Facial Keypoint Recognition

Initial Modelling

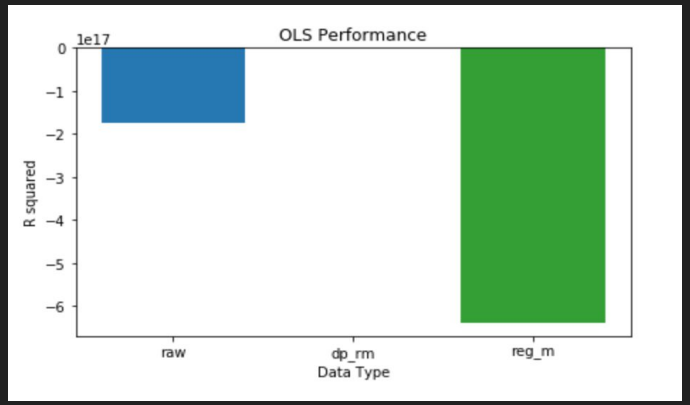
w207 03, Spring 2021

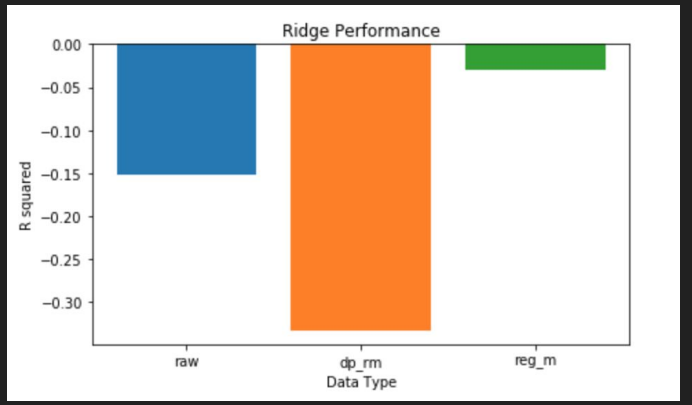
The Black Boxes

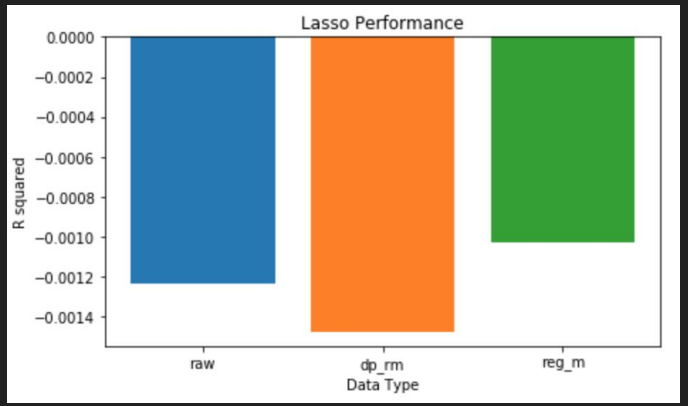
Modelling Overview

- Data explored, cleaned.
- 3 datasets to model:
  - Raw dataset - use mean to fill missing values
  - Duplicates removed - use mean to fill in missing values
  - Augmented dataset - Linear regression to predict missing values
- This is a regression problem i.e. trained model predicts the x, y values of the keypoints given an image
- Models tried:
  - Linear regression: OLS, ridge, lasso
  - Decision tree regression
  - K-nearest neighbors regression (use 5 and 7 neighbors).

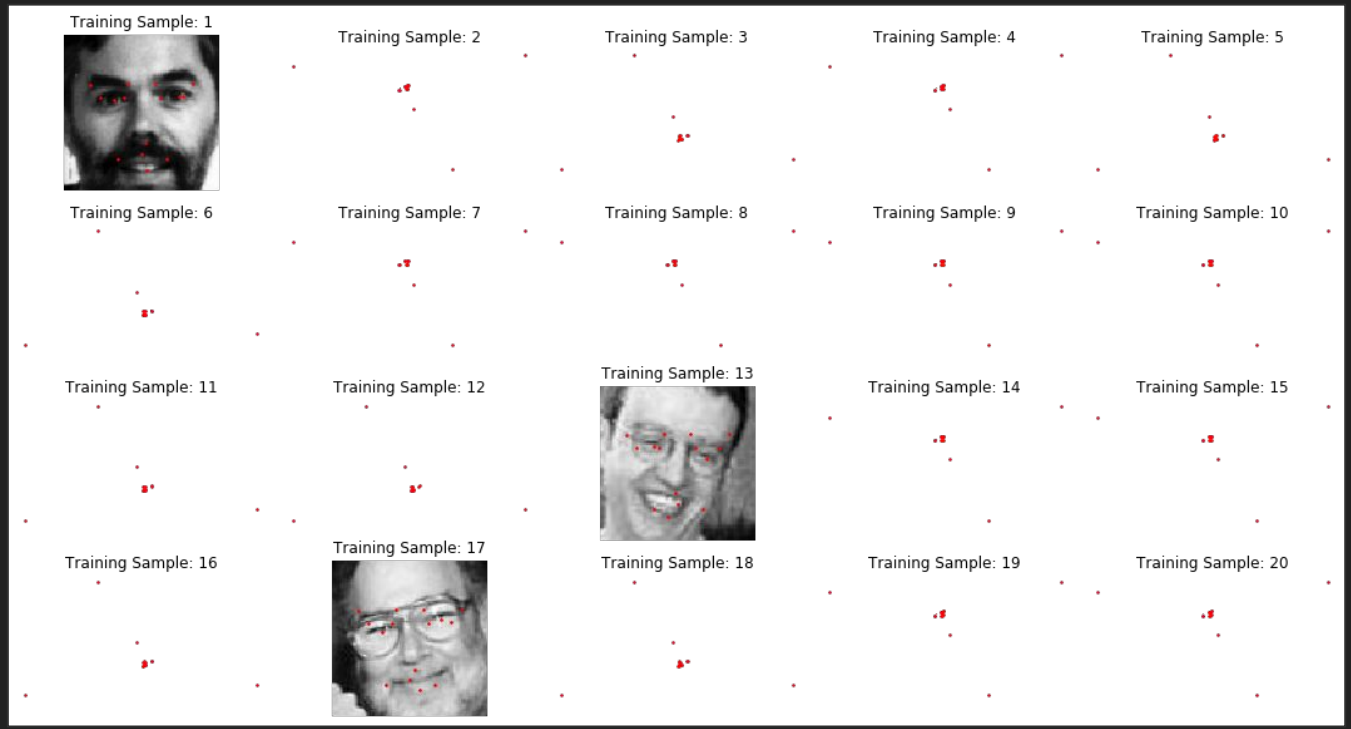
Linear Model Performance





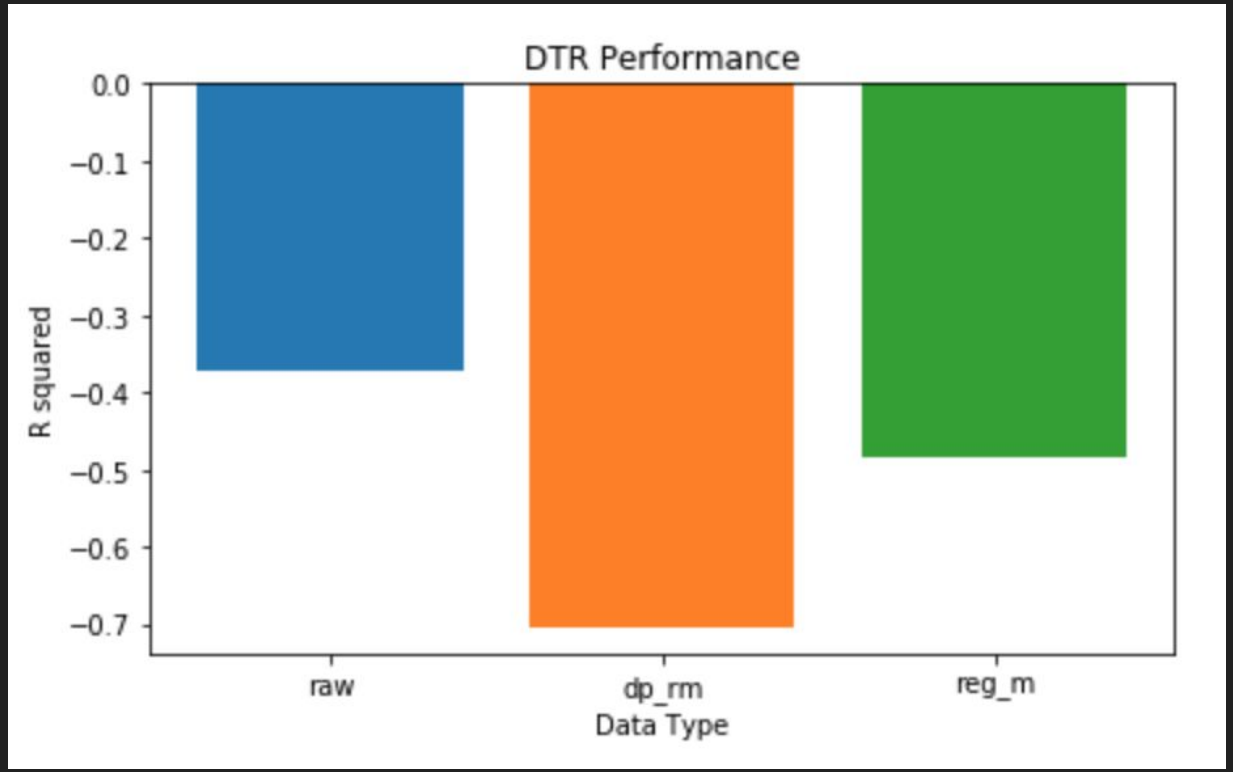


Examples: OLS Predictions



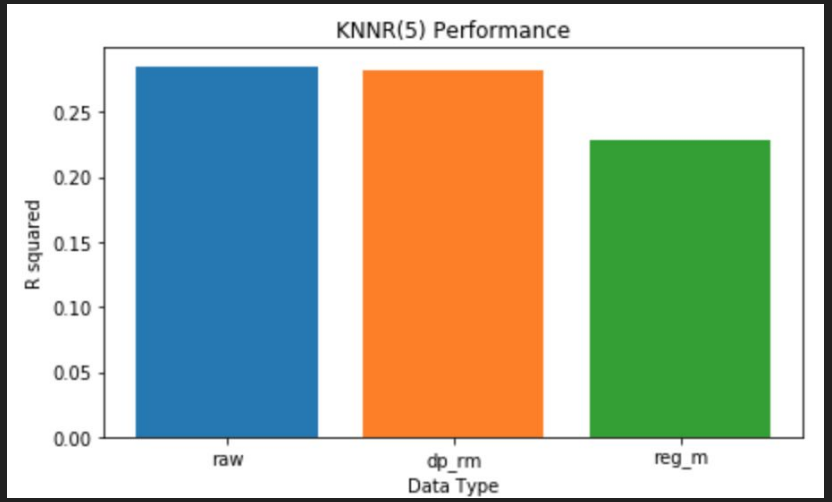
Examples: Lasso Predictions

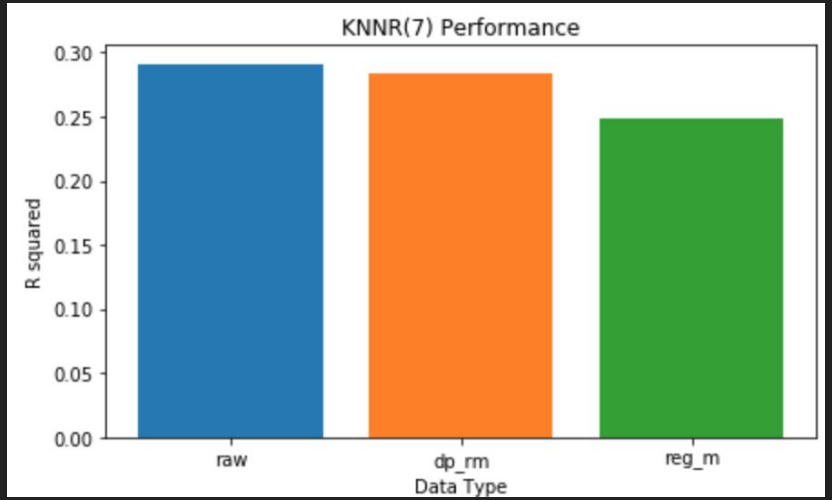
Decision Tree Regression Performance



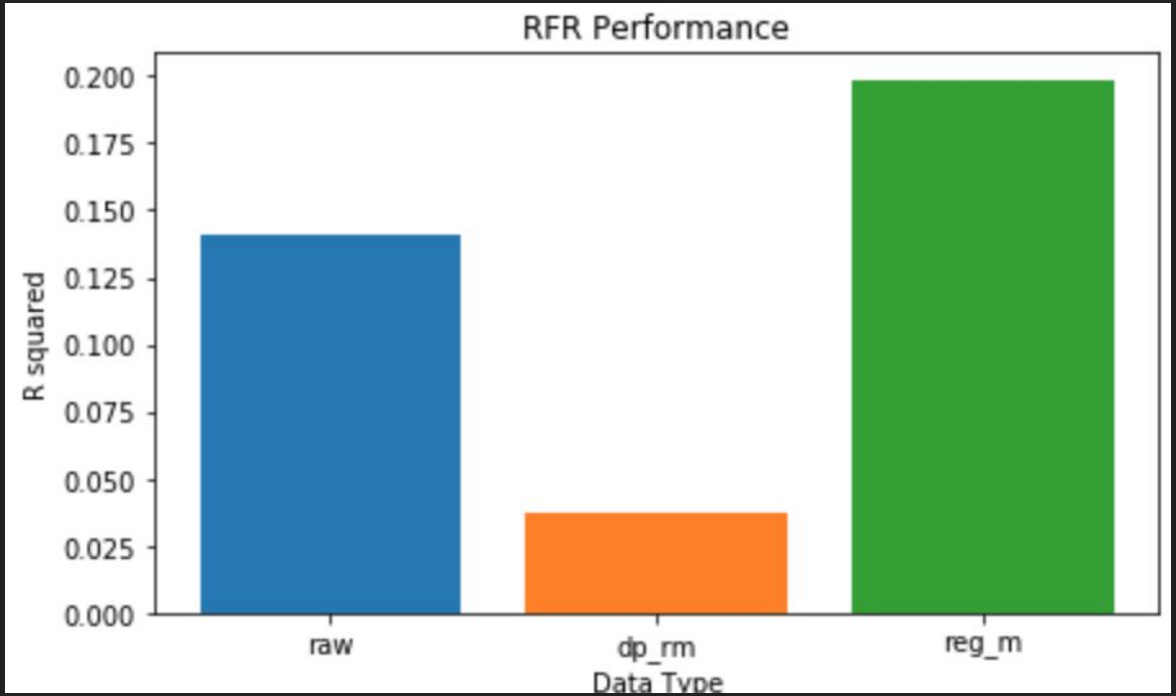
Examples: Decision Tree Predictions (raw dataset)

K-Nearest Neighbors Regression Performance





Random Forest Regression (5 estimators)



Summary of Modelling

- Standard SKL regression models do not offer very good performance for this task.
- KNN/RFR seem to offer the best performance out of all tested.
- The raw dataset (with mean fill) generally gives best performance.
- Eyeglasses, angled and childrens faces seem to pose challenges.
- Computationally intensive - take long time to run, difficult to optimize.
- The impact of various data processing methods is variable and model dependent.

Next Steps

- Look into deep learning frameworks - TensorFlow, PyTorch etc.
- See if any standard models (non-DL) can be optimized for this task e.g. ensemble methods.