A computational model for top down attention

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Visual attention

Attention refers to the selective processing of visual stimuli that results in the dimensionality reduction of the input for ease of computation in the subsequent stages.

Why Top down attention?

- Top down attention is task specific.
- Focus is on the various elements of the scene which might aid in achievement of the goal.
- Simulation of this aspect can help us understand what can be attended to while performing complex tasks

Approach

- Data for the experiment was collected from subjects playing video games(3DDS and HDB)
- The model maps the features present in the scene along with the eye gaze map for previous frames to the eye gaze map of the current frame,thus exploiting the sequentiality of top down attention.
- Hence,we need to maximise $P(X_t|F_t, X_{1:t-1})$,where

$$X_t = \text{eye gaze map of the current frame}$$
$$X_{1:t-1} = \text{eye gaze map of the previous frames}$$
$$F_t = \text{features present in the current frame}$$

Models developed for comparison

- Mean eye position
- Random eye position
- Regression
- k Nearest Neighbours
- Dynamic Bayesian Network

Saccades and Fixations

- *Fixations* occur between *saccades*,during which the eye gaze is relatively stationary
- Model for predicting fixations utilises data from all frames
- Saccade prediction is achieved by utilising the data from frames where the saccades occur and one frame before and after every saccadic frame
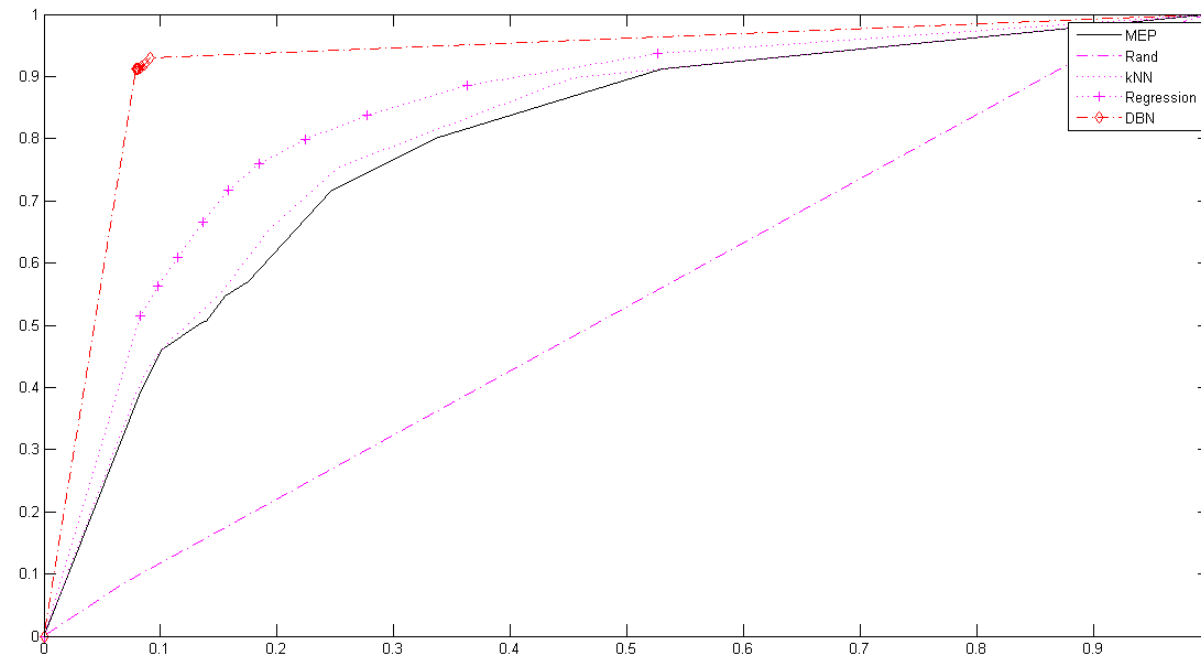
Saccade prediction

- There is a saccadic movement from each of these frames to the next frame
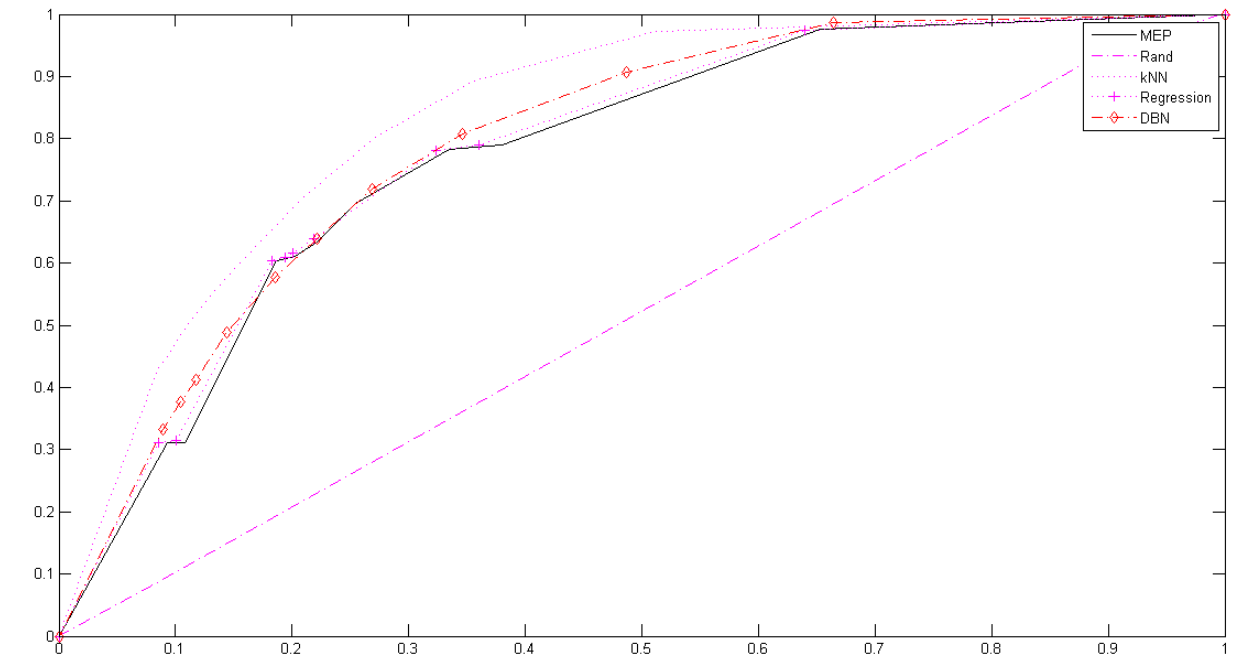- The prediction accuracy of the saccades depends on the prediction accuracy of the fixations
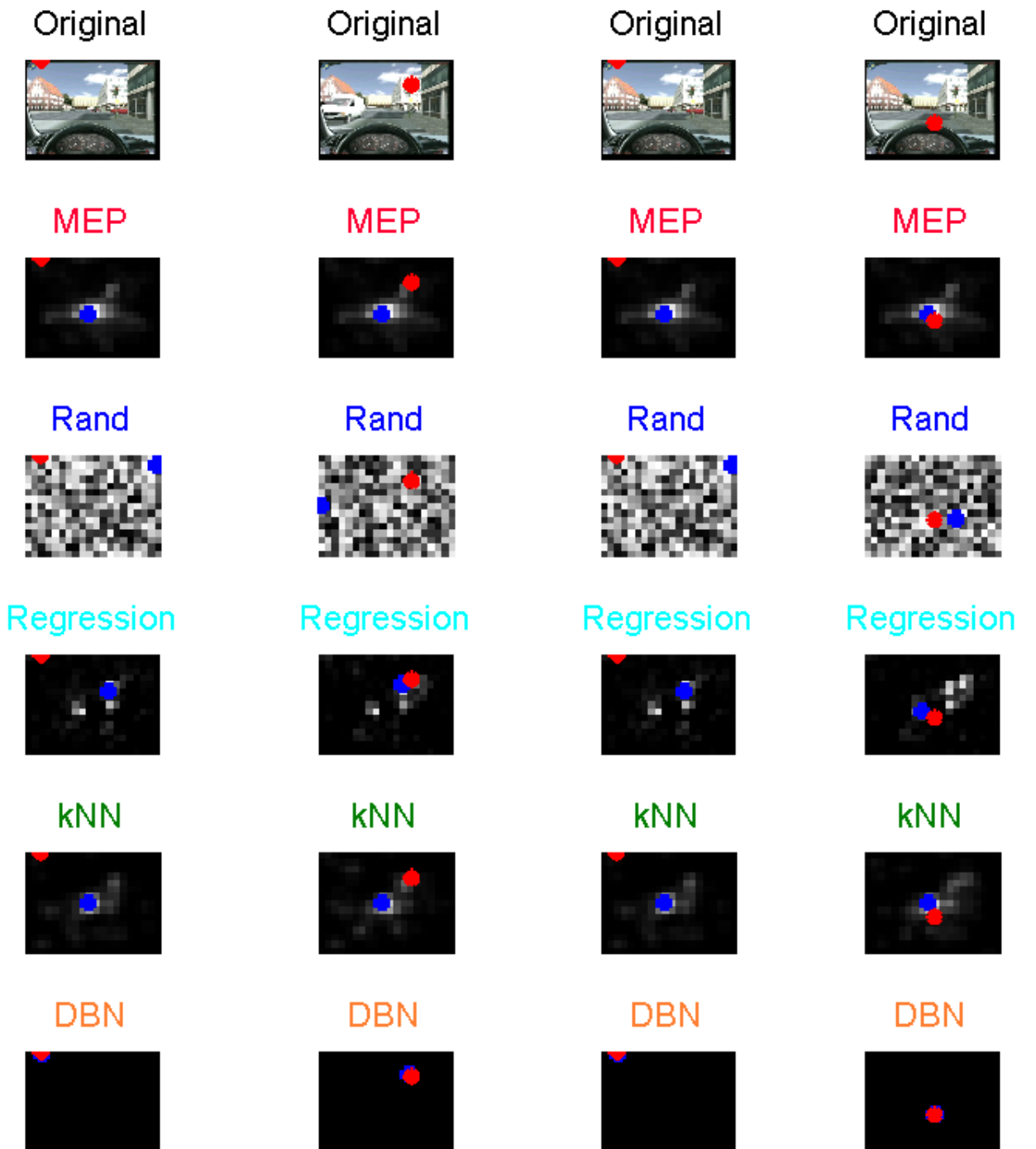
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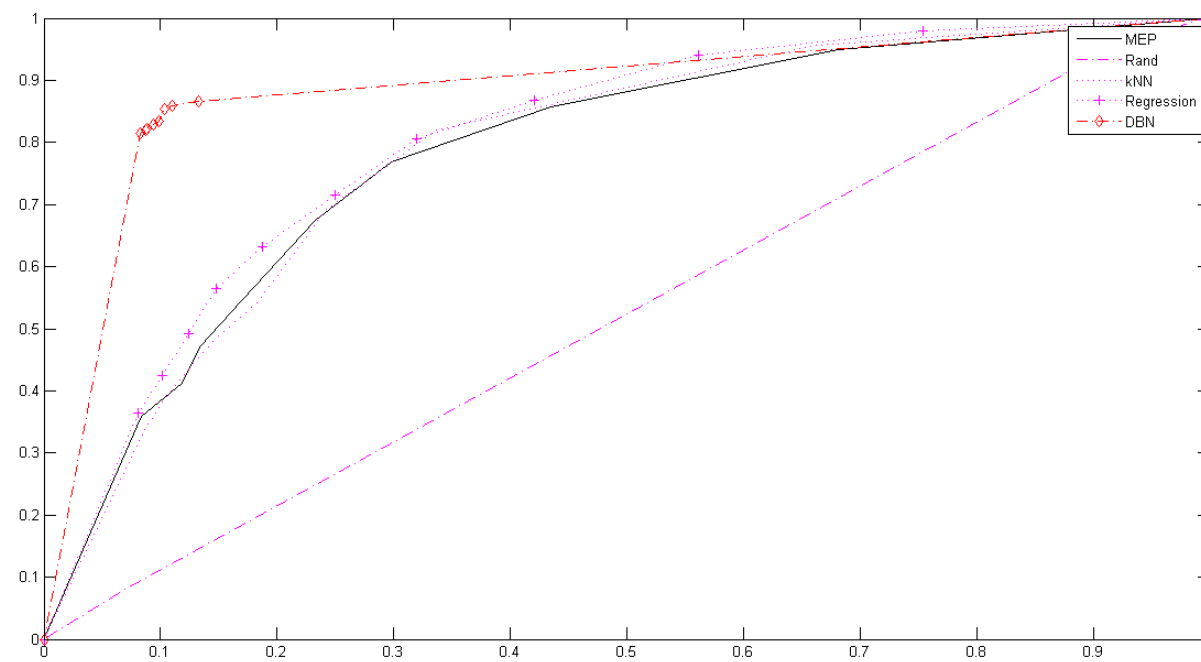Supervisor : Dr. Amitabha Mukherjee
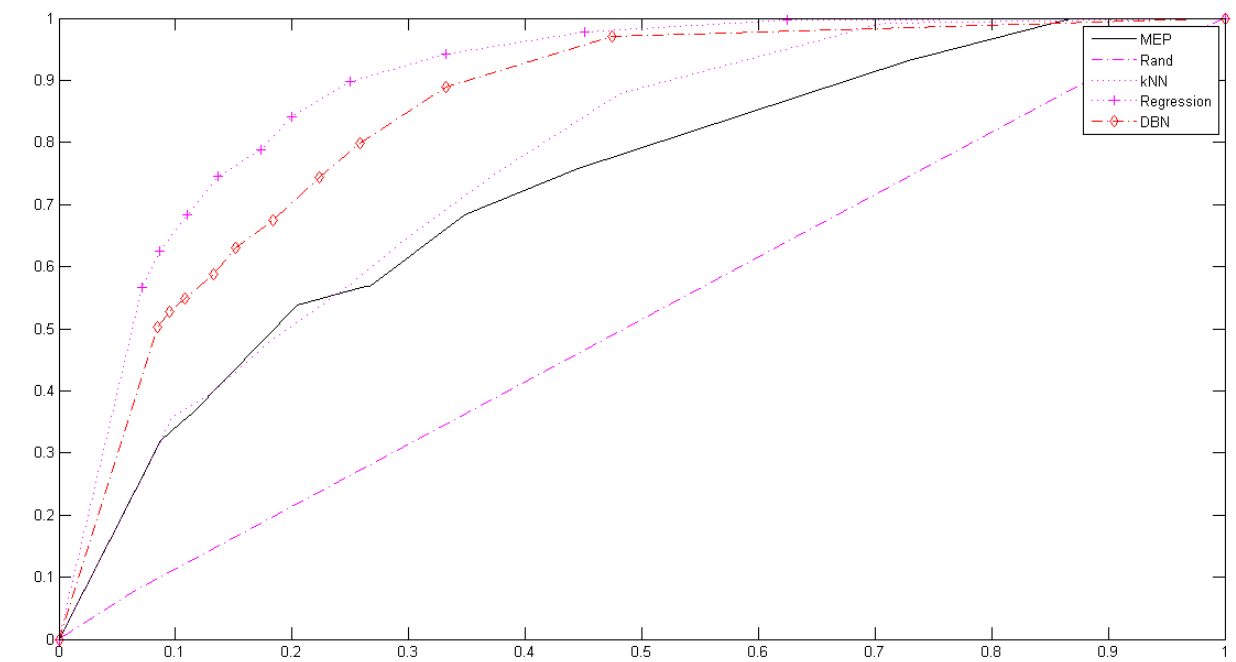
ROC curves for fixation

3DDS

HDB

ROC curves for saccades
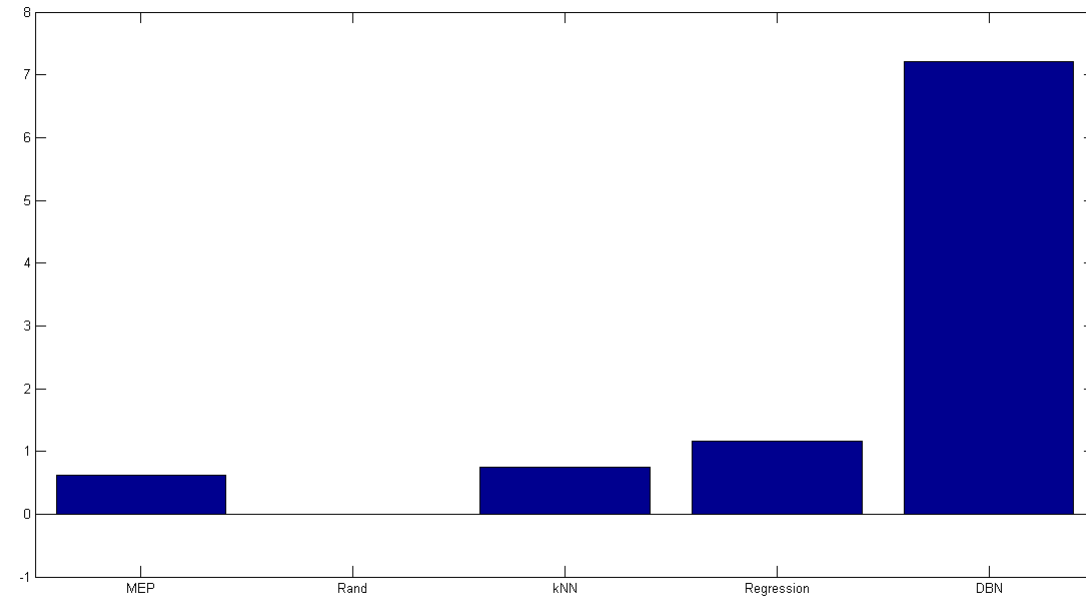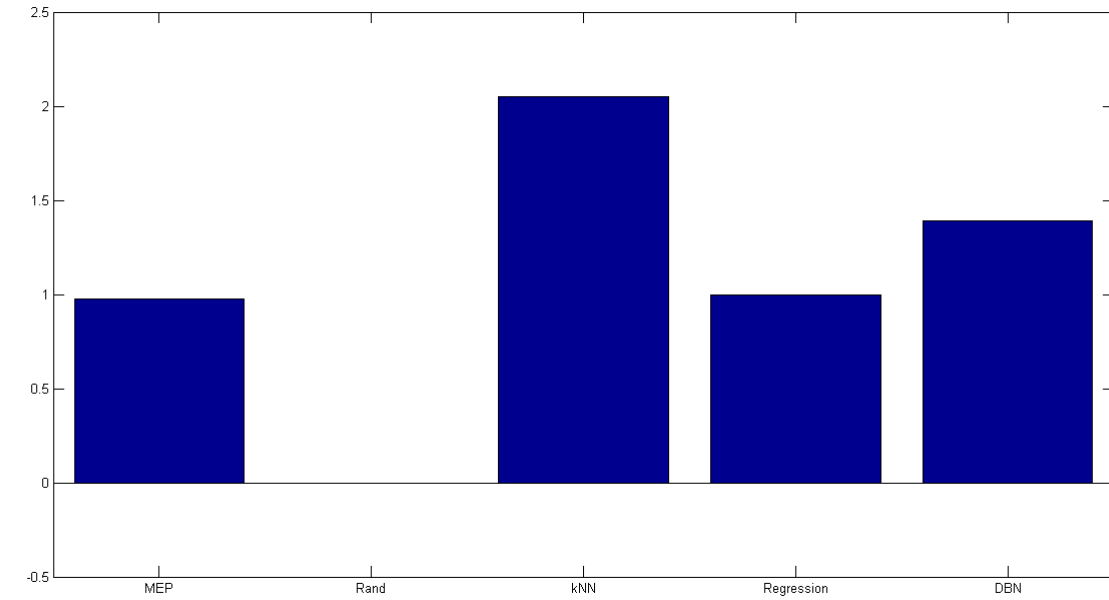

3DDS

HDB

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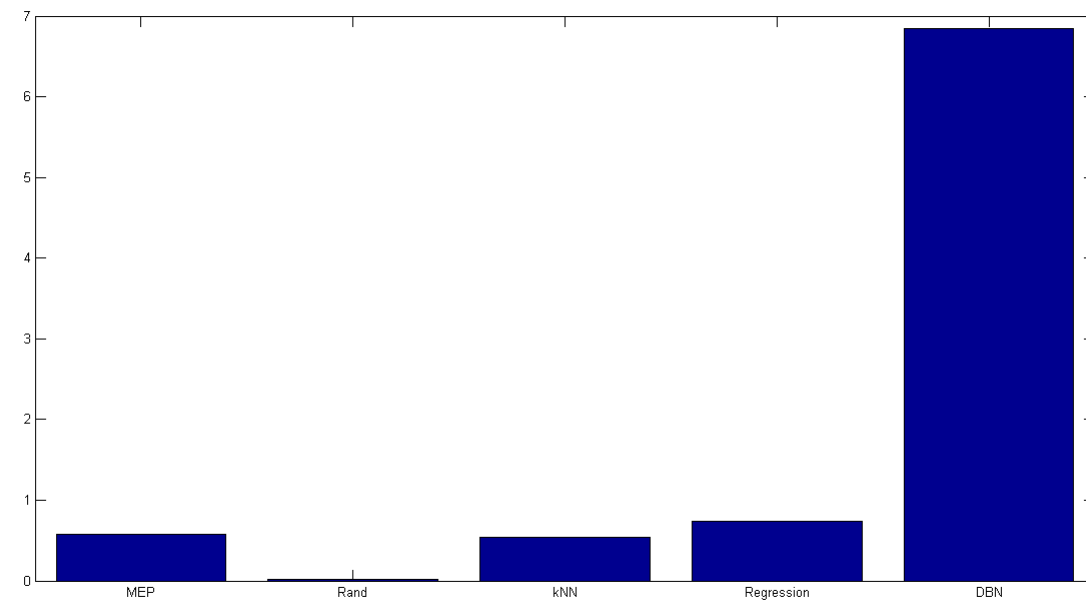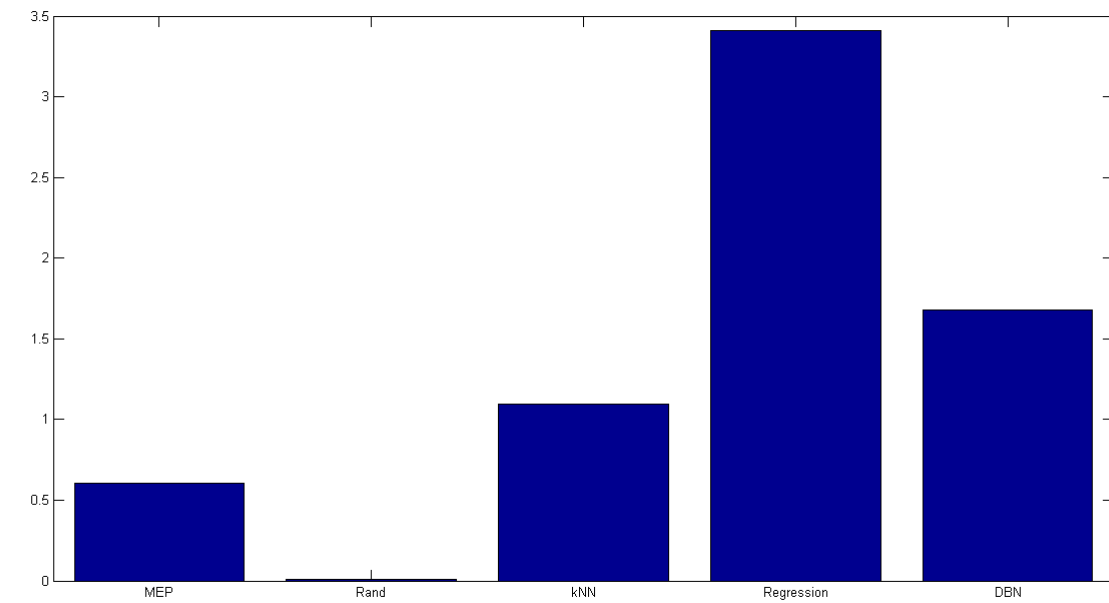
NSS scores for fixation

3DDS

HDB

NSS scores for saccades

3DDS

HDB