

DAFTAR ISI

HALAMAN PENGESAHAN	iii
PERNYATAAN BEBAS PLAGIASI	iv
HALAMAN PERSEMBAHAN	v
PRAKATA	vi
DAFTAR ISI	viii
DAFTAR GAMBAR	xi
DAFTAR TABEL	xiii
DAFTAR LAMPIRAN	xiv
INTISARI	xvi
ABSTRACT	xvii
I. PENDAHULUAN	1
1.1. Latar Belakang	1
1.2. Pembatasan Masalah	2
1.3. Tujuan Penelitian	3
1.4. Tinjauan Pustaka	3
1.5. Metode Penelitian	5
1.6. Sistematika Penulisan	6
II. LANDASAN TEORI	8
2.1. Suara	8
2.2. Arah Mata Angin	9
2.3. Dasar – dasar Aljabar Matriks	11
2.3.1. Definisi Matriks	11
2.3.2. Transpos Matriks	11
2.3.3. Invers Matriks	12
2.3.4. Jenis Matriks	13
2.3.5. Operasi Matriks	15
2.4. Vektor	16
2.5. <i>Speech Recognition</i>	20
2.6. <i>Machine Learning</i>	21
2.7. <i>Deep Learning</i>	22
2.8. <i>Neural Network</i>	23

2.8.1.	Komponen Neural Network	25
2.8.2.	Fungsi Aktivasi	27
2.8.3.	<i>Backpropagation Learning</i>	30
2.8.4.	<i>Gradient Descent Learning</i>	31
2.9.	Klasifikasi	31
III.	EKSTRAKSI MEL FREQUENCY CEPTRUM COEFFICIENT (MFCC), CONVOLUTIONAL NEURAL NETWORK (CNN), DEEP LONG SHORT TERM MEMORY (LSTM), DAN REGRESI LOGISTIK MULTINOMIAL	33
3.1.	Ekstraksi Ciri Mel Frequency Ceptrum Coefficient (MFCC)	33
3.1.1.	<i>Sampling</i>	34
3.1.2.	<i>Pre-emphasis</i>	34
3.1.3.	<i>Frame Blocking</i>	34
3.1.4.	<i>Windowing</i>	35
3.1.5.	<i>Fast Fourier Transformation</i>	38
3.1.6.	<i>Mel Filter Bank</i>	39
3.1.7.	<i>Log</i>	40
3.1.8.	<i>Discrete Cosine Transform</i>	41
3.2.	Convolutional Neural Network (CNN)	41
3.2.1.	Lapisan Konvolusi	42
3.2.2.	Lapisan Pooling	45
3.2.3.	Lapisan Fully-Connected	47
3.2.4.	Regulasi Dropout	47
3.2.5.	Lapisan Softmax	48
3.2.6.	Cross Entropy Loss Function	50
3.3.	Long Short-Term Memory (LSTM)	51
3.4.	Deep Long Short-Term Memory (DLSTM)	54
3.5.	Regresi Logistik Multinomial	55
3.5.1	Uji Overall	58
3.5.2	Uji Parsial	58
IV.	STUDI KASUS	60
4.1	Deskripsi Data	60
4.2	Preprocessing Data dan Sampling	60
4.3	Ekstraksi Fitur Mel Frequency Ceptrum Coefficient (MFCC)	62
4.3.1	Preemphasis	62

4.3.2	<i>Fast Fourier Transformation (FFT)</i>	63
4.3.3	<i>Mel Filterbank</i>	65
4.3.4	<i>Log Mel Filterbank</i>	67
4.3.5	Koefisien MFCC	68
4.4	Analisis Klasifikasi	70
4.5	<i>Convolutional Neural Network (CNN)</i>	71
4.5.1	Proses pada Lapisan Konvolusi	73
4.5.2	Proses pada Lapisan <i>Pooling</i>	75
4.5.3	Proses pada Lapisan <i>Fully-Connected</i>	75
4.5.4	Hasil Klasifikasi <i>Convolutional Neural Network</i>	75
4.6	<i>Deep Long Short Term Memory (DLSTM)</i>	78
4.6.1	Hasil Klasifikasi <i>Deep Long Short Term Memory</i>	80
4.7	Regresi Logistik Multinomial	82
4.7.1	Model Regresi Skenario 1	83
4.7.2	Model Regresi Skenario 2	86
4.7.3	Model Regresi Skenario 3	90
4.7.4	Hasil Klasifikasi Regresi Logistik Multinomial.....	93
4.8	Perbandingan Klasifikasi Metode CNN dan DLSTM.....	94
V.	PENUTUP	96
5.1	Kesimpulan.....	96
5.2	Saran	97
VI.	DAFTAR PUSTAKA	98
VII.	LAMPIRAN.....	103