딥러닝 기반 객체 탐지 모델을 활용한 HTP 심리 검사

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Introduction

HTP(House-Tree-Person) Drawing Test

Draw House, Tree, Person.
Then, can analyze picture for diagnose mental illness.

- Nonverbal test
- Easy and fast
- Projective test (reduce wariness)
- Subjective interpretation
  (Various Evaluation Indicators)

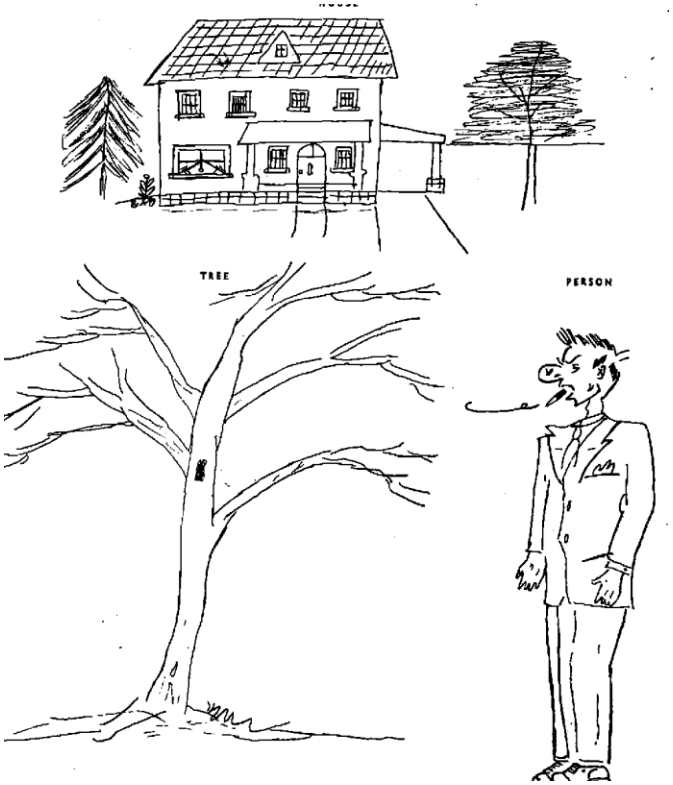
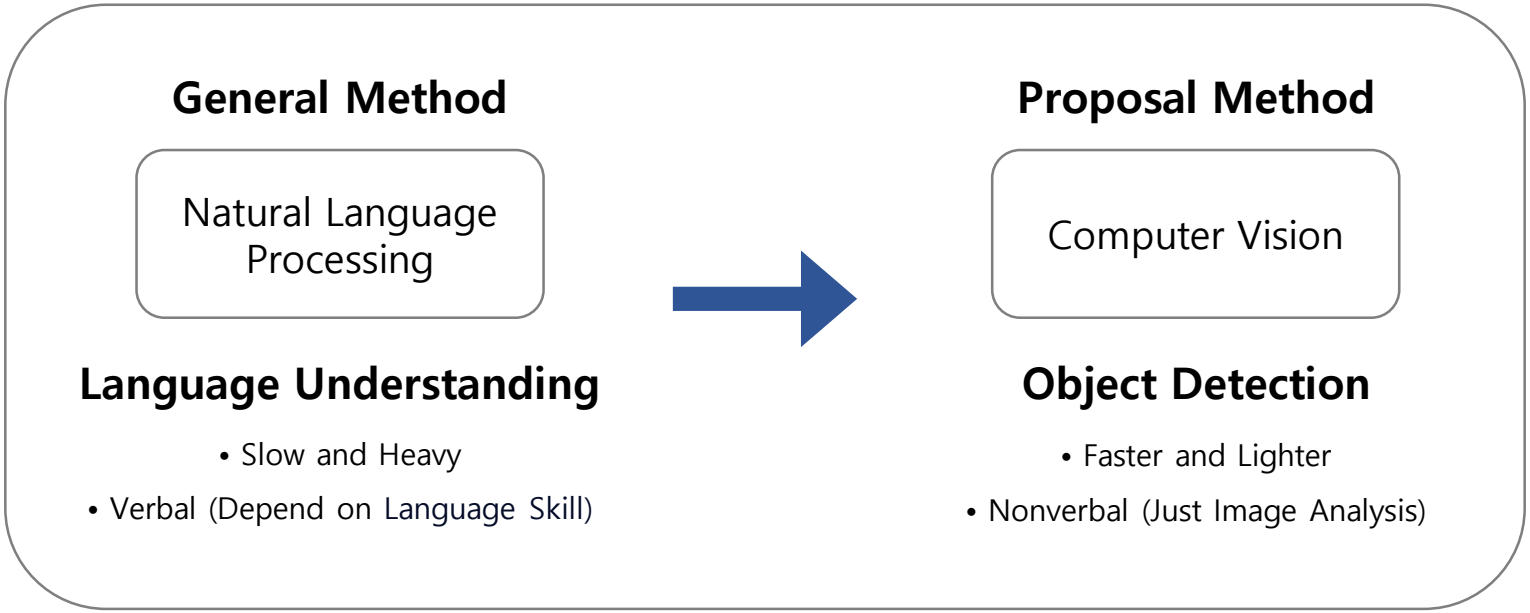


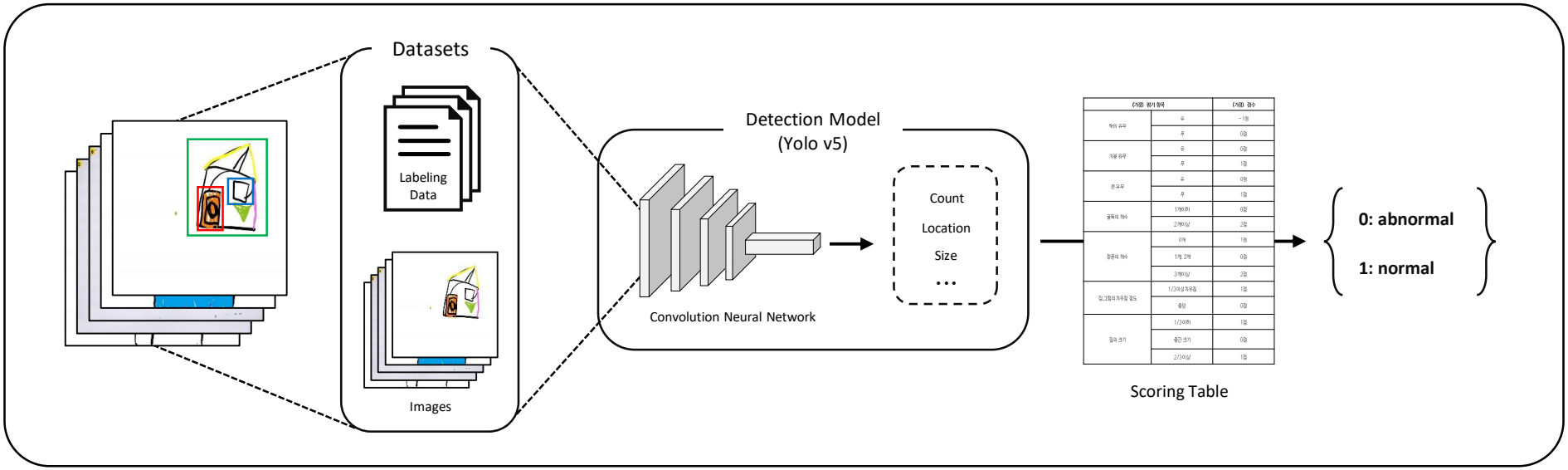
Image Source : J.N Buck, "The H-T-P test", Published in Journal of Clinical , 1 April 1948

Introduction

Psychological Testing Using AI



Proposed Method



Step1. Train the YOLO v5 model with pictures of HTP tests and labeled data.

Step2. Detect objects such as door, windows, roofs from new input pictures.

Step3. Extract information such as class, coordinate, number of classification.

Step4. Calculate using scoring table to determine whether it is normal of abnormal.

Proposed Method

Scoring Table for Diagnosis

Since accurate evaluation items have not been regulated, this paper assumed scoring table and uses them as an evaluation standard to determine whether a person has a mental illness.

Scores are given according to each evaluation items and determines that a person has a mental illness if the score is 4 or higher.

(가정) 평가 항목		(가정) 점수
해의 유무	유	-1점
	무	0점
지붕 유무	유	0점
	무	1점
문 유무	유	0점
	무	1점
굴뚝의 개수	1개 이하	0점
	2개 이상	2점
창문의 개수	0개	1점
	1개, 2개	0점
	3개 이상	2점
집 그림의 치우침 정도	1/3 이상 치우침	1점
	중앙	0점
집의 크기	1/3 이하	1점
	중간 크기	0점
	2/3 이상	1점

Scoring Table for Diagnosis
(assumed)

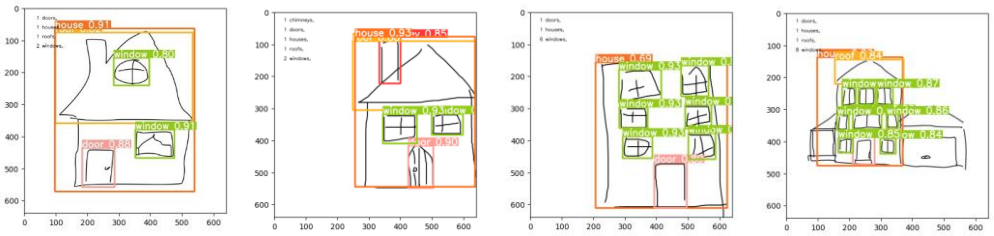
Experiments

In Tesla T4 GPU environment,
train 432 pieces of labeled images on the
pre-trained YOLO v5 model to increase accuracy.

Precision	Recall	mAP@.5	FPS
79.36%	74.62%	73.32%	101

Evaluation Metrics

Can see very significant results from the table and detected results (images).



Detected Results (Images)

Image Name	Points	Test Result
test1.ipg	1	Normal
test2.jpg	3	Normal
test3.ipg	2	Normal
test4.jpg	1	Normal
test5.ipg	**4**	**Mental illness**
test6.jpg	2	Normal
test7.ipg	3	Normal
test8.jpg	**6**	**Mental illness**
test9.ipg	0	Normal
test10.jpg	3	Normal

Diagnostic Results (Table)

After detect and extract information from images, scores are given according to each evaluation items and determined.
Because test5 and test8 received a score of 4 and 6, they were judged to have mental illness.

Conclusion

Despite low quality and small amount of dataset, high detection rate and high accuracy shown. But, scoring method is not good for diagnosis and, also evaluation items for diagnose have not been regulated.

- Proposed method in this paper -

Step1. Train the YOLO v5 model with pictures of HTP tests and labeled data.

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"Must be developed"

Future Research Direction :

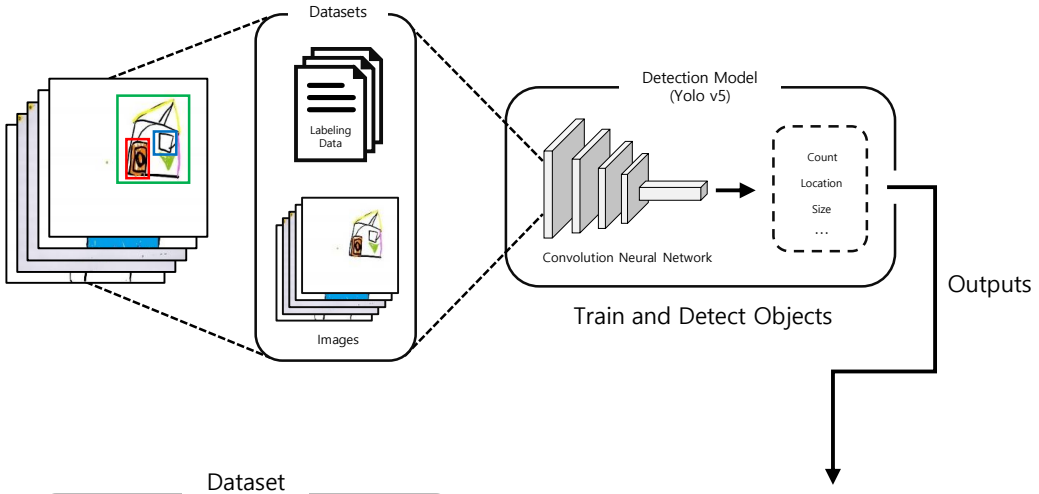
- Create regression model using actual HTP test results data.(It contains information of objects & disease name)
- Input the output from step3. into regression model and predict disease

Expected Results

- More Accurate Diagnosis
- Diagnose Various Diseases

Conclusion

Future Research Direction



Create Regression Model Using Actual HTP Test Results Data

Future Research Direction

- More Accurate Diagnosis
- Diagnose Various Diseases

Expected Results