Social Robotics
Detecting and classifying touch patterns with MiRo

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Outline

How can a robot help children with Autism Spectrum Disorder (ASD)?

The goal is to get the children to step out of their comfort-zone without fear. A robot gives them the motivation, unlike an inanimate object such as a computer or tablet.

A social robot called *Buddy* has been tested in several institutes for autism and most of the doctors said:

- Fast adaptability of the children
- Compared with the tablet, there is a real interaction with a little robot.

The objective of this project is to try to build a real interaction with the social robot MiRo using touch.

Collecting Data

The experiment is to reproduce sequentially six gestures on MiRo:

- Fixed Head
- Pat Head
- Caress Top-Bottom
- Caress Bottom-Top
- Fixed Body
- Pat Body

The experiment involves some volunteers, and before each experiment an explanation of each gesture is presented to the volunteer.
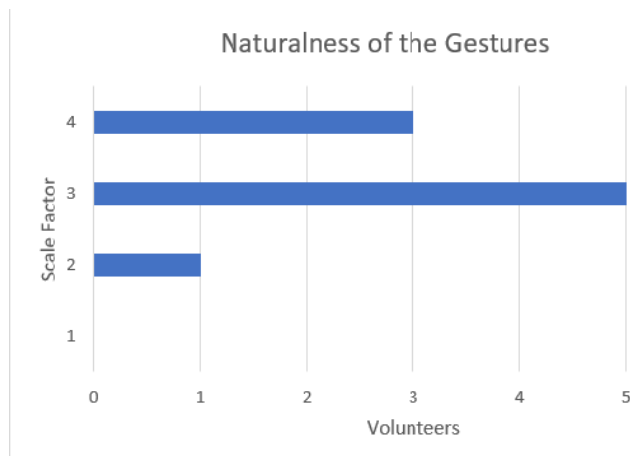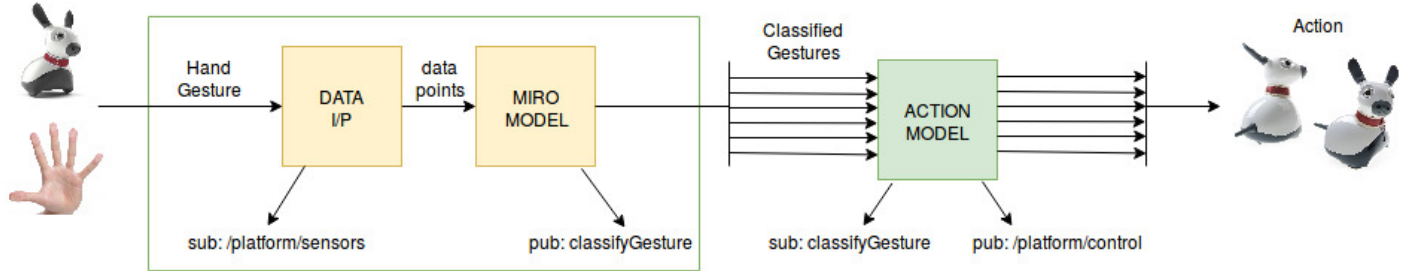
Measure and Metrics

At the end of the experiment, the volunteer is requested to fill out a experiment survey in order to understand the quality of the application, in terms of:

- Naturalness of the gestures

using a scale of four values, from 1 to 4 , in which 1 represents a strong negative evaluation and 4 a strong positive evaluation.
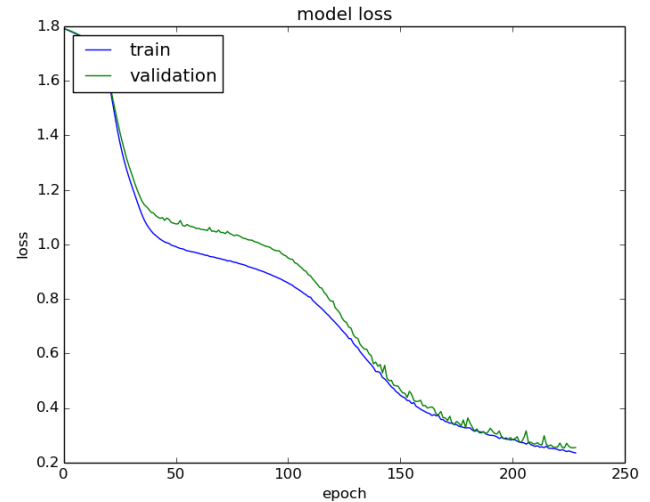

Naturalness of the Gestures
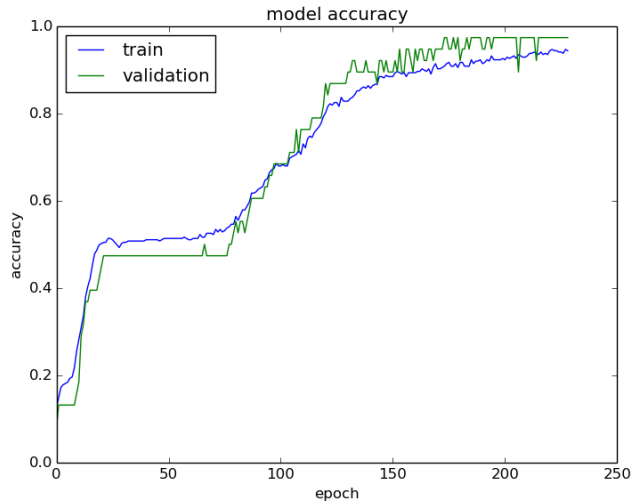
Overall software architecture

Tensorflow : Keras

- Training samples: 483 (~80%)
- Validation samples: 54 (~10%)
- Test samples: 59 (~10%)
- Algorithm: Long short-term memory (LSTM) Recurrent Neural Network (RNN)
- # Attributes: 8 # Targets: 6 # Time-samples for each observation: 105
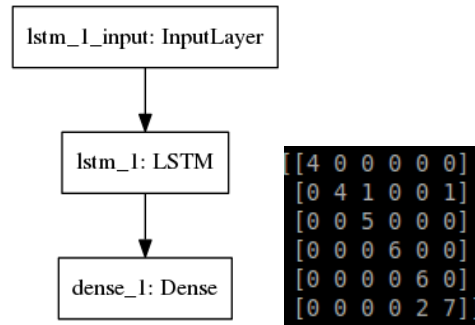- # Hidden layer: 1 # Hidden Neurons: 100

Performance

Tensorflow : Keras

	With Regularisation	Without Regularisation
Training loss	0.2348	0.6925
Training accuracy	0.9436	0.8190
Validation loss	0.2548	0.7237
Validation accuracy	0.9737	0.7895
Testing loss	0.349	-
Testing accuracy	0.888	-

NN Model and confusion matrix