# Neuroscience of Athletes

Framing the question:

1. This study tries to establish skill development and motor control in athletes in athletes. Athletes tend to make predictive decisions instead of reactive decisions.
2. For modelling an athlete learning behavior a Forward Model concept of decision making is employed. It is a feedback mechanism which produces result based on desired state to achieve and, prediction of current state. The current state prediction is the subject of study. Response from sensory networks may cause large delays hence will be useless to achieve fast reaction times. So, the brain relies on predicted current state to make decision.
3. The results of the hypothesis can be the reaction time of the athlete. This can be setup as a Reinforcement Learning problem. The cost function will depend on errors and reward function on correct targets achieved.
4. An optimization problem to minimize cost and maximize reward.

Implementing the model:
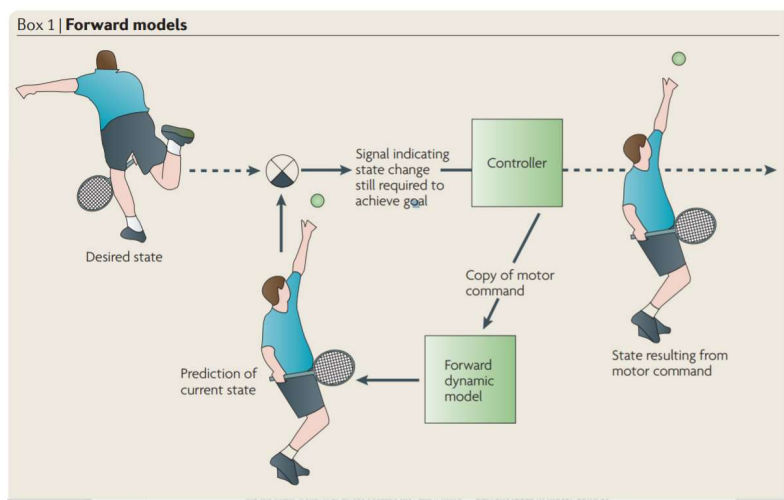
Model Testing:

A dataset of for hours of deliberate practice and reaction times of athletes for a particular sport can be obtained. The implemented model can be tested against this data and parameters can be tuned / added accordingly.

I have used following paper:

Inside the brain of an elite athlete: the neural processes that support high achievement in sports

Yarrow, K., Brown, P. & Krakauer, J. Inside the brain of an elite athlete: the neural processes that support high achievement in sports. *Nat Rev Neurosci* **10,** 585–596 (2009). https://doi.org/10.1038/nrn267

Experiment:

1. Brain mapping of the athlete while practicing can be done to determine changes when he is in peak focus/ target not achieved /target achieved.
2. A simple setup like pressing a button when light is blinked can be done to measure reaction time.
3. Further eye tracking can be used to study how sensory networks work for predicting the target.