

**Manu Varma**

# **Kin Recognition Using Weighted Graph Embeddings**

Computer Science Tripos – Part II

St John's College

March 9, 2021

## **Declaration**

I, Manu Varma of St. John's College, being a candidate for Part II of the Computer Science Tripos, hereby declare that this dissertation and the work described in it are my own work, unaided except as may be specified below, and that the dissertation does not contain material that has already been used to any substantial extent for a comparable purpose.

Signed Manu Varma

Date March 9, 2021

# **Proforma**

Name: **Manu Varma**  
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Project Originator: **The Dissertation Author**  
Supervisor: **Daniel Bates**

## **Original Aims of the Project**

## **Work Completed**

## **Special Difficulties**



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# **Chapter 1**

## **Introduction**

**1.1 Problem Overview**

**1.2 Motivation**

**1.3 Related Work**

**1.4 Project Overview**





# Chapter 2

## Preparation

### 2.1 Starting Point

### 2.2 Neural Networks

### 2.3 Face Detection

### 2.4 Face Descriptors

#### 2.4.1 Local Binary Patterns

#### 2.4.2 Histogram of Gradients

#### 2.4.3 Scale-Invariant Feature Transform

#### 2.4.4 VGG

#### 2.4.5 CifarNet

### 2.5 K-Nearest Neighbors

### 2.6 Metric Learning

### 2.7 PCA

### 2.8 Requirements Analysis

### 2.9 Software Engineering Practices

#### 2.9.1 Tools Used

#### 2.9.2 Datasets

#### 2.9.3 Testing

#### 2.9.4 Licensing

# Chapter 3

## Implementation

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- 3.1 Repository Overview**
- 3.2 Overview of Workflow**
- 3.3 Face Descriptors**
- 3.4 WGEML**
- 3.5 Prediction**
- 3.6 Data Preparation**
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  - 3.6.4 Saving Results to Disc**
- 3.7 CifarNet Extension**



# **Chapter 4**

## **Evaluation**

### **4.1 Success Criterion**

### **4.2 Original Results**

### **4.3 Potential Biases in Datasets**

### **4.4 Ablation Studies**

#### **4.4.1 Blocking Face Descriptors**

#### **4.4.2 Blocking Parts of Images**

### **4.5 Replacing VGG**

### **4.6 Unit Tests**



# **Chapter 5**

## **Conclusion**

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### **5.1 Achievements**

### **5.2 Lessons Learnt**

### **5.3 Future Work**



# Bibliography



# **Appendix A**

## **Project Proposal**