

Digital & Deep Tech Apr 13, 2019

How Machine Learning Transformed the Porsche 919 Hybrid Evo

The history of Porsche Endurance Racing is one of the most exciting and successful and probably unparalleled by any. During the decades, legends like 917, 956, 911 GT1 collected victories on racetracks around the world. Among those, surely, the 24-hours of Le Mans is the absolute pinnacle. No other brand managed to collect as many overall victories as Porsche in this race.



In 2012, the return of the Porsche Factory Team to the top LMP1 class was officially announced. This is how the Porsche 919 Hybrid was born. In 2014 was the first season, when the 919 took part in the FIA World Endurance Championship racing series and Porsche managed to achieve the overall 3rd place in its first season.

During the next 3 seasons 2015, 2016 and 2017 the Porsche 919 Hybrid dominated the racing series and managed to achieve the hat-trick both in terms of victories in 24-hours of Le Mans as well as overall series victory. All summed up, the 6 Championship titles and 3 overall victories in Le Mans in 4 seasons made the Porsche 919 Hybrid a legend.

Even if the season 2017 was the last one for the 919 Hybrid, the so-called 919 Tribute tour was planned for the year 2018 — as a farewell to the legend. For this purpose, the 919 Hybrid was freed from the limitations given by the regulations of the WEC racing series. This led to the 919 Hybrid Evo with even more engine power, more aerodynamic performance, etc



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Therefore, also at this stage, optimization algorithms have to be used. Here again, we used the algorithms, that mimic the evolution process of the organisms in the nature and lead to the “fittest” one. Thanks to this, the optimum could be found only by analyzing hundreds to a few thousands of designs.

The hundreds to thousands are already a relatively reasonable range, which can be simulated with the computational fluid dynamics (CFD) tools and with the use of high performance computing (HPC) resources available. Therefore, with the use of Machine learning for the airfoil description, Genetic algorithms for the optimization and computational fluid dynamic for the simulation on a HPC cluster, the optimal shape of the rear wing for the 919 Evo was found. Using conventional methods, billions of different shapes would have to be analyzed and even the best of these billions still would not reach the quality of the one, which was obtained by our implemented method.



Battery cell of the Porsche 919 Hybrid

In case of the 919 Evo, the best design obtained from the optimization was only tested as the single one wing geometry in the wind tunnel to confirm the results from the simulations. Therefore, one could say: our wing made the way from our optimization process directly to the race track.

In 2018, the Porsche 919 Hybrid Evo went to some of the most famous classic racetracks around the world and managed to achieve

astonishing records: 1:41.770min in Spa, being faster than the that-time F1 fastest lap and the all-time-record on the Nurburgring Nordschleife of 5:19.55 min, being almost a minute faster than the 35 years old record of Stefan Bellof. All this once again confirmed the 919 to be a unique car and a true follower of the 917, 956, 911 GT1 and other legendary cars.

Info

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