Title of Your Dissertation

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Approval

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Abstract

Your abstract goes here. Blah blah blah.

Dedication

I dedicate this thesis to my pets, Sparky and Coco.

Certificate of Originality

I hereby declare that this submission is my own work and to the best of my knowledge it contains no materials previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any degree or diploma at NUST SEECS or at any other educational institute, except where due acknowledgement has been made in the thesis. Any contribution made to the research by others, with whom I have worked at NUST SEECS or elsewhere, is explicitly acknowledged in the thesis.

I also declare that the intellectual content of this thesis is the product of my own work, except for the assistance from others in the project's design and conception or in style, presentation and linguistics which has been acknowledged.

Author Name: **Your Name Goes Here**
Signature: _____

Acknowledgment

I would like to thank my advisor, my parents, my friends and my pets. Blah blah blah ...

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Chapter 1

Introduction or the Name of your First Chapter

1.1 Name of the First Section of Your First Section

Over the past ten years blah blah blah blah.

1.2 The second section of your first chapter

There you go, getting boring already.

1.2.1 First subsection

While designing blah blah blah. We designed a classification algorithm for activity inference.

Chapter 2

Literature Review

2.1 Mobile Phone Sensors

In the past few years Mobile Phones have become an essential communication device. Previously, Goodwin, Velicer and Intille [2] used cell phones to record feelings and opinions of participants in behavioral studies, while [1] tracks recreation and tourism behavior by GPS enabled cell phones. Using cell phones as part of the study is unlikely to introduce health bias in a data set according to Lajunen et al. [3] furthermore, computer use did correlate with higher BMI results in young people, while cell phone use was only weakly linked.

Table 2.1 shows the number of activity traces collected for various activities, broken up by the phone placement.

$$\sigma_{ij} = \frac{1}{N-1} \sum_{n=1}^{N} \left(a_i[n] - \overline{a}_i\right)\left(a_j[n] - \overline{a}_j]\right) \tag{2.1}$$

The covariance matrix $\mathbf{C}$ is defined in terms of covariance terms as,

$$\mathbf{C} = \begin{bmatrix} \sigma_x^2 & \sigma_{xy} & \sigma_{xz} \\ \sigma_{yx} & \sigma_y^2 & \sigma_{yz} \\ \sigma_{zx} & \sigma_{zy} & \sigma_z^2 \end{bmatrix} \tag{2.2}$$

If $\mathbf{V}$ is the matrix of eigenvectors, then the matrix $\mathbf{A}$ of accelerometer signals is transformed into matrix $\mathbf{D}$ according to Equation 2.3.

$$\mathbf{D} = \mathbf{AV} \tag{2.3}$$

where

$$\mathbf{D} = \begin{bmatrix} d_1[n] & d_2[n] & d_3[n] \end{bmatrix} \mathbf{A} = \begin{bmatrix} a_x[n] & a_y[n] & a_z[n] \end{bmatrix} \tag{2.4}$$

Table 2.1: Data set of activity traces.

Activity \ Placement	Pant Pocket	Hand	Hand Bag	Shirt Pocket	Sub-total
Walking	25	20	15	20	**80**
Running	20	20	25	15	**80**
Climbing Stairs	15	25	15	10	**75**
Descending Stairs	15	20	15	10	**60**
Driving	10	10	20	25	**65**
Cycling	25	15	15	10	**65**
Inactive	20	20	25	20	**85**
TOTAL					**510**

Chapter 3

Implementation and Results

3.1 Classifier Training & Validation Strategy

3.1.1 Classifier Training

Machine learning algorithms are used to classify activities based on a feature set.

3.2 Performance Evaluation

For performance evaluation we used 10-fold validation.

Table 3.1: Detailed Accuracy By Class (Naïve Bayes).

Class	TP Rate	FP Rate	Precision	Recall	ROC Area
Walking	0.789	0.031	0.675	0.789	0.818
Running	1.000	0.000	1.000	1.000	0.999
Climbing Stairs	0.450	0.054	0.731	0.450	0.807
Descending Stairs	0.833	0.023	0.814	0.833	0.919
Driving	0.933	0.018	0.897	0.933	0.934
Cycling	1.000	0.000	0.880	1.000	0.992
Inactive	0.933	0.000	0.996	0.933	0.961
Weighted Average	**0.847**	**0.040**	**0.846**	**0.847**	**0.891**

Figure 3.1: Feature rank by information gain.

Table 3.2: Confusion matrix (Naive Bayes).

a	b	c	d	e	f	g	← Classified As Actual Activity ↓
59	0	6	5	1	0	0	a ← Walking
0	**50**	0	1	0	0	0	b ← Running
5	0	**34**	4	0	0	0	c ← Climbing Stairs
4	0	3	**29**	5	0	0	d ← Descending Stairs
0	0	0	0	**32**	0	4	e ← Driving
2	0	0	1	0	**20**	0	f ← Cycling
0	0	0	0	5	0	**30**	g ← Inactive

Chapter 4

Conclusions

4.1 This is the End

In this research we reported the design and implementation of.

Appendix A

Feature Extraction Walking

Features plotted in Matlab.

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