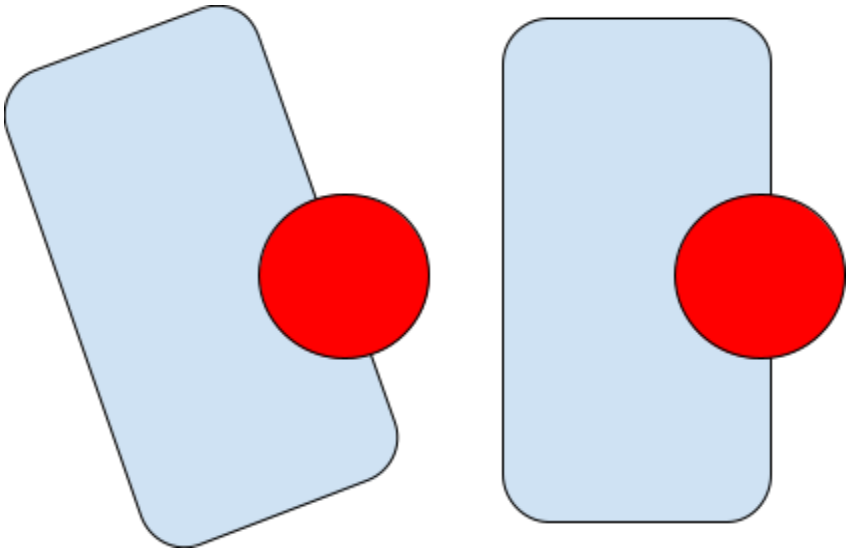
Long Short Term Memory (LSTMs) networks are an improvement over the traditional Recurrent neural networks (RNNs). The important difference is the introduction of 3 “gates”, namely, forget gate, input gate and output gate which decide how much data to remember, what is the new cell state and what is the new hidden state/ output respectively. The introduction of these gates regulates the flow of data through the network, instead of infinitely long recurrence as found in the conventional RNNs. Thus, it helps by alleviating the issues of exploding and vanishing gradient as it is the major drawback limiting the length of sequence that can be processed per session.

Considering this, the advantages of LSTM and its use cases in the field of autonomous vehicles becomes vibrant. It is used for handling sequential data, so any data with temporal aspect is best handled using LSTM. One of the best example case scenario is avoiding obstacles, if a non temporal network as feed forward network is used the algorithm only processes what information it received in the current time step, completely ignoring the history, leading to possible collisions as depicted below



Blue- vehicle,**Red-** Obstacle

The LSTM **(Left)** would use the knowledge from history to avoid the obstacle and drive at an angle and correct its course, but a non-temporal algorithm **(right)** would only focus on the current data, and unless there's a camera with view of the obstacle, it would drive right on and possibly colloid. The above example is extremely simplified for understanding. But this is a scalable issue for real world Motion Planning for autonomous vehicles. Integration of the LSTM framework into computer vision using Convolutional-LSTM networks is thus the best suited option to tackle the problem of motion planning for proper temporal and spatial recognition. Another option is to use GRUs or Gated Recurrent Units, which are a slightly depreciated version of LSTMs, with only 2 gates, for a boosted computational efficiency and expenses with minimal compromise towards the network performance.

Reference:

Deep Learning Based Motion Planning For Autonomous Vehicle Using Spatiotemporal LSTM Network (https://arxiv.org/abs/1903.01712v1)