

CONTENTS

Agreement Page	
Originality Statements	
ABSTRACT	iv
PREFACE	v
Contents	vii
List of Figures	ix
List of Tables	x
1 INTRODUCTION	1
1.1 Background	1
1.2 Problem Formulation	3
1.3 Objectives	3
1.4 Scope of Research	3
1.5 Research Methods	4
List of Appendices	1
2 BASIC CONCEPT	5
2.1 Manufacturing of steel	5
2.2 Deep Learning	6
2.3 Convolutional Neural Network(CNN)	7
2.4 MMDetection	9
2.4.1 Multi-Stage Deep Learning	10
2.4.2 Faster R-CNN	11
2.4.3 Cascade R-CNN	13
2.4.4 DetectoRS	14
2.4.5 ResNet	15
2.4.6 ResNeXt	17

3	SYSTEM DESIGN	19
3.1	System Design	19
3.1.1	Data Acquisition	19
3.1.1.1	Crazing	20
3.1.1.2	Inclusion	21
3.1.1.3	Patches	21
3.1.1.4	Pitted Surface	22
3.1.1.5	Rolled in scale	23
3.1.1.6	Scratches	23
3.1.2	Pre-proccesing	24
3.1.3	Classification using Multi-stage Deep Learning	25
3.1.3.1	Setup Environment for Training and Testing	26
3.1.3.2	Training using Multi-stage Deep Learning	26
3.2	Performance Testing Parameters	28
3.2.1	Accuracy	28
3.2.2	Precision	28
3.2.3	Recall	29
3.2.4	mAP	29
3.2.5	Fps	30
3.3	System Description	30
4	PERFORMANCE EVALUATION	31
4.1	Model Evaluation	31
4.2	Backbone Evaluation	33
4.3	Evaluation using DetectoRS	34
4.3.1	Comparing Faster RCNN	35
4.4	Evaluation DetectoRS Cascade RCNN	36
4.5	Evaluation Pretrained Model	37
4.6	Research result	38
5	CONCLUSIONS	39
5.1	Conclusion	39
5.2	Suggestion	39
	Bibliography	40
	Appendix	