Human Activity Recognition

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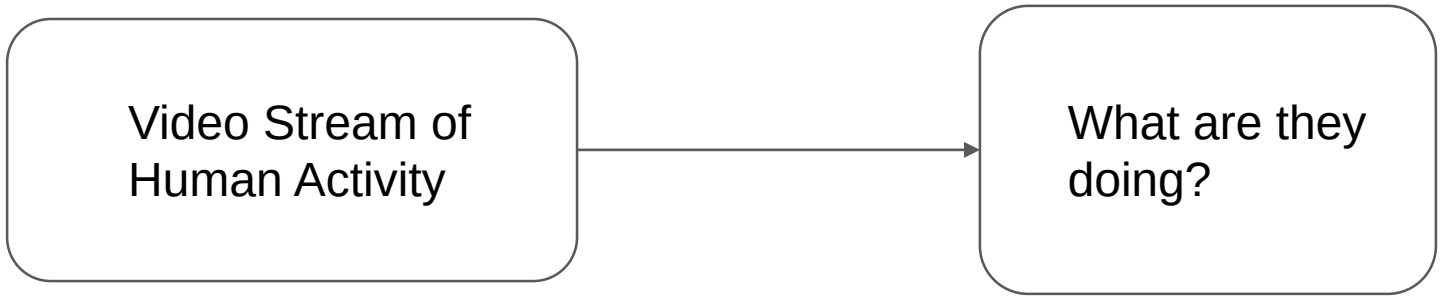
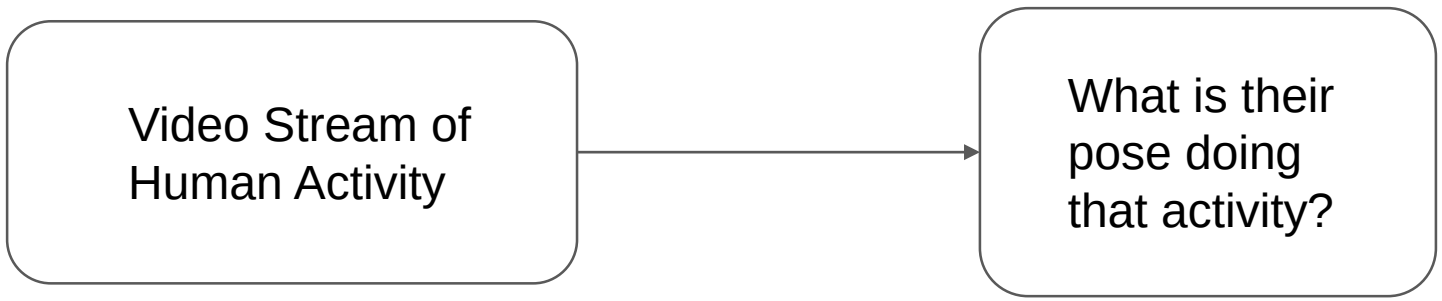
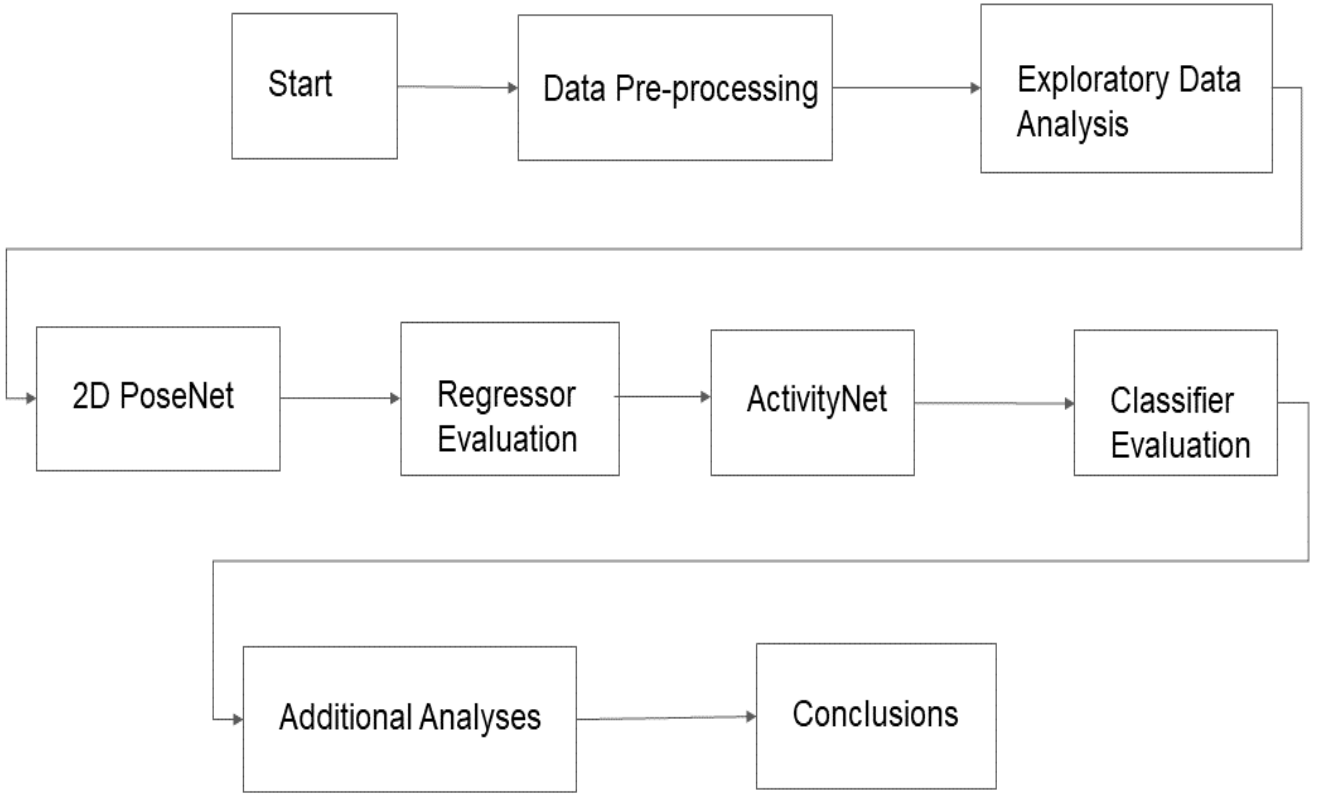
Problem


Video Stream of Human Activity
What are they doing?


Video Stream of Human Activity
What is their pose doing that activity?

Methods

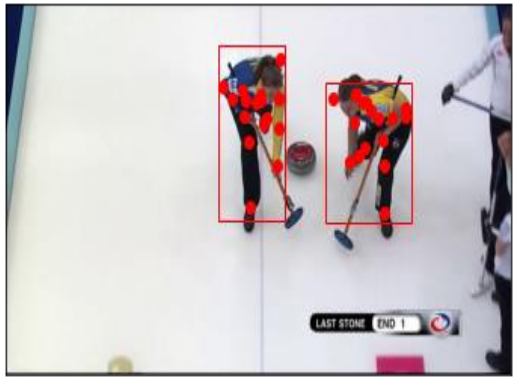

Start
Data Pre-processing
Exploratory Data Analysis
2D PoseNet
Regressor Evaluation
ActivityNet
Classifier Evaluation
Additional Analyses
Conclusions

Dataset

- MPII Human Pose Dataset, Version 1 available at: http://human-pose.mpi-inf.mpg.de/#download
- The dataset consists of 24,984 images of about 40,000 people with annotated body joints.
- Each image in the dataset contains activities performed by one person or more. Activities are grouped into 20 categories with 410 classes or types.

Data Cleaning

Sample Images



Sports, Curling

Occupation, Truck Driving

Winter Activities,
Skiing Downhill

Occupation,
Carpentry

Occupation,
Loading/Unloading Truck

Lawn and Garden,
Planting

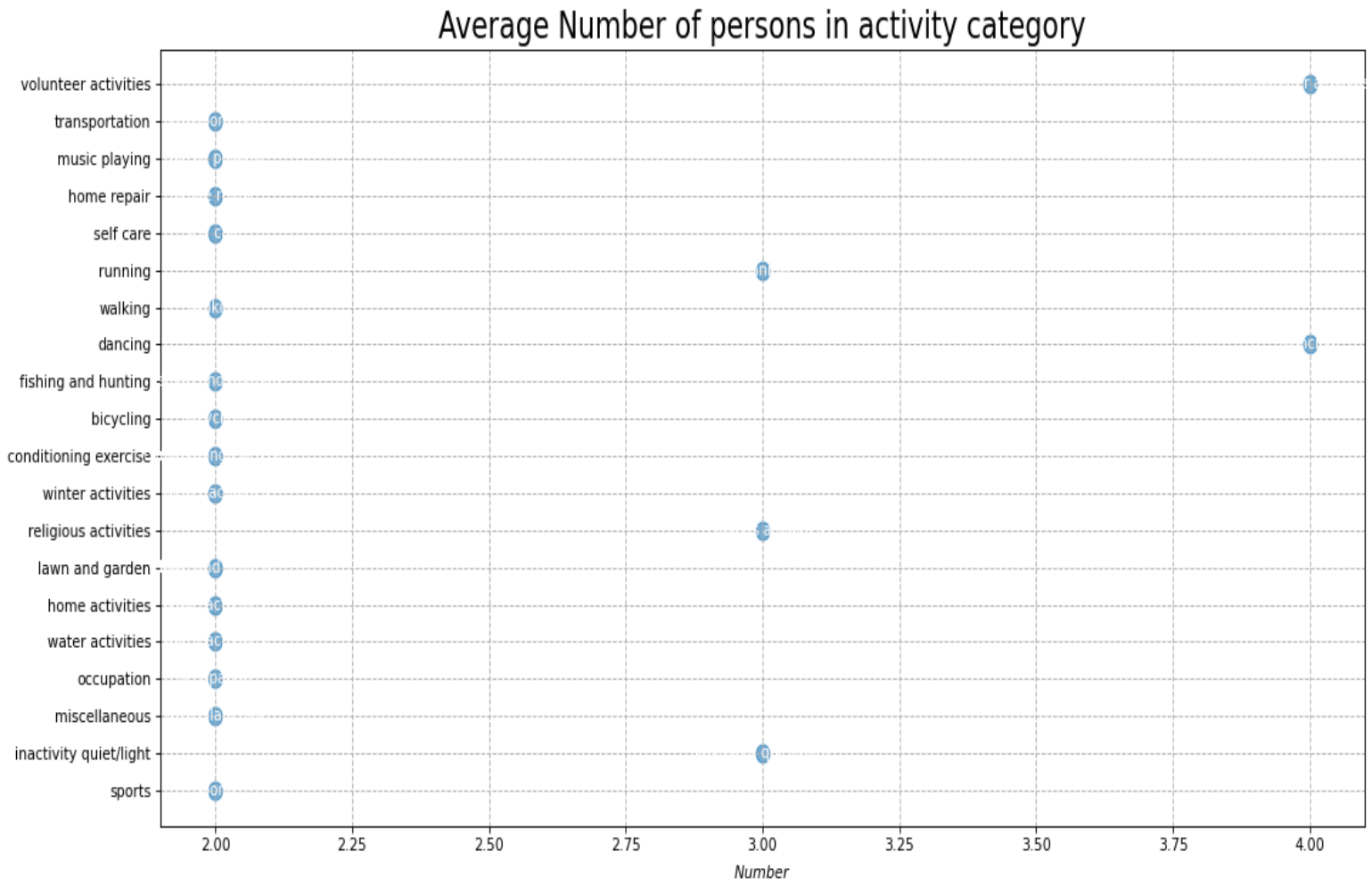
Arguments

- The dimensions of the box (length and width) has no effect on the general activity category class. In other words, we would be asking whether there is a relationship between the general category of the activity e.g. sports versus music playing and the area of the bounding box computed using the body joint coordinates.

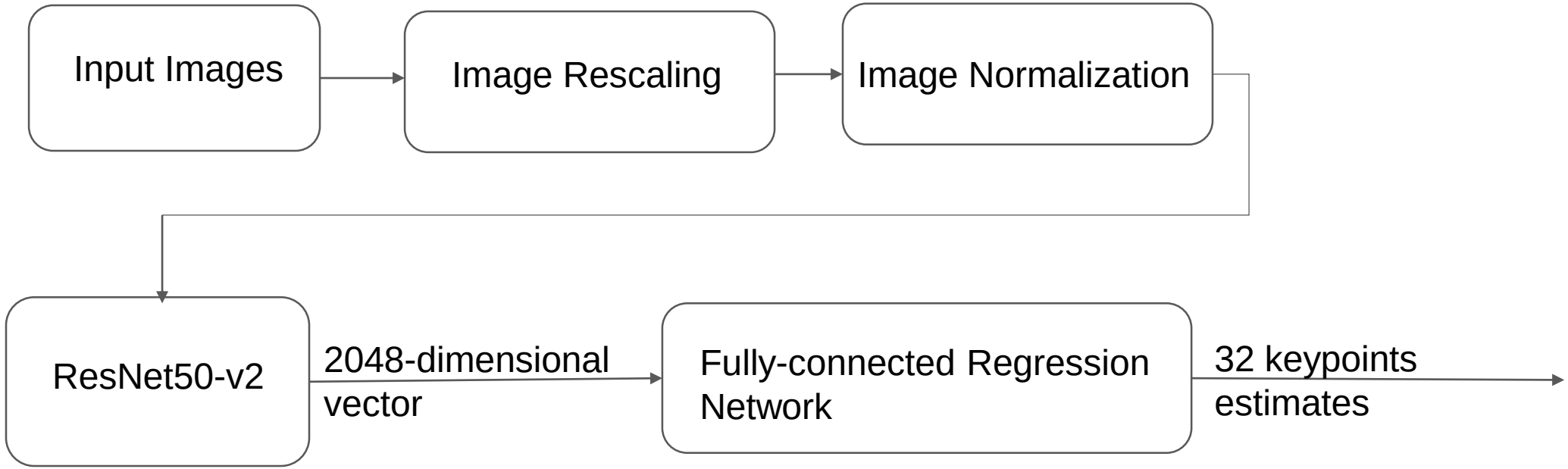
- Identifying activity types in images using body poses alone is not enough, and that the context of the activity is important.

Hypothesis Testing

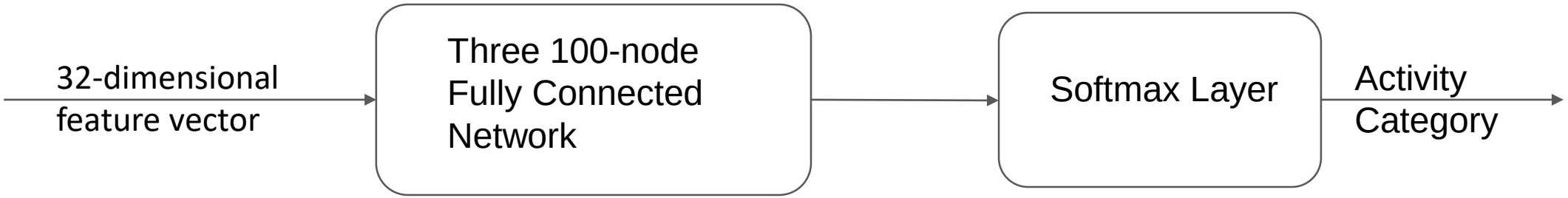
- The number of people in the image has no effect on the activity classification decision process.
- Chi-squared Test: 3.638
- p-value: 0.99



2D PoseNet


Input Images
Image Rescaling
Image Normalization
ResNet50-v2
2048-dimensional vector
Fully-connected Regression Network
32 keypoints estimates

ActivityNet



Future Experimentation

- Use a different pre-trained network for feature extraction and selection.
- Train on more than one epoch.
- Train the feature extractor layer with the dataset and experiment with different hyperparameters.
- Achieve a good classification accuracy on the training set, then validate the model on the test set.