

Facial Keypoint Recognition

Initial Modelling

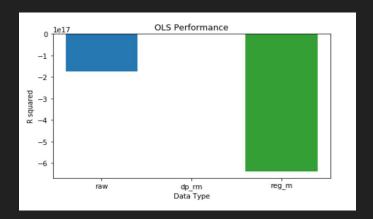
w207 03, Spring 2021

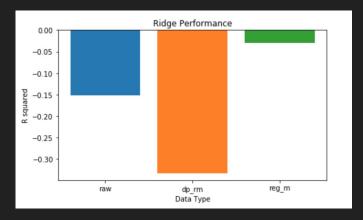
The Black Boxes

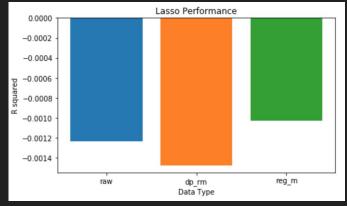
Modelling Overview

- 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

Training Sample: 1	Training Sample: 2	Training Sample: 3	Training Sample: 4	Training Sample: 5
25				
Training Sample: 6	Training Sample: 7	Training Sample: 8	Training Sample: 9	Training Sample: 10
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•	•	• Training Sample: 13	•	•
Training Sample: 11	Training Sample: 12	Training Sample. 13	Training Sample: 14	Training Sample: 15
		1 37		
4	· ·	3/		
Training Sample: 16	Training Sample: 17	Training Sample: 18	Training Sample: 19	Training Sample: 20
	O.C.			

Examples: Lasso Predictions

Training Sample: 1

Training Sample: 6



Training Sample: 11



Training Sample: 16



Training Sample: 2



Training Sample: 7



Training Sample: 12



Training Sample: 17



Training Sample: 3



Training Sample: 8



Training Sample: 13



Training Sample: 18



Training Sample: 4





Training Sample: 14



Training Sample: 19



Training Sample: 5



Training Sample: 10



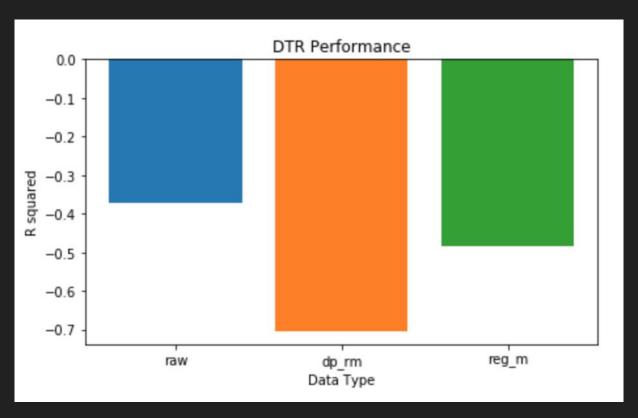
Training Sample: 15



Training Sample: 20



Decision Tree Regression Performance



Examples: Decision Tree Predictions (raw dataset)

Training Sample: 1

Training Sample: 6

Training Sample: 6





























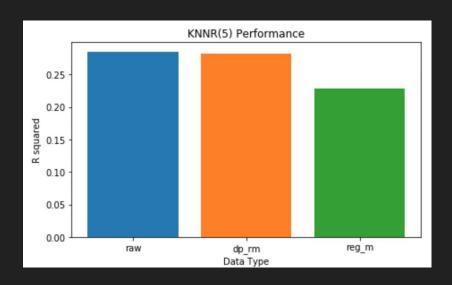


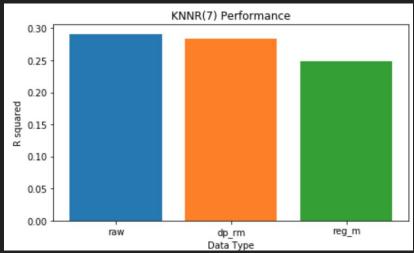




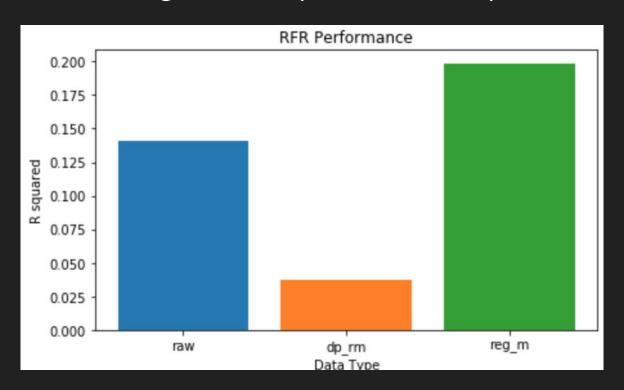


K-Nearest Neighbors Regression Performance





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.