

THAI SIGN LANGUAGE RECOGNITION FROM VIDEO

BADS7203 Image and Video Analytic

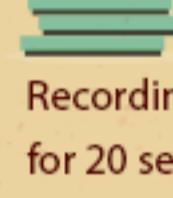
INTRODUCTION

Since we found that the previous research on sign language translation related to Thai is minimal, the researchers were interested in designing the subject to translate Thai sign language using data from video image analysis. This study focuses on Sign language recognition (SLR), a translation of words that the communicator wants to communicate from a video that shows the gestures of the communicator, which is a basic sign language translation and will also be able to extend to more detailed tasks in the future.

PROJECT SCOPE

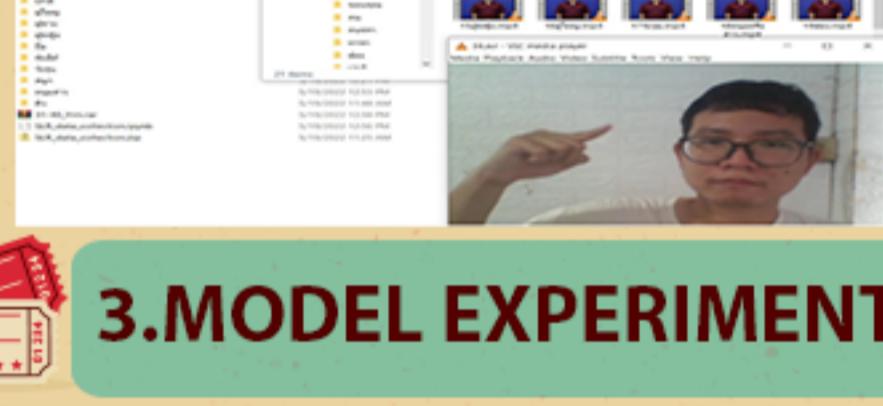
This study would focus on SLR using the created 20 gestures of sign language dataset, which consists of child(เด็ก), friend(เพื่อน), sad(เศร้า), lover(คนรัก), angry(โกรธ), sorry(ขอโทษ), thanks(ขอบคุณ), person(คน), old person(คนแก่), infant(ทารก), brother/sister(พี่น้อง), adult(ผู้ใหญ่), men(ผู้ชาย), women(ผู้หญิง), smile(ยิ้ม), cry(ร้องไห้), adolescence(วัยรุ่น), fun(สนุก), youthful(หนุ่มสาว), hungry(หิว). Therefrom, apply the Deep learning models namely, LSTM, RNN, and GRU to compare each model's performance by a confusion matrix.

WORKING PROCESS



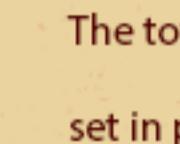
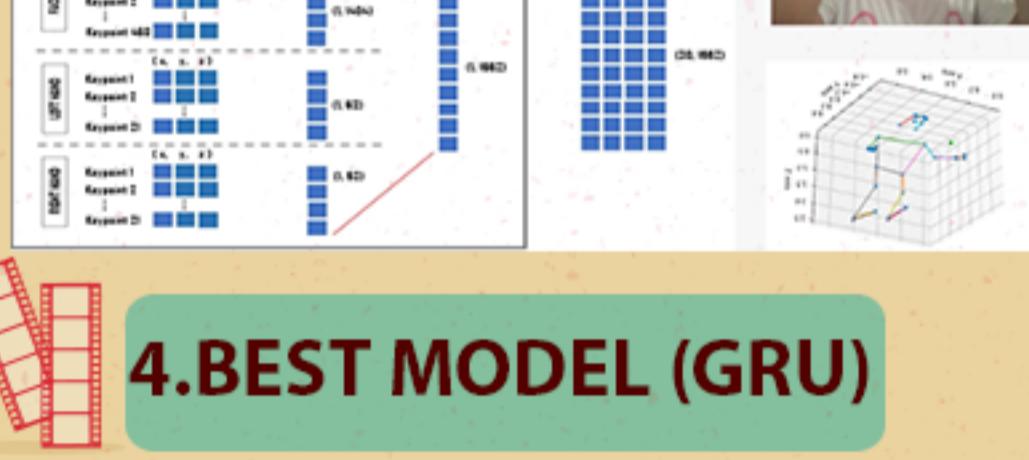
1.COLLECTING DATA

Recording the short video clip, 3 seconds with 30 fps each, for 20 selected Thai sign language words and a normal pose, a total of 21 categories.



2.EXTRACTING KEYPOINT

Applying the media pipe to extract the key points representing the action of hands, arms, and face.



3.MODEL EXPERIMENT

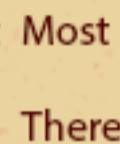
The total 1,050 data will be split into training, validation, and test. Most predictions look fine / the test set accuracy is 84%.

set in portion 80: 10: 10 accordingly. Then, it will be used for training 3 deep learning models, namely LSTM, RNN, and GRU. The generated model will be evaluated as optimizer = Adam, loss = categorical crossentropy, metrics = categorical accuracy, with epoch = 200, batch size = 32, random state = 42.

| Model: "sequential_A" | Output Shape | Param # |
|---------------------------|----------------|---------|
| Layer (Type) | | |
| lstm_11 (LSTM) | (None, 36, 32) | 234968 |
| lstm_12 (LSTM) | (None, 64) | 24832 |
| dense_32 (Dense) | (None, 64) | 4368 |
| dense_33 (Dense) | (None, 32) | 2088 |
| dense_34 (Dense) | (None, 21) | 483 |
| Total params: 249,725 | | |
| Trainable params: 248,725 | | |
| Non-trainable params: 0 | | |

| Model: "sequential_A" | Output Shape | Param # |
|---------------------------|-----------------|---------|
| Layer (Type) | | |
| simple_rnn_13 (SimpleRNN) | (None, 36, 328) | 229248 |
| simple_rnn_14 (SimpleRNN) | (None, 256) | 98568 |
| dense_39 (Dense) | (None, 128) | 32096 |
| dense_40 (Dense) | (None, 64) | 8256 |
| dense_41 (Dense) | (None, 23) | 1365 |
| Total params: 376,325 | | |
| Trainable params: 376,325 | | |
| Non-trainable params: 0 | | |

| Model: "sequential_B" | Output Shape | Param # |
|---------------------------|----------------|---------|
| Layer (Type) | | |
| lstm_13 (LSTM) | (None, 36, 32) | 234968 |
| lstm_14 (LSTM) | (None, 64) | 24832 |
| dense_42 (Dense) | (None, 64) | 4368 |
| dense_43 (Dense) | (None, 32) | 2088 |
| dense_44 (Dense) | (None, 21) | 483 |
| Total params: 249,725 | | |
| Trainable params: 248,725 | | |
| Non-trainable params: 0 | | |



4.BEST MODEL (GRU)

There is some confusion between predicting class "ขอโทษ" and "ขอบคุณ" since both classes have only a facial posture difference. The lowest precision class is "แม่น" (0.43) due to a similar initial hand movement to class "เด็ก" and "娘". The lowest recall classes "ขอโทษ", "ผู้ชาย", "หนุ่มสาว" and "娘" (0.5) because these classes have a similar posture to other classes.

| | precision | recall | f1-score | support |
|---|-----------|--------|----------|---------|
| ขอโทษ | 0.67 | 0.67 | 0.67 | 6 |
| 恩 | 1.00 | 1.00 | 1.00 | 5 |
| 宋 | 1.00 | 1.00 | 1.00 | 2 |
| 泰國 | 0.67 | 1.00 | 0.88 | 6 |
| 泰國人 | 1.00 | 1.00 | 1.00 | 5 |
| 泰國舞 | 0.80 | 0.50 | 0.62 | 8 |
| 泰國舞者 | 0.62 | 0.83 | 0.73 | 6 |
| 宋 | 0.43 | 1.00 | 0.60 | 3 |
| 宋舞 | 0.89 | 1.00 | 0.94 | 8 |
| 宋舞者 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國 | 0.67 | 0.67 | 0.67 | 6 |
| 宋舞泰國人 | 1.00 | 0.60 | 0.75 | 5 |
| 宋舞泰國舞 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞者 | 0.67 | 0.67 | 0.67 | 4 |
| 宋舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國人 | 0.83 | 0.83 | 0.83 | 3 |
| 宋舞泰國舞泰國舞 | 0.67 | 0.50 | 0.57 | 4 |
| 宋舞泰國舞泰國舞者 | 1.00 | 0.50 | 0.67 | 4 |
| 宋舞泰國舞泰國舞泰國 | 0.88 | 1.00 | 0.93 | 7 |
| 宋舞泰國舞泰國舞泰國人 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞 | 0.67 | 0.67 | 0.67 | 6 |
| 宋舞泰國舞泰國舞泰國舞者 | 1.00 | 0.60 | 0.75 | 5 |
| 宋舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 4 |
| 宋舞泰國舞泰國舞泰國舞泰國舞 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞者 | 0.83 | 0.83 | 0.83 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 4 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞者 | 0.88 | 1.00 | 0.94 | 7 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 6 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞者 | 0.88 | 1.00 | 0.94 | 7 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 6 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞者 | 0.88 | 1.00 | 0.94 | 7 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 6 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞者 | 0.88 | 1.00 | 0.94 | 7 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 6 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞者 | 0.88 | 1.00 | 0.94 | 7 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 6 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞者 | 0.88 | 1.00 | 0.94 | 7 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 6 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞者 | 0.88 | 1.00 | 0.94 | 7 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 6 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞者 | 0.88 | 1.00 | 0.94 | 7 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 6 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞者 | 0.88 | 1.00 | 0.94 | 7 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 6 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞 | 1.00 | 1.00 | 1.00 | 3 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞者 | 0.88 | 1.00 | 0.94 | 7 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國 | 1.00 | 1.00 | 1.00 | 2 |
| 宋舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國舞泰國人 | 0.67 | 0.67 | 0.67 | 6 |