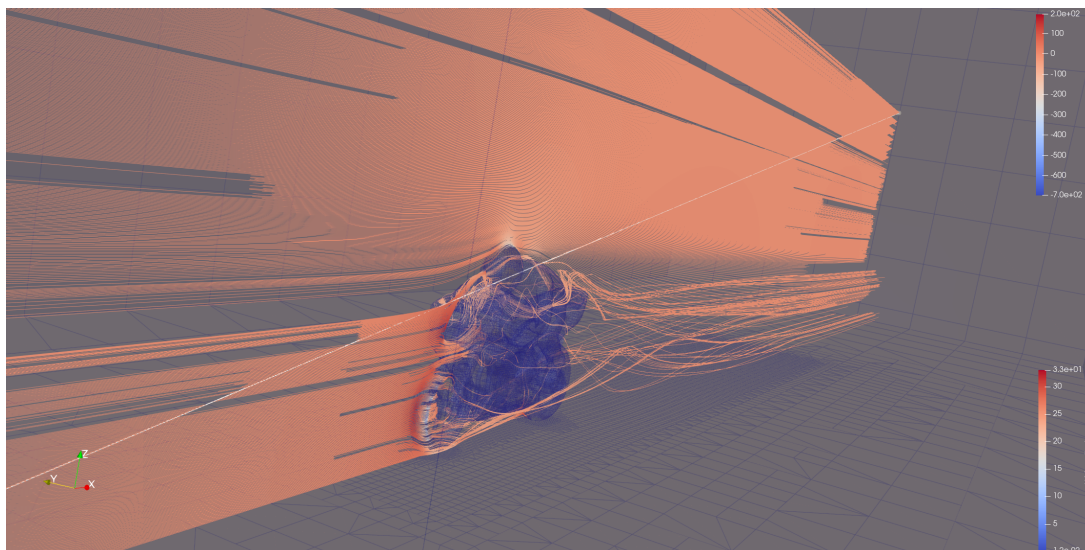


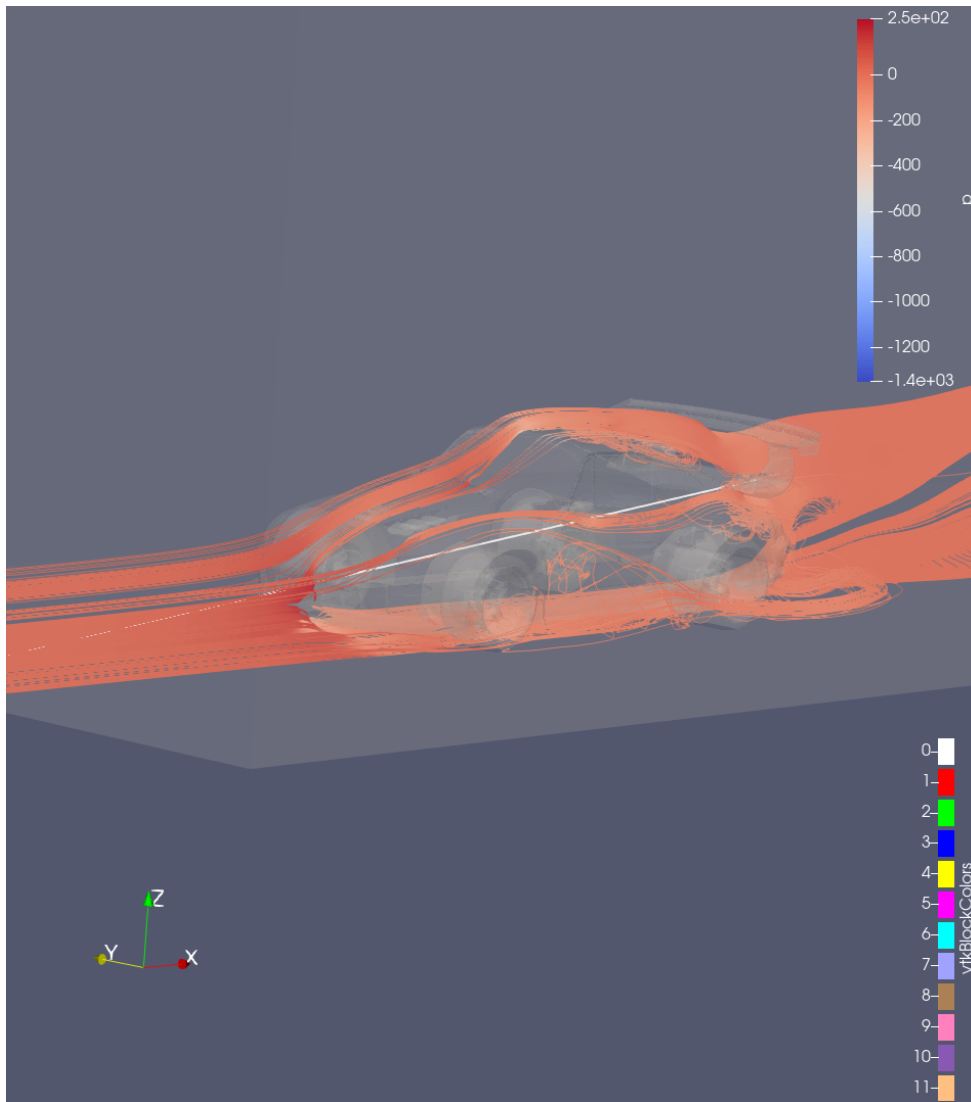
Hello Nathan, Dennis, and Chris

Please find our responses inline.

- *“First, we’re going to take some CAD models of cars and learn to simulate simple fluid flows with OpenFOAM.”*
  - Are there any pre-existing flow simulation datasets that you can try? Creating a flow simulation of a car could be an entire project in and of itself, and I’m worried that you’ll spend too much time trying to get OpenFOAM to do what you want. Not only could using at least some pre-existing data save you time, a pre-existing dataset might be a lot less trivial than what you can do on your own machine, and therefore more interesting/valuable to look at.

We’ve already managed to produce useful results from OpenFOAM for their tutorial dataset and a dataset of our own creation using a Porsche 911. See attached images for their outputs visualized in paraview. We believe it should be only a small step from here to visualize the F1 cars that we found from thingiverse. See our update for the links to the models.





- One possible dataset to look at would be the “Research Vessel Tangaroa” from here: <https://cgl.ethz.ch/research/visualization/data.php>

We’d prefer to generate our own dataset, but if we’re looking to test out some visualization techniques on a different dataset, we can try this.

- *“We would also like to explore the aerodynamic characteristics of different car types/models. For example visualizing the widely debated aerodynamics of modern F1 cars and comparing them to older F1 cars would be interesting.”*
  - Can you be more specific about which aerodynamic characteristics you have in mind/what you will be looking for? E.g. why are the aerodynamics of modern F1 cars widely debated? What, exactly, is being debated? How do you intend to figure out who is correct?

The debate around modern f1 cars aerodynamics is in regard to the turbulent flow produced behind the cars. This turbulent flow means that cars driving behind other cars can experience a decrease in downforce of up to 50%. This decrease in downforce makes passing extremely difficult thus making the sport less interesting to watch. It would be interesting to see how the turbulence of the air coming off of the cars has changed over the

years and if the concerns are valid. We found a model of Ayrton's Senna 1991 World Championship winning car and modern f1 cars (Ferrari, Redbull 2018). We hope to perform an analysis and comparison between Senna's car with the 2018 Ferrari (driven by world championship winner Sebastian Vettel) to determine whether Senna was an amazing driver given the car he had.

- You should at least brainstorm which visualization techniques you want to use, and why

We'll try to use some standard fluid flow visualizations such as stream lines, pressure visualization on the 3d surfaces, and volume rendering to show air velocity at certain points along the cars. These are our preliminary ideas, but we'll have a better idea of what's possible once we get going.

Best,

Pranav, Jacob, Jack