,625	102,276	102,13	101,852	101,646	101,477	101,552	100,897	100,753	101,852
Räikkönen	Alfa Romeo	103,662	104,312	103,05	103,921	102,384	102,35	102,629	102,276	104,351	102,988	102,277	103,184	102,918	100,049	102,424	102,918
Giovinazzi	Alfa Romeo	103,553	103,756	102,81	103,851	104,251	102,554	102,94	102,763	103,603	101,955	102,436	103,531	102,552	101,873	101,92	102,81
Russell	Williams	103,54	102,911	102,727	102,702	103,327	102,078	103,423	102,779	102,496	102,691	101,725	102,329	102,326		102,939	102,715
Latifi	Williams	104,446	103,619	103,452	103,847	104,033	102,74	103,587	102,896	104,131	102,982	103,028	103,231	103,344	102,658	103,357	103,357
Perez	Racing Point	101,463	101,495			101,188	101,264	101,053	101,553	101,109	101,244	100,865	101,973	101,212	100,768	101,374	101,244
Stroll	Racing Point	101,614	101,266	101,822	101,496	101,33	101,224	101,315	101,5	102,256		101,513	102,561	102,628	100,867	100,84	101,498
Magnussen	Haas	103,535	103,683	102,803	103,619	103,075	102,914	102,512	102,933	103,699	102,028	102,677	103,165	103,263	102,488	102,719	102,933
Grosjean	Haas	102,625	103,758	103,378	102,466	103,314	102,443	102,855	102,562	103,601	102,689	102,489	103,137	103,293			102,855

Appendix 3

Driver	Team	Avg finish	Coef
Max Verstappen	Red Bull	41	1
Lando Norris	McLaren	35,08	1
Charles Leclerc	Ferrari	35,57	1
Oscar Piastri	McLaren	30,17	1
Carlos Sainz	Ferrari	32,43	1
George Russell	Mercedes	27,73	1
Lewis Hamilton	Mercedes	26,59	1
Sergio Pérez	Red Bull	21,55	1
Fernando Alonso	Aston Martin	13,78	1
Nico Hülkenberg	Haas	12,29	1
Pierre Gasly	Alpine	11,8	1
Yuki Tsunoda	Racing Bulls1	9,56	0,75
Yuki Tsunoda	Racing Bulls2	11,4	0,25
Lance Stroll	Aston Martin	9,38	1
Esteban Ocon	Alpine	9	1
Kevin Magnussen	Haas	8,71	1
Alexander Albon	Williams1	8,17	0,5
Alexander Albon	Williams2	10,8	0,25
Daniel Ricciardo	Racing Bulls1	9,25	0,75
Zhou Guanyu	Sauber	5,91	1
Valtteri Bottas	Sauber	5,45	1
Franco Colapinto	Williams2	10,5	0,5
Logan Sargeant	Williams1	4,33	0,5
Liam Lawson	Racing Bulls2	8,17	0,25

Appendix 4

```
import pandas as pd

from collections import deque, defaultdict

xls = pd.ExcelFile(r'C:\Users\Erik\Documents\Thesis\codedataraces.xlsx')



# function pair_finder

# arguments: size, array

# size is the number of keys in each array

# array is a table of F1 drivers, with each of them having a team, average points score,

# and coefficient showing how much of the season they participated in.



# pair_finder looks for drivers who were in the same team,

# and finds the fraction of points the less successful driver scored.

# The driver pairings are then made into keys for a dictionary,

# with the corresponding values being the fraction of points and the coefficient of said pairing.



i = 0

def pair_finder(size, array):

    dc = {}

    for i in range(size):

        for j in range (i+1, size):

            if array['Team'][i] == array['Team'][j]:

                _, lname1 = array['Driver'][i].split()
```

```
            _, lname2 = array['Driver'][j].split()
            pair = lname1 + "-" + lname2
            gap = round(array['Avg finish'][j]/array['Avg finish'][i], 3)
            coef = array['Coef'][i]
            dc[pair] = {}
            dc[pair]['Gap'] = gap
            dc[pair]['Coef'] = coef
    return dc
# function k_shortest_ paths
# arguments: connections, start, k
# connections is a dictionary with all drivers as keys and all their teammates as items
# start is the current chose starting driver
# k is the maximum number of connections that will be found

# The function moves through the connections dictionary to determine every way to get from a given
# starting driver to any other driver. The 2000 shortest paths are returned.

def k_shortest_paths(connections, start, k):
    queue = deque([[start]])
    paths = defaultdict(list)

    while queue:
        path = queue.popleft()
```

```
        node = path[-1]
        if len(paths[node]) >= k:
            continue
        paths[node].append(path)
        for neighbor, _ in connections[node]:
            if neighbor not in path:
                queue.append(path + [neighbor])
    return paths


# function gap_finder
# arguments: driver_1, driver_2, pairs
# driver_1 and driver_2 are any given drivers present in the investigated data
# pairs is a dictionary of all driver pairings as keys and their gaps and coefficients as items


# The function combines the two drivers into a pairing and finds their relevant data from the pairs dictionary.
# As that dictionary is alfabetically sorted, the gap may be inverted if the drivers were given in the other order.


def gap_finder(driver_1, driver_2, pairs):
    for pairing in pairs:
        driver1, driver2 = pairing.split('-')
        if driver1 == driver_1 and driver2 == driver_2:
```

```
            return pairs[pairing]['Gap'], pairs[pairing]['Coef']
        elif driver1 == driver_2 and driver2 == driver_1:
            return (1 / pairs[pairing]['Gap']), pairs[pairing]['Coef']


#region reading in the data and creating dictionaries for each season
df10 = pd.read_excel(xls, '2010')
df11 = pd.read_excel(xls, '2011')
df12 = pd.read_excel(xls, '2012')
df13 = pd.read_excel(xls, '2013')
df14 = pd.read_excel(xls, '2014')
df15 = pd.read_excel(xls, '2015')
df16 = pd.read_excel(xls, '2016')
df17 = pd.read_excel(xls, '2017')
df18 = pd.read_excel(xls, '2018')
df19 = pd.read_excel(xls, '2019')
df20 = pd.read_excel(xls, '2020')
df21 = pd.read_excel(xls, '2021')
df22 = pd.read_excel(xls, '2022')
df23 = pd.read_excel(xls, '2023')
df24 = pd.read_excel(xls, '2024')
list_pairs = []
dc10 = pair_finder(len(df10), df10)
list_pairs.append(dc10)
```

```
dc11 = pair_finder(len(df11), df11)

list_pairs.append(dc11)

dc12 = pair_finder(len(df12), df12)

list_pairs.append(dc12)

dc13 = pair_finder(len(df13), df13)

list_pairs.append(dc13)

dc14 = pair_finder(len(df14), df14)

list_pairs.append(dc14)

dc15 = pair_finder(len(df15), df15)

list_pairs.append(dc15)

dc16 = pair_finder(len(df16), df16)

list_pairs.append(dc16)

dc17 = pair_finder(len(df17), df17)

list_pairs.append(dc17)

dc18 = pair_finder(len(df18), df18)

list_pairs.append(dc18)

dc19 = pair_finder(len(df19), df19)

list_pairs.append(dc19)

dc20 = pair_finder(len(df20), df20)

list_pairs.append(dc20)

dc21 = pair_finder(len(df21), df21)

list_pairs.append(dc21)

dc22 = pair_finder(len(df22), df22)
```

```
list_pairs.append(dc22)

dc23 = pair_finder(len(df23), df23)

list_pairs.append(dc23)

dc24 = pair_finder(len(df24), df24)

list_pairs.append(dc24)

#endregion

pairs = {}


#Loop to combine the 15 seasons of team-mate pairings into one dictionary, with calculated total gaps and corresponding coefficients.

for season in list_pairs:

    for pairing in season:

        driver1, driver2 = pairing.split('-')

        sorted_pair = '-'.join(sorted([driver1, driver2]))

        gap = float(season[pairing]['Gap'])

        coef = float(season[pairing]['Coef'])

        if sorted_pair != pairing:

            gap = 1 / gap

        if sorted_pair in pairs:

            pairs[sorted_pair]['Gap'] = round((pairs[sorted_pair]['Gap'] * pairs[sorted_pair]['Coef'] + (gap * coef)) / (coef + pairs[sorted_pair]['Coef']), 3)

            pairs[sorted_pair]['Coef'] = pairs[sorted_pair]['Coef'] + coef

        else:

            pairs[sorted_pair] = {}
```

```
            pairs[sorted_pair]['Gap'] = round(gap, 3)
            pairs[sorted_pair]['Coef'] = coef
        pairs[sorted_pair]['Length'] = 1

#find all the connections each driver has and the corresponding coefficients
connections = defaultdict(list)
for pairing in pairs:
    driver1, driver2 = pairing.split("-")
    coef = pairs[pairing]['Coef']
    connections[driver1].append((driver2, coef))
    connections[driver2].append((driver1, coef))
starters = {}
for driver in connections:
    if len(connections[driver]) == 1:
        starters[driver] = {}
        starters[driver]['Teammate'] = connections[driver][0]

#define starting points of the ranking, should be drivers with only one connection.
print(starters)
ranking = {}
for starter in starters:
    teammate = starters[starter]['Teammate'][0]
    paths = k_shortest_paths(connections, starter, 2000)
```

```
    ranks = {}
    for driver in paths:
        ranks[driver] = {}
        for path in paths[driver]:
            if len(path) > 1:
                for i in range(len(path) - 1):
                    if i == 0:
                        gap, coef = gap_finder(path[i], path[i + 1], pairs)
                    else:
                        n_gap, n_coef = gap_finder(path[i], path[i + 1], pairs)
                        gap = (gap * coef + n_gap * n_coef) / (coef + n_coef)
                        coef = (coef + n_coef) / 2
                if coef < 1 and driver != 'Colapinto':
                    continue
                if ranks[driver] == {}:
                    ranks[driver]['Gap'] = round(gap, 3)
                    ranks[driver]['Coef'] = coef
                else:
                    ranks[driver]['Gap'] = round((gap * coef + ranks[driver]['Gap'] * ranks[driver]['Coef']) / (coef + ranks[driver]['Coef']),3)
                    ranks[driver]['Coef'] = round((coef + ranks[driver]['Coef']) / 2, 3)
            else:
                gap, coef = gap_finder(starter, teammate, pairs)
                ranks[driver]['Gap'] = 1
```

```
                ranks[driver]['Coef'] = coef
    speed = 0
    to_delete = []
    for driver in list(ranks):
        if 'Gap' in ranks[driver]:
            if float(ranks[driver]['Gap']) > speed:
                speed = ranks[driver]['Gap']
        else:
            to_delete.append(driver)
    for driver in to_delete:
        del ranks[driver]
    ranking[starter] = {}
    for driver in ranks:
        ranking[starter][driver] = {}
        ranking[starter][driver]['Gap'] = round(ranks[driver]['Gap'] / speed, 3)
        ranking[starter][driver]['Coef'] = ranks[driver]['Coef']
gaps = {}


#combine the rankings
for starter in ranking:
    for driver in ranking[starter]:
        if driver not in gaps:
            gaps[driver] = {}
```

```
            gaps[driver]['Gaps'] = []
            gaps[driver]['Coefs'] = []
        gaps[driver]['Gaps'].append(ranking[starter][driver]['Gap'])
        gaps[driver]['Coefs'].append(ranking[starter][driver]['Coef'])
final_ranking = {}
for driver in gaps:
    total_gap = 0
    sum_coefs = 0
    for i in range(len(gaps[driver]['Gaps'])):
        total_gap += gaps[driver]['Gaps'][i] * gaps[driver]['Coefs'][i]
        sum_coefs += gaps[driver]['Coefs'][i]
    final_ranking[driver] = {}
    final_ranking[driver] = round(total_gap / sum_coefs, 3)
print(final_ranking)
```

Appendix 5

O/A Rank	Driver	Q Rank	R Rank	Race performance	MMR	Quali delta	MMQ	Average
1	Verstappen	1	1	0,9	1	100,159	1	1
2	Leclerc	2	5	0,852	0,867	100,226	0,902	0,8845
3	Gasly	3	2	0,869	0,914	100,271	0,836	0,875
4	Alonso	5	3	0,869	0,914	100,304	0,787	0,8505
5	Norris	6	4	0,855	0,875	100,31	0,778	0,8265
6	Hamilton	4	7	0,834	0,817	100,282	0,819	0,818
7	Barrichello	9	6	0,842	0,839	100,333	0,744	0,7915
8	Sainz	10	8	0,824	0,789	100,338	0,737	0,763
9	Russell	8	11	0,794	0,706	100,33	0,749	0,7275
10	Hülkenberg	16	10	0,795	0,709	100,409	0,633	0,671
11	Ricciardo	11	17	0,759	0,609	100,347	0,724	0,6665
12	diResta	7	21	0,743	0,565	100,327	0,753	0,659
13	Vettel	15	13	0,774	0,651	100,407	0,636	0,6435
14	Button	26	9	0,799	0,72	100,49	0,514	0,617
15	Wehrlein	20	15	0,773	0,648	100,444	0,581	0,6145
16	Rosberg	17	19	0,752	0,59	100,418	0,62	0,605
17	Nasr	29	12	0,778	0,662	100,496	0,505	0,5835
18	Sutil	14	30	0,727	0,521	100,402	0,643	0,582
19	Bottas	12	33	0,718	0,496	100,386	0,667	0,5815
20	Albon	19	22	0,742	0,562	100,432	0,599	0,5805
21	Ocon	31	16	0,772	0,645	100,499	0,501	0,573
22	Kovalainen	13	35	0,709	0,471	100,396	0,652	0,5615
23	Kobayashi	24	20	0,749	0,582	100,481	0,527	0,5545
24	Kubica	25	25	0,74	0,557	100,488	0,517	0,537
25	Räikkönen	38	14	0,774	0,651	100,552	0,423	0,537
26	Colapinto	28	23	0,742	0,562	100,493	0,51	0,536
27	Magnussen	23	28	0,731	0,532	100,48	0,529	0,5305
28	Pérez	33	24	0,742	0,562	100,501	0,498	0,53
29	MickSchumacher	21	38	0,705	0,46	100,461	0,557	0,5085
30	Kvyat	30	31	0,721	0,504	100,498	0,502	0,503
31	Hartley	34	32	0,719	0,499	100,51	0,485	0,492
32	Giovinazzi	18	48	0,67	0,363	100,422	0,614	0,4885
33	Grosjean	27	37	0,706	0,463	100,492	0,511	0,487
34	Piastri	35	36	0,707	0,465	100,518	0,473	0,469
35	Vandoorne	39	29	0,729	0,526	100,562	0,408	0,467
36	Trulli	22	50	0,667	0,355	100,473	0,539	0,447
37	Ericsson	43	26	0,738	0,551	100,608	0,341	0,446
38	Vergne	49	18	0,759	0,609	100,652	0,276	0,4425
39	Maldonado	36	40	0,697	0,438	100,542	0,438	0,438
40	Gutiérrez	32	51	0,658	0,33	100,5	0,499	0,4145
41	Tsunoda	41	39	0,702	0,452	100,607	0,342	0,397
42	delaRosa	44	41	0,697	0,438	100,615	0,33	0,384
43	MichaelSchumacher	45	42	0,695	0,432	100,636	0,3	0,366
44	Zhou	47	43	0,692	0,424	100,638	0,297	0,3605
45	Massa	37	53	0,64	0,28	100,542	0,438	0,359
46	Sirotkin	42	49	0,668	0,357	100,607	0,342	0,3495
47	Lawson	46	46	0,683	0,399	100,637	0,298	0,3485
48	Liuzzi	53	27	0,732	0,535	100,758	0,12	0,3275
49	Stroll	50	44	0,692	0,424	100,693	0,216	0,32
50	Webber	40	55	0,636	0,269	100,597	0,357	0,313
51	deVries	48	52	0,642	0,285	100,641	0,292	0,2885
52	Palmer	55	34	0,713	0,482	100,779	0,09	0,286
53	Heidfeld	52	45	0,688	0,413	100,757	0,122	0,2675
54	Senna	56	47	0,675	0,377	100,784	0,082	0,2295
55	Latifi	51	56	0,634	0,263	100,733	0,157	0,21
56	Mazepin	54	57	0,625	0,238	100,775	0,095	0,1665
57	Petrov	57	54	0,64	0,28	100,807	0,048	0,164
58	Karthikeyan	58	58	0,611	0,199	100,81	0,044	0,1215
59	Sargeant	59	59	0,539	0	100,84	0	0