Human Pose Estimation

Group: 13

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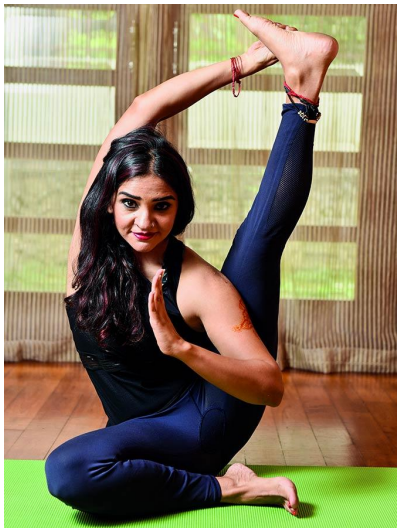
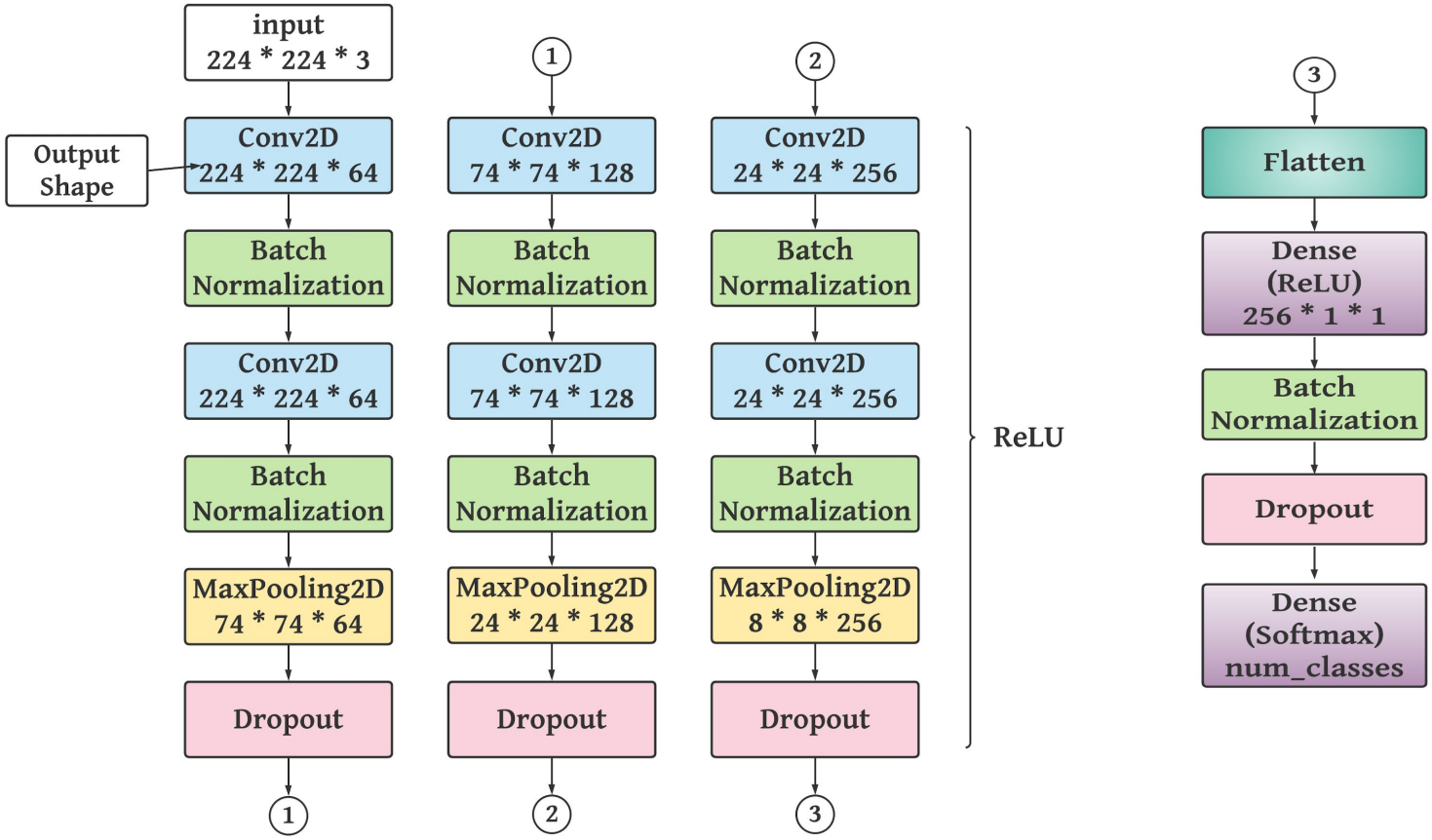
Motivation/Objective

- Human Pose Estimation is a popular topic among researcher's groups.
- What is the need for Human Pose Estimation?
- Diverse applications in Visual Media
- Activity Recognition, Video-Surveillance, Clothing Parsing, Motion Tracking, Training Robots, VAI Fitness Coach.
- Human pose estimation can be achieved by joint localization, using Deep Learning Models, and henceforth Predicting the activity from 410 different classes.
- Dataset is reduced to 14, 20 and 50 classes amid lack of resources.

Challenges

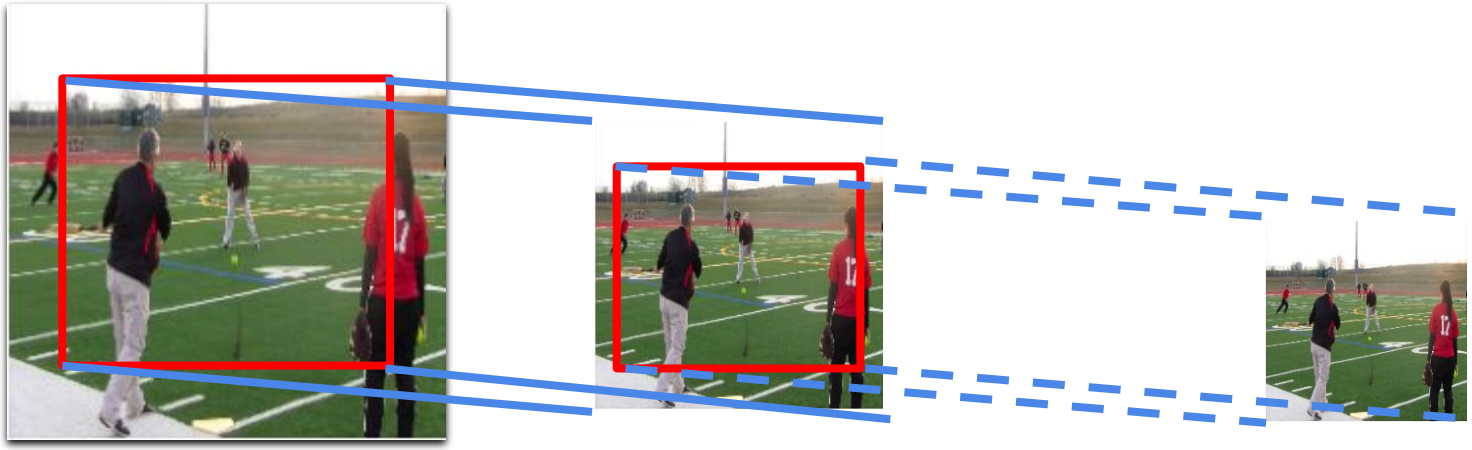


Best CNN Variant



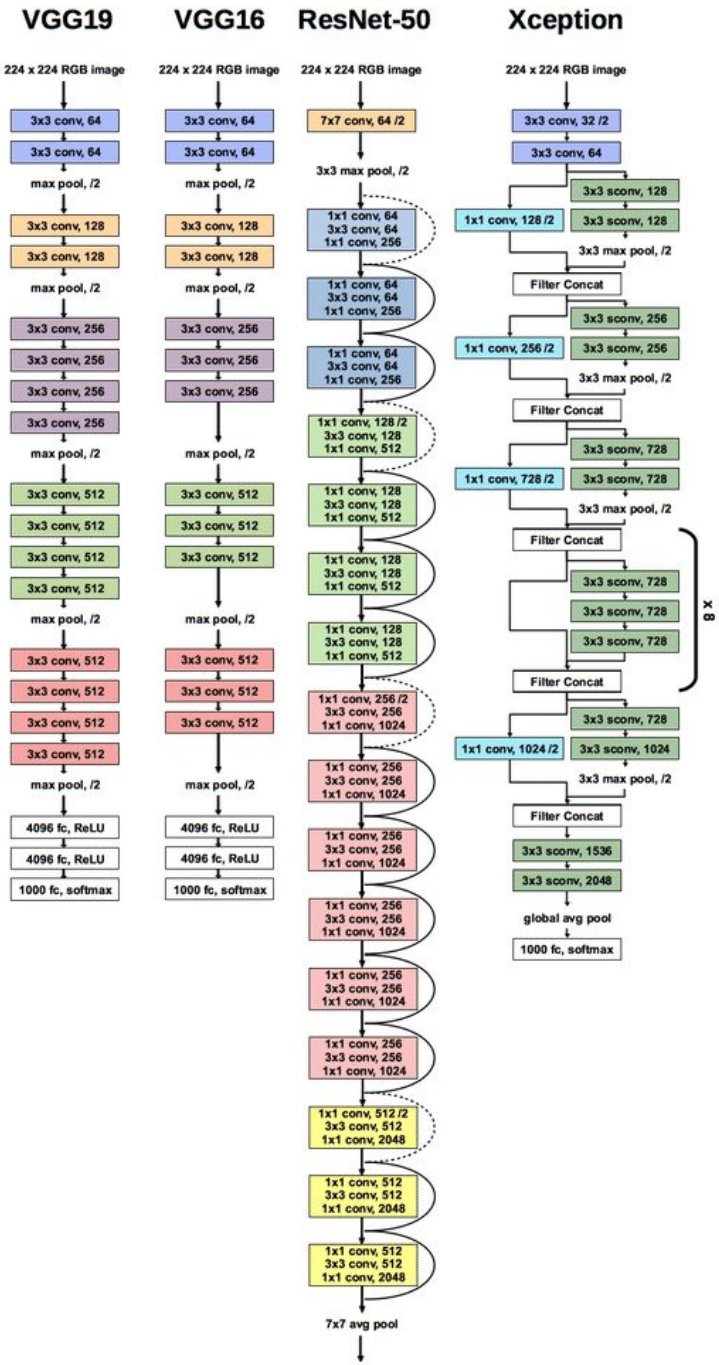
CNN Model Working

Proposed CNN model reduces image size after each pooling layer.



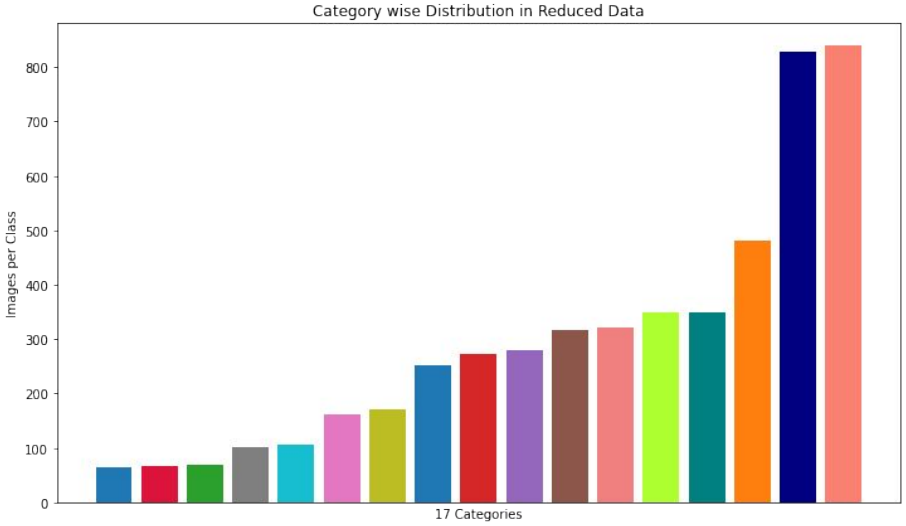
After final pool layer, model flatten() the results and dense layer architecture can be imposed. For compiling ‘adam’ optimizer with categorical cross-entropy and accuracy metrics is used.

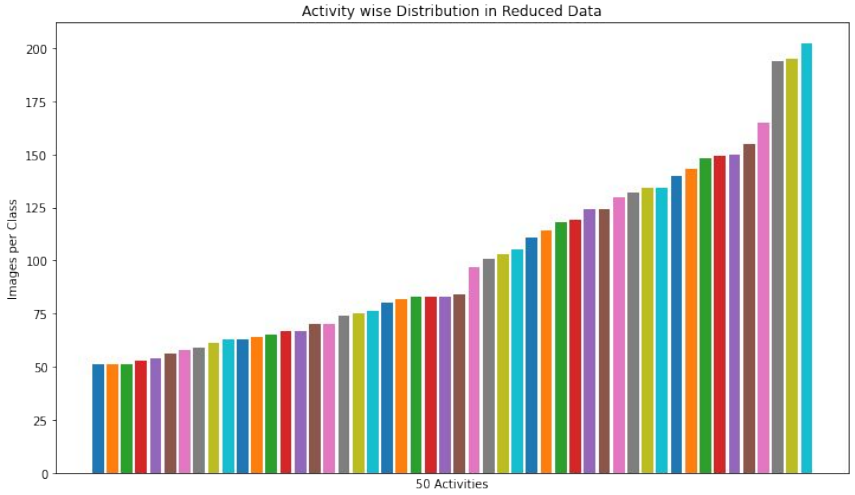
Baseline Models:



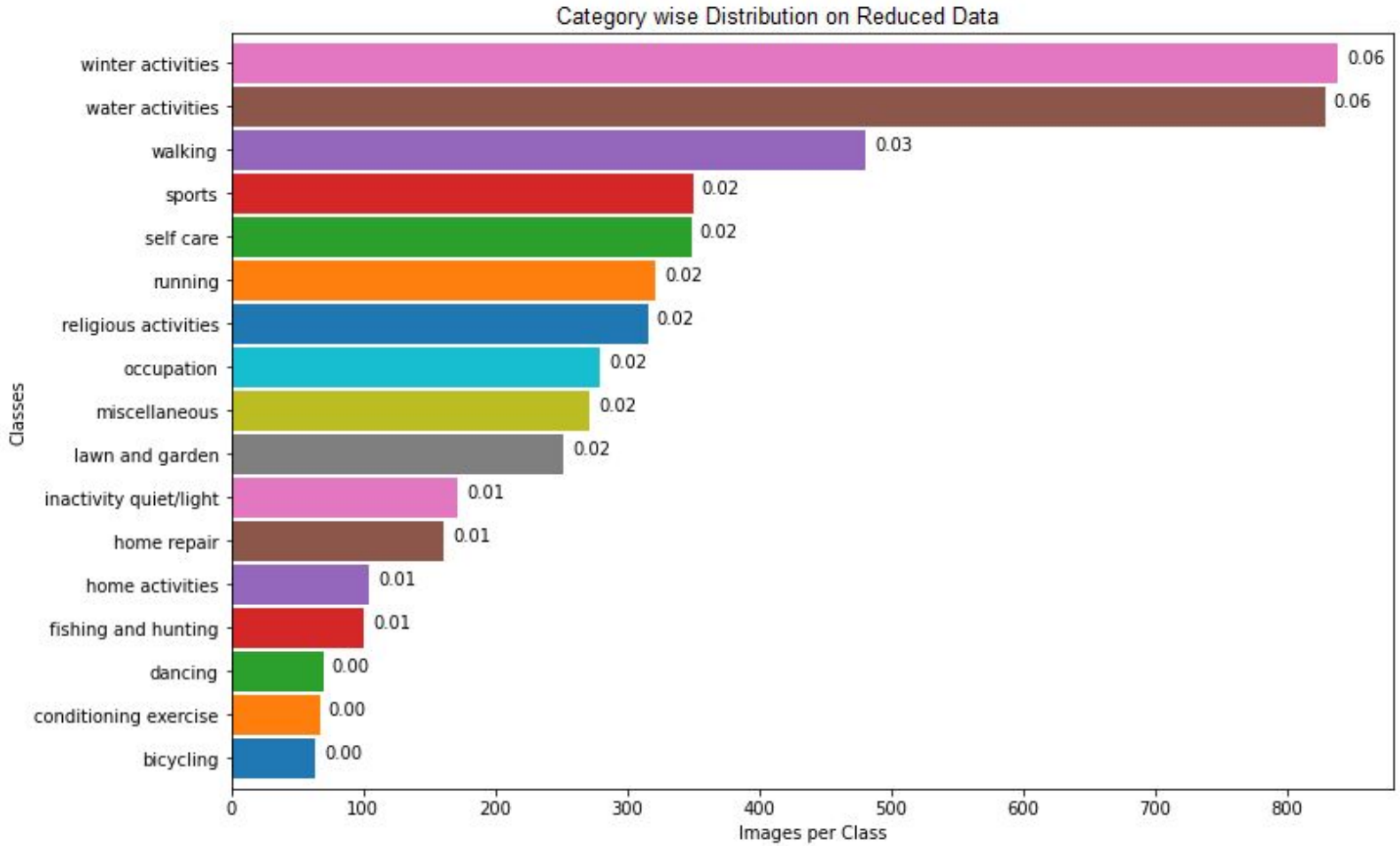
Dataset Description

- The dataset used is MPII Human Pose Dataset.
- Dataset contains 25k images, with 20 categories and 397 activities.
- Due to computational challenges we reduce the dataset to 17 categories and three sets containing 14, 20 and 50 activities.





Category wise Distribution

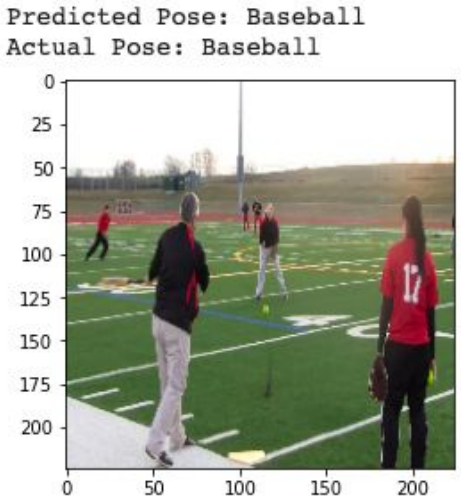


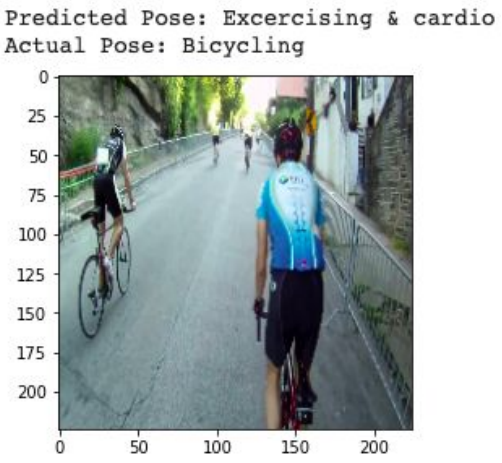
Visualising Results

Original Joints on image

Predicted Joints on image

Joints Detection using Regression





Classifications

Results

Classification Results

	CNN 1	CNN 2	CNN 3	VGG16	VGG19	Xception	ResNet50
14 Classes	69.69%	83.37%	69.10%	86.79%	90.33%	71.23%	91.04%
20 Classes	73.47%	79.48%	72.88%	81.18%	83.14%	91.18%	62.56%
50 Classes	57.75	73.57%	65.74%	--	--	82.18%	46.36%

Metrics used: Validation accuracy

Results

Regression Results

	CNN	ResNet50
PCP Metric	82.71%	86.36%
PCKh Metric	88.22%	88.84%

PCP: A limb is considered detected if the distance between the two predicted joint locations and the true limb joint locations is less than half of the limb length.

PCKh: A detected joint is considered correct if the distance between the predicted and the true joint is within a certain threshold. **PCKh** is when the threshold = 50% of the head bone link

Contributions

Palak Tiwari (MT20103): Literature surveys, Data augmentation, Data analysis, Xception model, Resnet50 for both classification and regression, visualisation of final output values for data augmentation models, report writing, baselines, results and analysis plotting and explaining.

Deepankar Kansal (MT20007): Literature surveys, Data preprocessing (reducing data for compatibility with google colab), CNN variants (2), Regression models (CNN), VGG19 for classification task, visualisation of final predicted output values for reduced data models, report writing, adding images to the report for better understanding, methodology.

Mohd. Naki (2018052): Literature surveys, CNN variants (1), VGG16 for classification, PCP and PCKh metrics and other evaluation results, report writing, adding visualising results in code files, literature review writing.

Thank you