



DAFTAR ISI

HALAMAN PENGESAHAN	iii
HALAMAN PERNYATAAN	iv
HALAMAN PRAKATA	v
DAFTAR ISI.....	vi
DAFTAR TABEL.....	ix
DAFTAR GAMBAR	x
INTISARI.....	xii
ABSTRACT.....	xiii
BAB I PENDAHULUAN	1
1.1 Latar Belakang	1
1.2 Rumusan Masalah	4
1.3 Tujuan Penelitian.....	4
1.4 Batasan Masalah.....	4
1.5 Manfaat Penelitian.....	5
1.6 Metode Penelitian.....	5
1.7 Sistematika Penulisan.....	6
BAB II TINJAUAN PUSTAKA.....	8
BAB III LANDASAN TEORI.....	13
3.1 Pencitraan Medis	13
3.1.1 X-ray	13
3.1.2 Computed Tomography (CT).....	14
3.1.3 Magnetic Resonance Imaging (MRI).....	14
3.2 Image Super-Resolution	15
3.3 Transformer Architecture	16
3.3.1 Encoder dan Decoder	18
3.3.2 Attention Layer	19
3.4 Switthing Windows Transformer (Swin Transformer)	20
3.4.1 Swin Transformer Blocks (STB)	22
3.4.2 Layer Normalization (LN)	23
3.4.3 Multilayer Perceptron (MLP).....	23
3.4.4 Shifted Windows Self-Attention	24
3.4.5 SwinIR.....	25



3.4.6	Hybrid Attention Transformer	27
3.5	Convolutional Neural Network	28
3.5.1	Convolution Layer	30
3.5.2	Cascaded Asymmetric Convolution.....	31
3.6	Peak Signal-to-Noise Ratio (PSNR) & Structural Similarity Index (SSIM)	
	33	
3.7	Standard Deviation.....	34
3.8	T-test.....	34
BAB IV ANALISIS DAN PERANCANGAN	36
4.1	Analisis Sistem Penelitian	36
4.1.1	Deskripsi Umum Penelitian	36
4.1.2	Analisis Kebutuhan	37
4.2	Perancangan Sistem dan Model Penelitian	37
4.2.1	Mekanisme Akuisisi Data	37
4.2.2	Mekanisme Data Pre-processing.....	40
4.2.3	Mekanisme Pembagian Data.....	41
4.2.4	Mekanisme Perancangan Model	41
4.2.5	Mekanisme Pelatihan Model.....	42
4.3	Perancangan Pengujian Model Penelitian	43
BAB V IMPLEMENTASI.....		45
5.1	Perangkat Implementasi	45
5.2	Implementasi Sistem	45
5.2.1	Persiapan Library	45
5.2.2	Pembagian Data	46
5.2.3	Inisialisasi Kelas Dataset.....	47
5.2.4	Pre-processing Data	49
5.2.5	Pemuatan Dataloader	52
5.3	Implementasi Model.....	53
5.3.1	Drop Path	54
5.3.2	Channel Attention Block (CAB).....	55
5.3.3	Multilayer Perceptron.....	57
5.3.4	Cascaded Asymmetric Convolution (CAC).....	58
5.3.5	Window Attention.....	58
5.3.6	Hybrid Attention Block (HAB).....	61



5.3.7	Overlapping Cross-Attention Block (OCAB).....	63
5.3.8	Patch Embedding dan Unembedding	66
5.3.9	Residual Hybrid Attention Group	68
5.3.10	Upsampling	71
5.3.11	Overall Network.....	72
5.4	Implementasi Pelatihan Model.....	78
5.5	Implementasi Pengujian Model.....	81
5.5.1	PSNR.....	81
5.5.2	SSIM	82
	BAB VI HASIL DAN PEMBAHASAN	84
6.1	Hasil Data Pre-processing	84
6.2	Inisialisasi Parameter.....	85
6.2.1	Parameter Jaringan	85
6.2.2	Parameter Pelatihan.....	86
6.3	Hasil Pengujian	87
	BAB VII KESIMPULAN DAN SARAN	97
7.1	Kesimpulan.....	97
7.2	Saran.....	98
	DAFTAR PUSTAKA	99