

# Simple and Complex Activity Recognition Through Smart Phones

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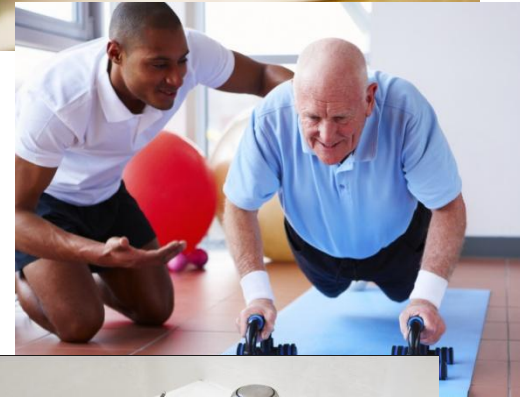
**Washington State University**

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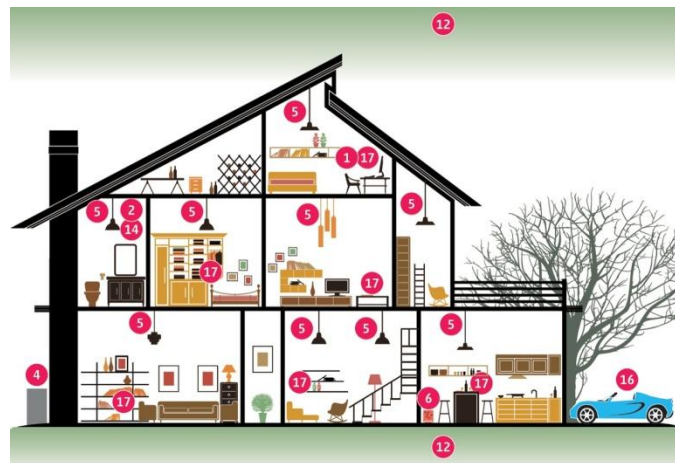


# Activity Recognition

- ✓ Aging in place.
- ✓ Remote health monitoring.



# Environmental Sensors



**cooking**



**exercising**



**hand washing**

# Sensors on Phone



sitting



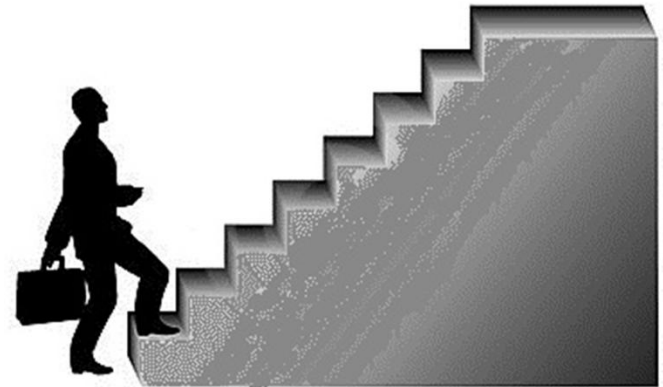
standing



walking

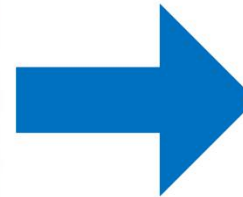
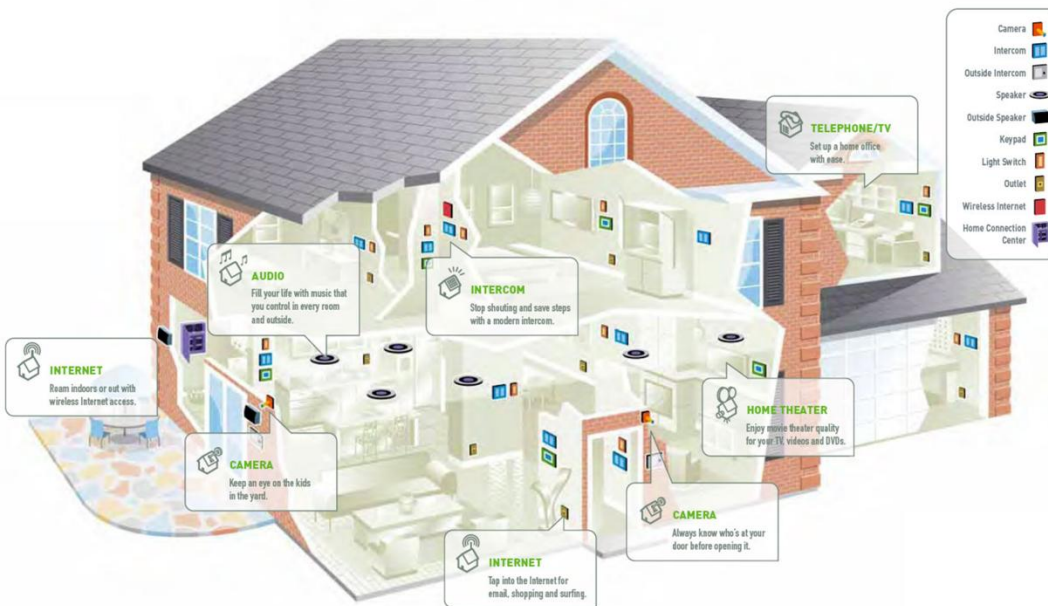


running

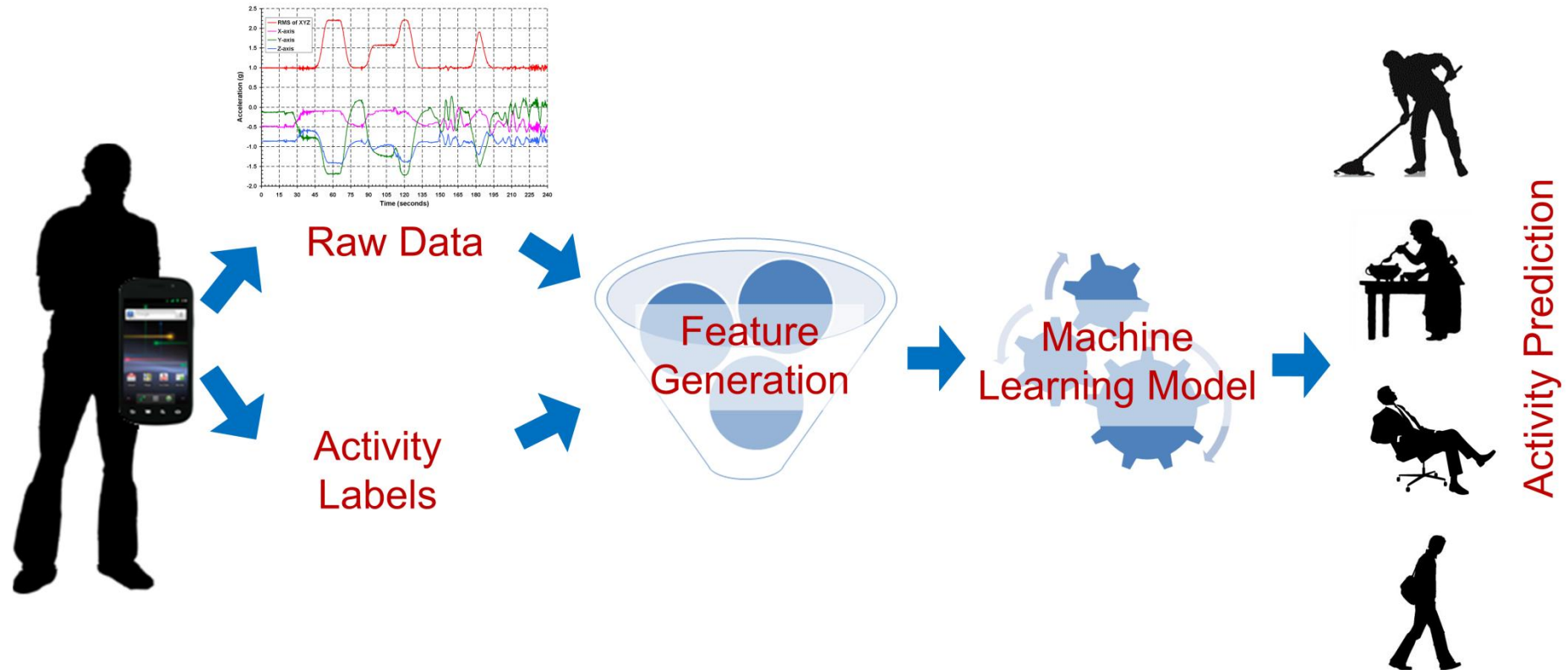


climbing stairs

# Our Endeavor: The Transition



# Proposed Architecture



# Activity Types



## Simple

- Sitting
- Standing
- Walking
- Running
- Climbing stairs
- Lying
- Biking
- Driving



## Complex

- Cleaning
- Cooking
- Medication
- Sweeping
- Washing hands
- Watering plants

# Experimental Setup

- ✓ **Device:** Samsung Captivate™
- ✓ **Operating System:** Android 2.1 Froyo
- ✓ **Sensors used:** Accelerometer and gyroscope
- ✓ **Sampling Rate:** 30 Hz
- ✓ **# Participants:** 10
- ✓ **Machine Learning Algorithms:**
  - Multilayer Perceptron
  - Naïve Bayes
  - Bayes Net
  - Decision Table
  - Best-First Tree
  - K-star



# Feature Generation

Feature	Acceleration	Orientation
Mean	X, Y, Z	Azimuth, Pitch, Roll
Min	X, Y, Z	Azimuth, Pitch, Roll
Max	X, Y, Z	Azimuth, Pitch, Roll
Standard Deviation	X, Y, Z	Azimuth, Pitch, Roll
# Zero-Crossings	X, Y, Z	
Pair-wise Correlation	X/Y, X/Z, Y/Z	

# Results: Accuracy

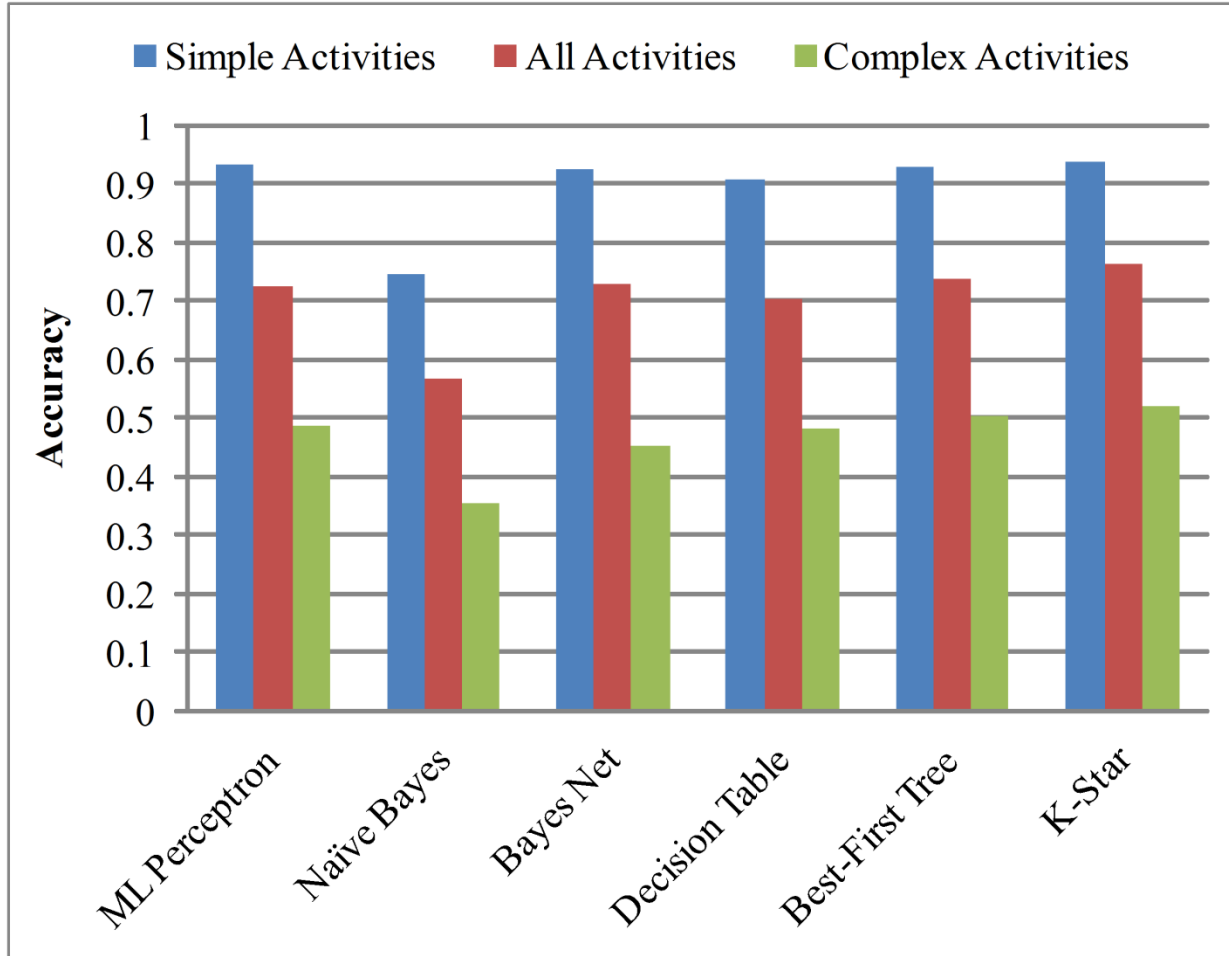


Figure: Performance of Different Classifiers

# Results: Sliding Window

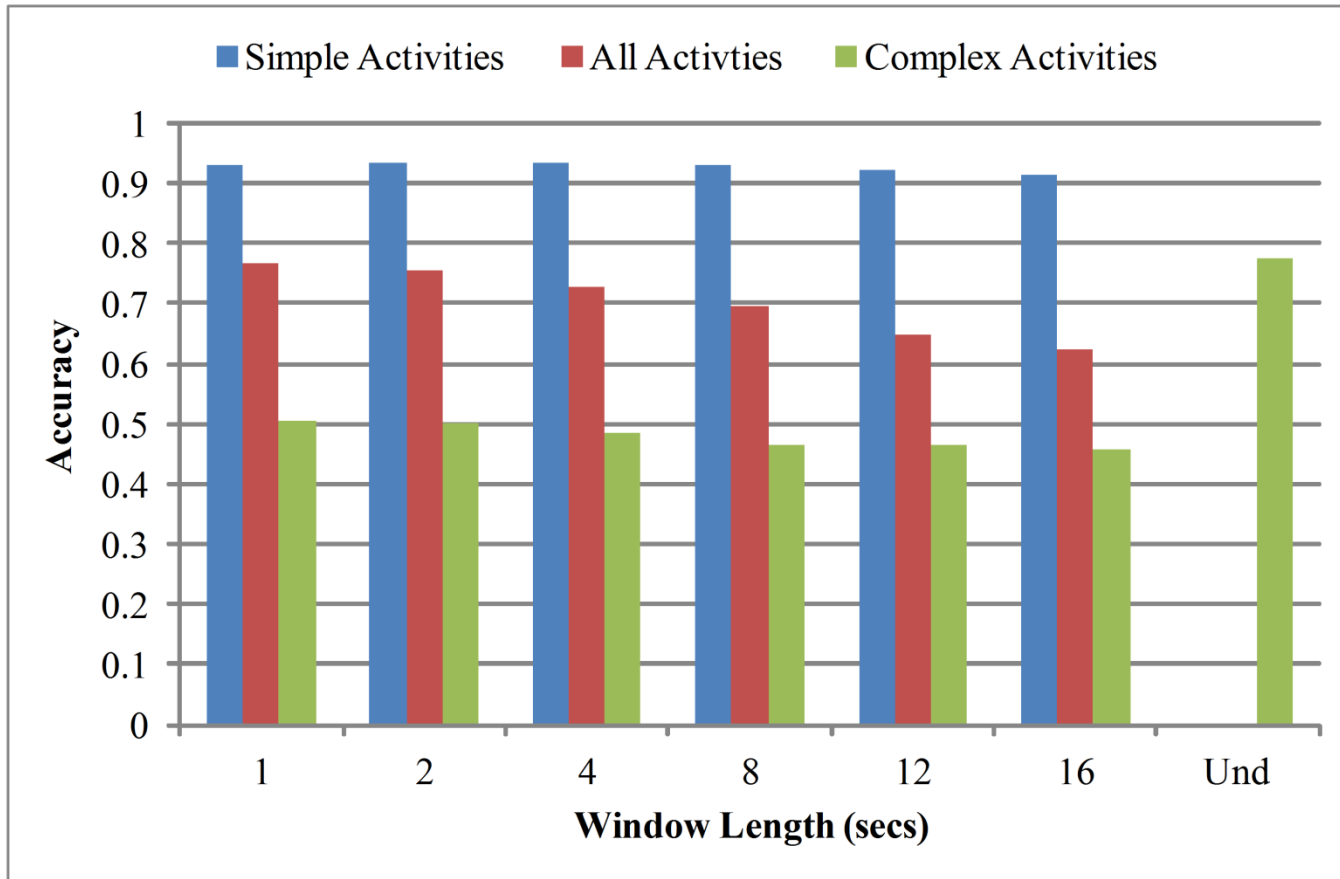


Figure: Classification Accuracies for K-star with Different Window Length.  
*Und* corresponds to the scenario when sliding window is not used

# Results: Orientation Data

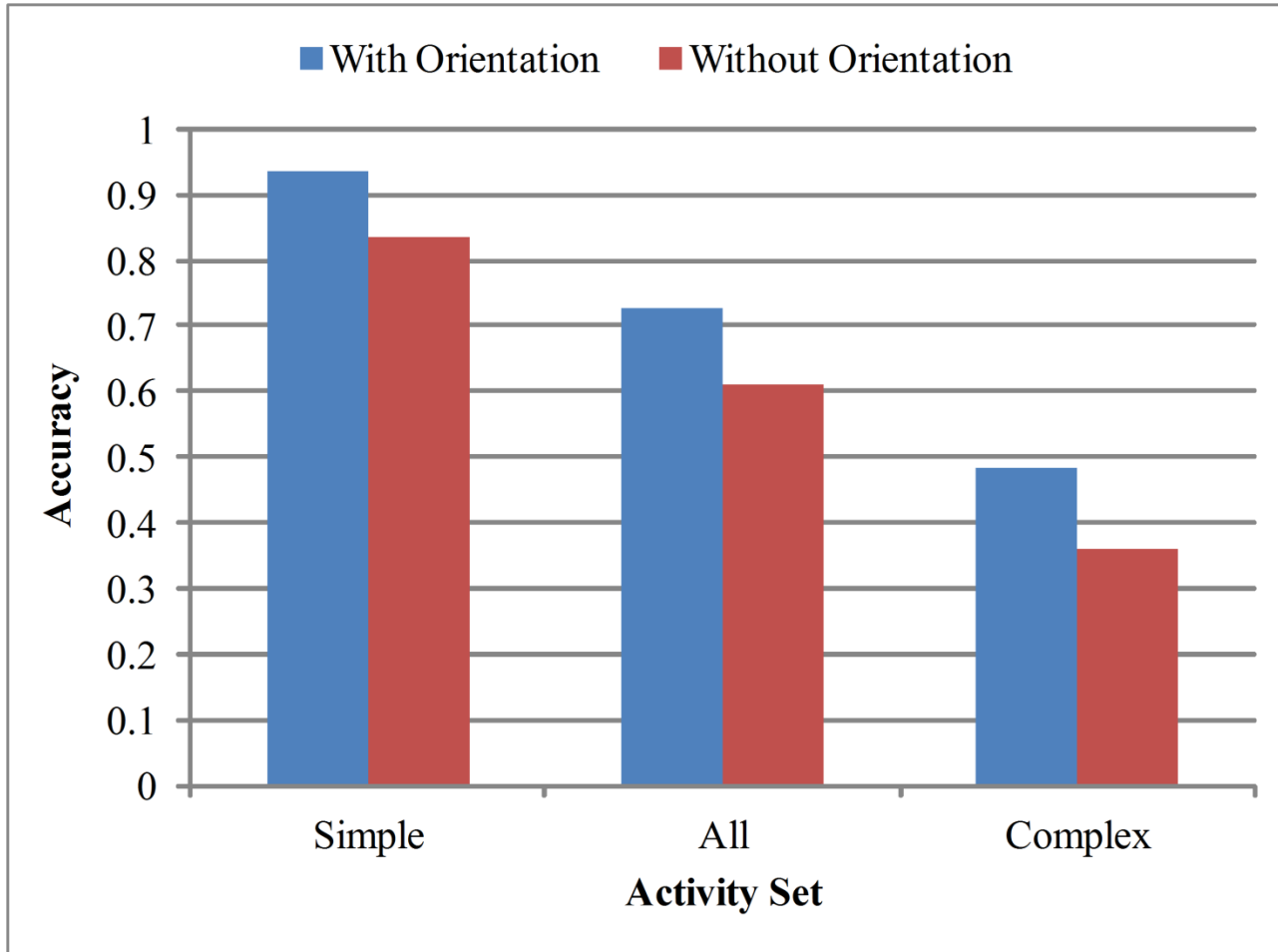


Figure: Accuracy of K-star with and without using orientation information from gyroscope

# Conclusion

- Simple activities recognized very accurately.
- Accuracy for complex activities not to high.
- However, indicates potential usage of phone sensor data.

# Contact Us

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