Neural Concept is a Swiss-based company that offers the first-ever deep learning-based software solution dedicated to Computer Aided Engineering and Design. It speeds up R&D cycles, enhances product performance, and reduces simulation costs. Neural Concept Shape (NCS) is a unique Deep Learning based-software for enhanced engineering. It leverages on industrial CAE data to efficiently assist engineers during the product design stage.

NCS’s engine cuts simulation times to milliseconds. Therefore, it can be used as complements to the traditional numerical simulation and experimental methods so as to alleviate the need for actual simulations or to avoid iterations between design, simulation and measurement teams. This dramatically accelerates and reduces the cost of the design process. NCS’s algorithms can also learn to generate new geometries that engineers may not have previously considered, allowing to reach unprecedented levels of performance and providing an intuitive approach to product design.

The company is active in many different industries such as aerospace, automotive, energy, marine or civil engineering, working with industry leaders across the globe, such as Airbus, Safran or Bosch. Neural Concept has now worked on more than 50 industrial projects, to design high-end product, and beat world records.

Neural Concept helps companies being better in various industries:

- Aerospace
- Automotive
- Civil Engineering
- Marine
- Energy
- Additive manufacturing
- Hardware design
Using Neural Concept Shape's surrogate model, Airbus was able to reduce the average time it takes to predict the pressure field on the external body of airplanes from one hour to 30 ms, i.e. over 3 orders of magnitude speed-up.

A customized application was delivered at the end of this first project.

Sharpness of results: NCS was able to reliably predict non-linear flow such as shock waves and the overall error range was within the range of the full-fledged numerical solver with a $R^2$ accuracy of 0.99.

The process will make it possible to take into account aerodynamics performance during the optimization of the structure of the wing and avoid lengthy iterations between teams. NCS has been tested and approved by Airbus' engineers and we are now collaborating to accelerate the engineering process and to generate new design solutions across many kinds of design problems in areas such as fluid dynamics, structural engineering, and electromagnetics.

**Figure 1:** Pressure distribution over an airfoil, comparison between NCS (red) and the simulation (blue). Note that the engineers can also vary the Mach number and the angle of attack.

**Figure 2:** NCS is reaching very high level of accuracy, with a $R^2$ of 0.993.
# Neural Concept

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