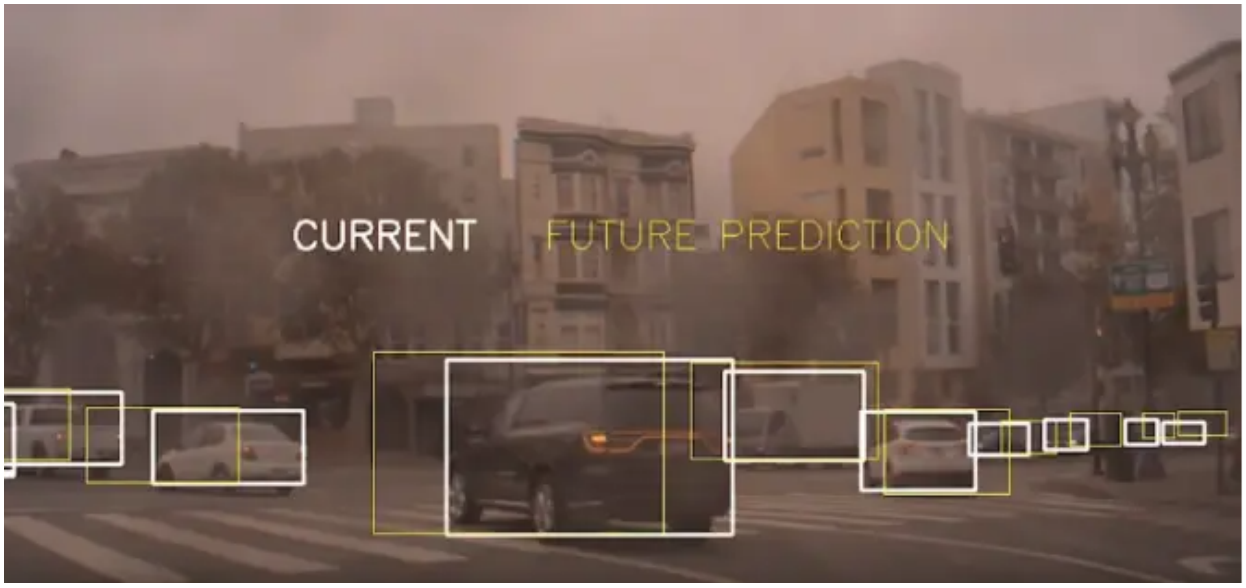
How recurrent neural networks like LSTM and GRU based models can be utilized in autonomous vehicles

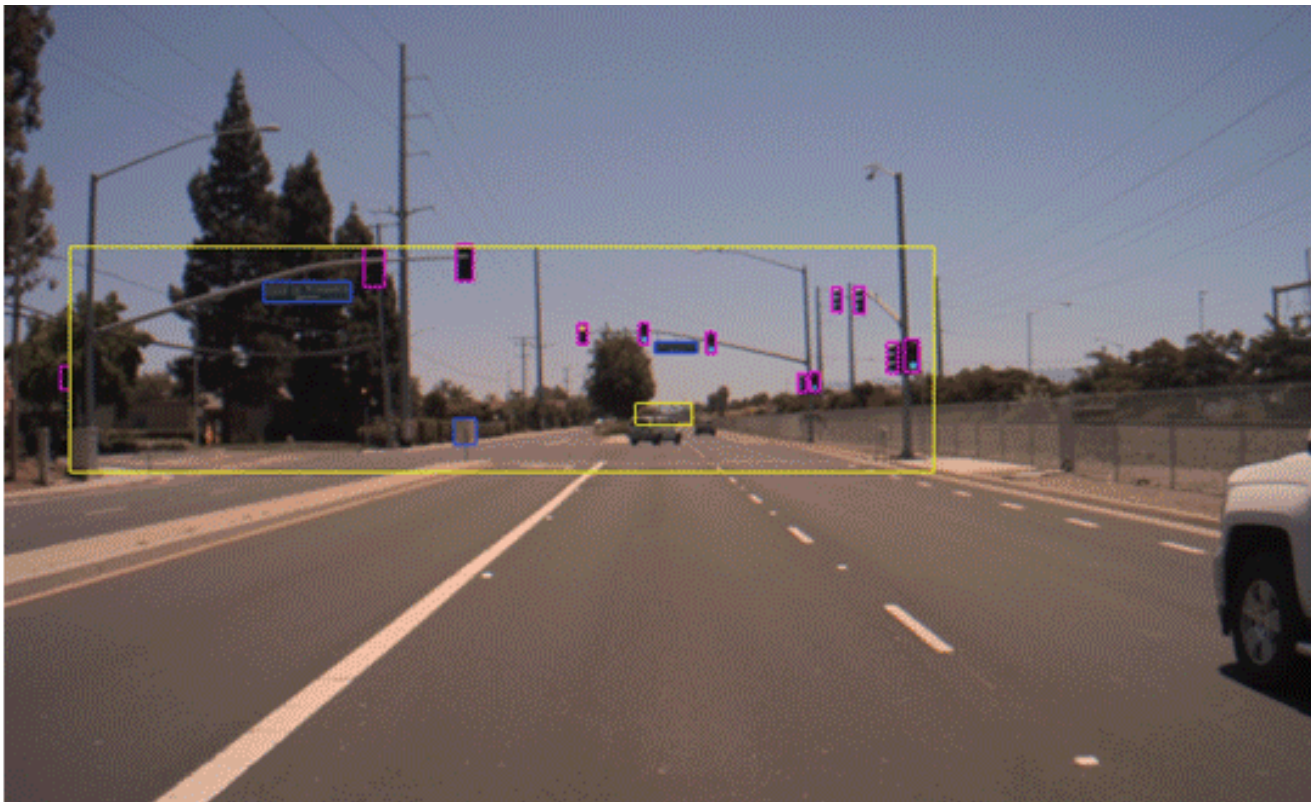
Convolutional Neural Networks or CNN's basically use the information of images and process it, frame by frame. However, Recurrent Neural Networks work differently. They process the information over time series data and keep a track of the previous information learned, through memory. In the case of autonomous vehicles, RNN's are used to learn from the videos and interpret them as sequences of images to predict future estimations. RNN's like LSTM and GRU can be used in the following ways for autonomous vehicles:

1. **To find the future positions and motion of the objects on the road**



For autonomous vehicles, the computer should be trained to predict various aspects on the road like movements of other vehicles, movements of pedestrians, objects on the road like traffic lights so that the decision for the next step could be taken in much less time to avoid collisions or any other kind of mishappenings. To do this RNN's could be trained on the data generated through radar or lidar sensors instead of camera images, which measure object velocity. This information can be further used to analyze cross-sensor fusion to form an automated data pipeline for training purposes The output from RNN could be given in the form of TTC i.e. "time to collision" so that computer can efficiently decide to adjust the speed and direction in sufficient time.

2. **Intersection detection for traffic lights or toll booths**



The task refers to the understanding of the total picture of traffic light crossings or toll barriers instead of just detecting the objects individually and perceiving them as a single identity. We would want our computer to understand the scene as a whole and classify it accordingly so that the vehicle can stop, wait and proceed accurately. This could again be done using RNN's only because all the video data taken as a time sequence of images could be processed as a whole and using the memory, the intersection of the whole scene could be analyzed by the deep neural network.