



Recognizing Head Gestures for Head-mounted Displays

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Motivation

An intuitive UI is crucial for immersive VR experiences



Using head gestures (like nodding yes or shaking you head no) is a natural way to interact with your surroundings



Future Work

Extend the approach to recognize other head gestures than Yes and No (like tilting, head rolls, user-defined gestures)



Speed up the classification:

- Find a faster implementation of DTW
- Experiment with a different machine learning algorithm (LSTMs, SVMs)

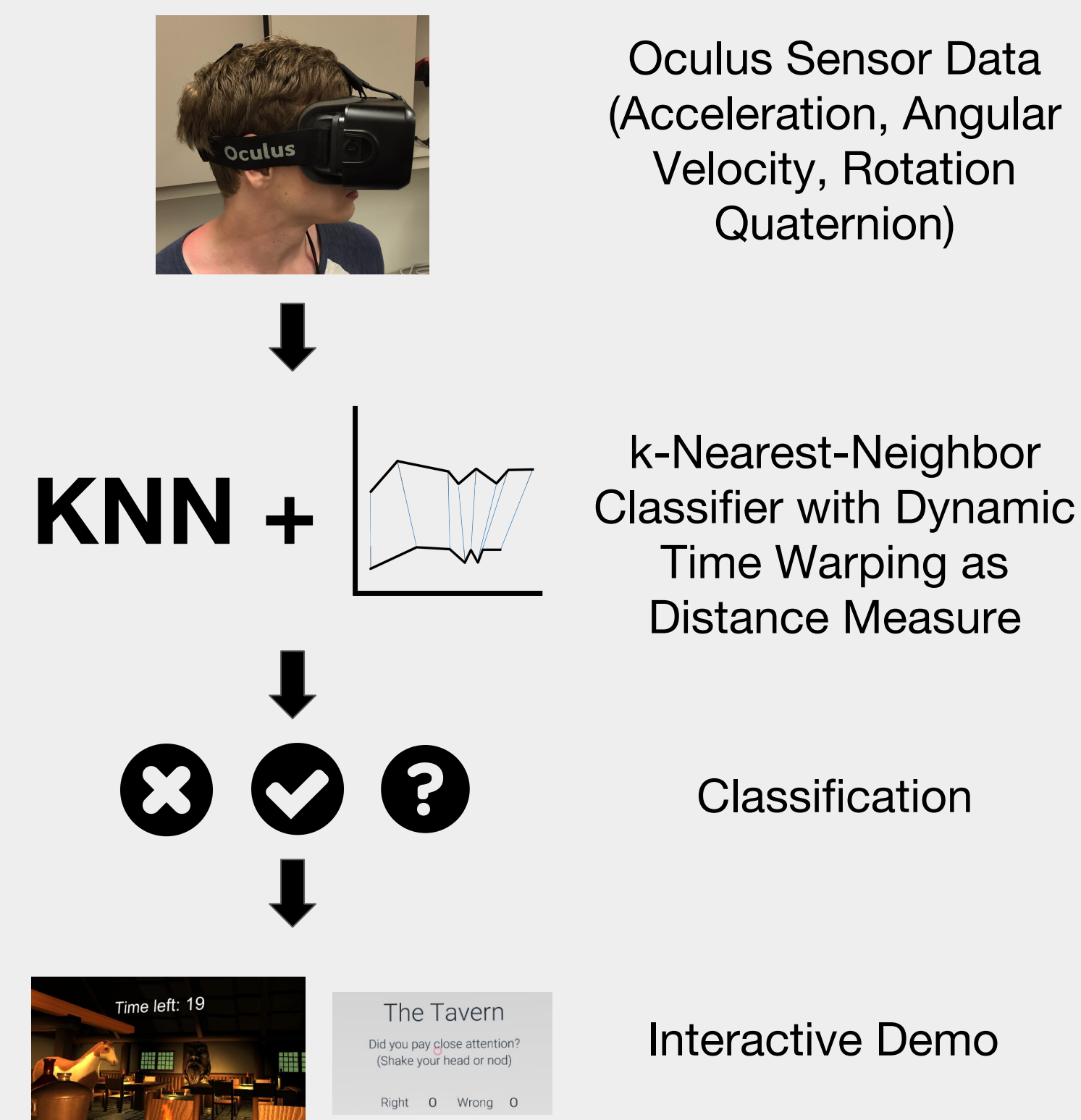


Related Work

Hui Ding, Goce Trajcevski, Peter Scheuermann, Xiaoyue Wang, Eamonn Keogh. Querying and mining of time series data: experimental comparison of representations and distance measures. *Proceedings of the VLDB Endowment*, 1(2):1542–1552, 2008.

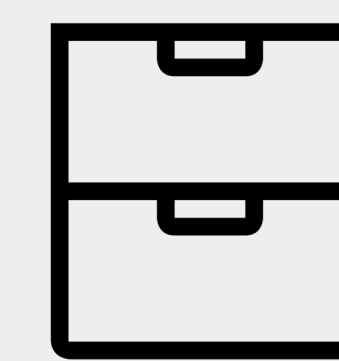
Karen Bryla. Riftgesture. https://github.com/kbryla/rift_unity_scripts/blob/master/RiftGestures/RiftGesture.cs. Accessed: 2016- 05-05.

Marcus Georgi, Christoph Amma, and Tanja Schultz. Recognizing hand and finger gestures with imu based motion and emg based muscle activity sensing. *In International Conference on Bio-inspired Systems and Signal Processing*, 2015. BIOSIGNALS 2015.



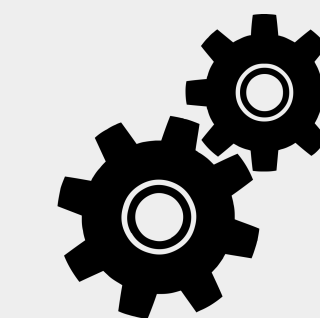
Approach

Data Collection



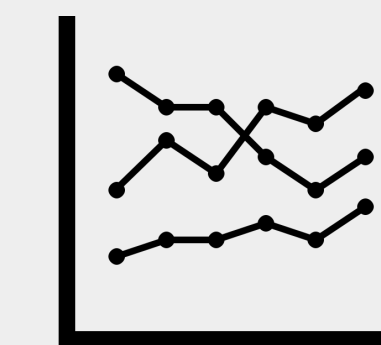
Collected 747 data points from 15 different people
267 YESs
237 NOs
243 NULLs

Training



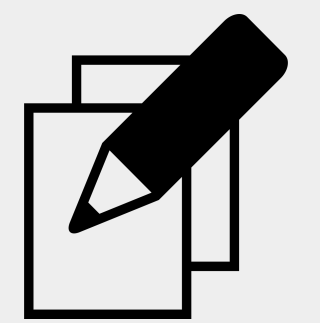
Forward Selection with Leave-one-out cross-validation to choose best features and best k

Error Analysis



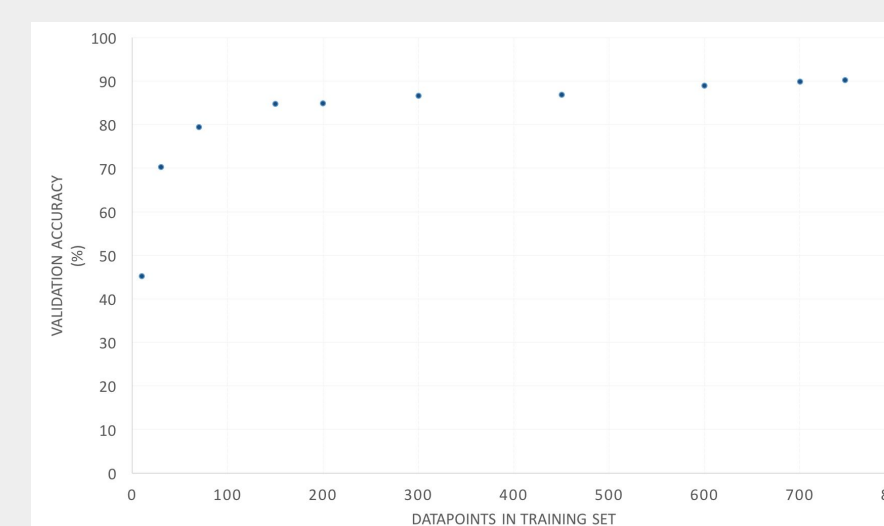
Plot learning curve, precision and recall and confusion matrix

Evaluation

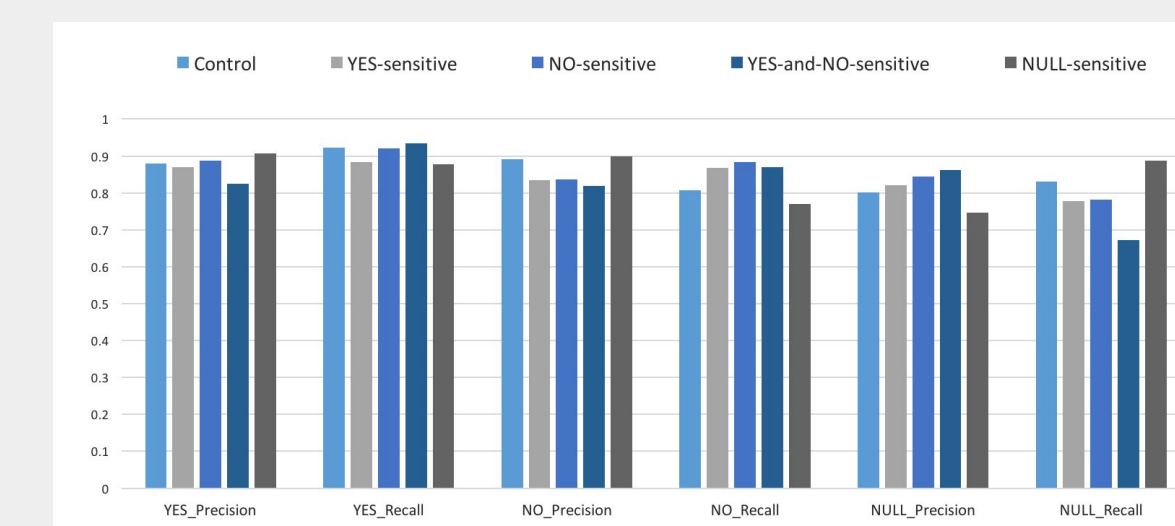


Evaluate best method on test set

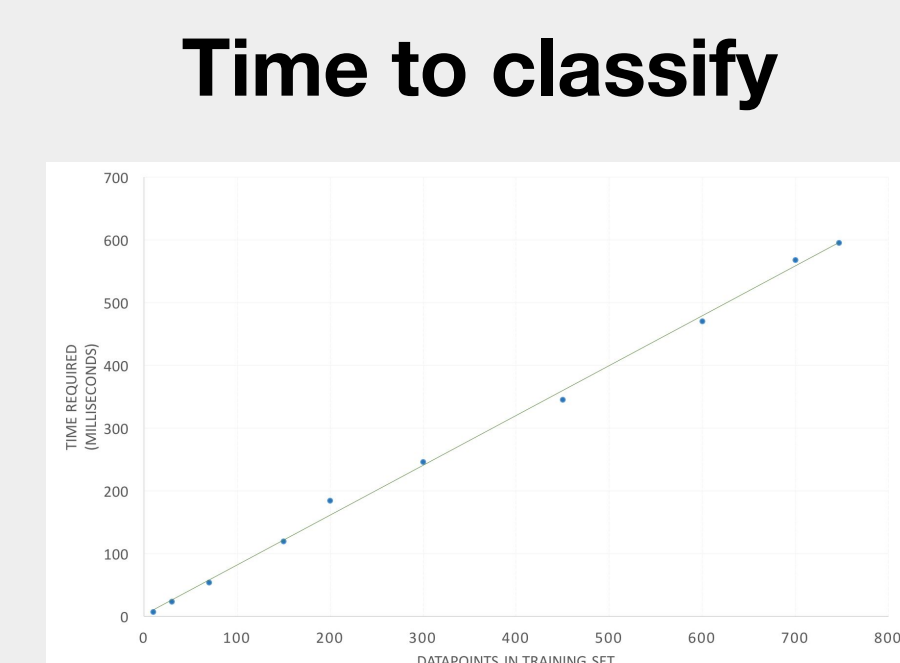
Results



Learning Curve

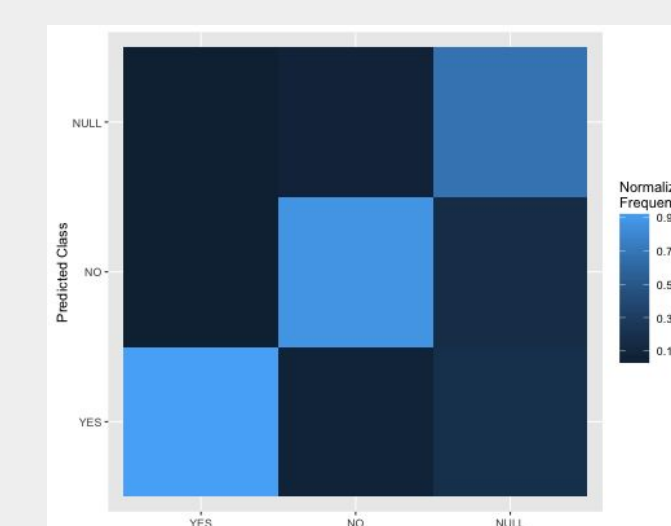


Precision/Recall

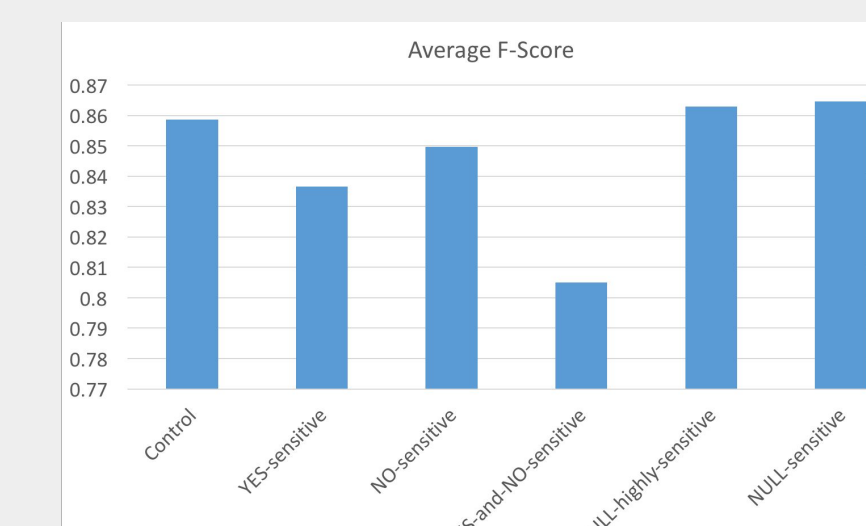


Time to classify

Confusion Matrix



F-Score



Forward Selection

Chosen Features:

- Acceleration (X, Y, Z)
- Rotation Quaternion (X, Y)

Best k = 5

Qualitative Results

- Short or too slow gestures are often not recognized => there are few examples of this in the collected training data!
- Interactive Demo feels smooth!

Test Accuracy: 85.04%