

# HTRやってみた

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まずこのまえ読んだ論文についてみてきた

でも知識蒸留に関してはstudentはteacherに性能が劣りやつてる理由が計算効率・運用・デプロイメントにおいて利点があるのみで精度向上におけるメリットが見受けられなかつたためteacherモデルのみでの構築を行つた。

モデルは前の論文を参考にして構築した

$[(\text{Conv} \rightarrow \text{ReLU} \rightarrow \text{SE} \rightarrow \text{MaxPooling}) \times 5] \rightarrow \text{Permute/Reshape} \rightarrow \text{Linear} \rightarrow \text{PosEnc}$   
 $\rightarrow \text{BiLSTM} \rightarrow \text{Multi-Head Attention} \rightarrow \text{Linear}$

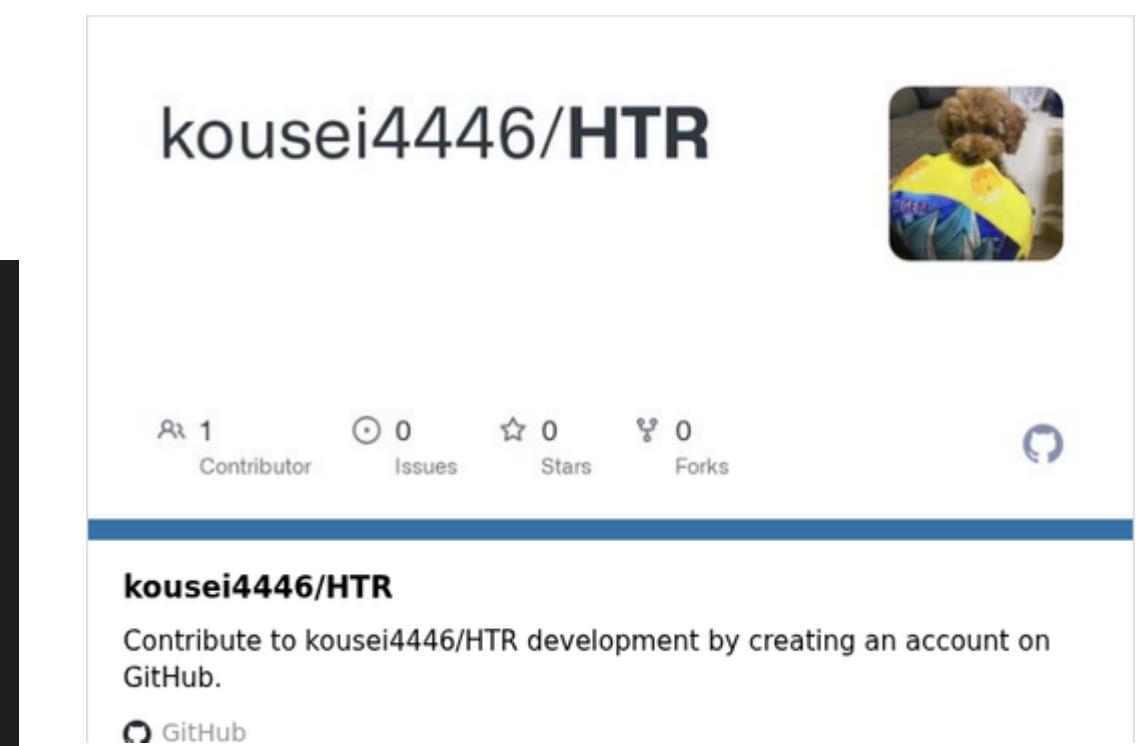
損失関数：CTCロス

$$\mathcal{L}_{\text{ctc}} = -\log(p(\mathbf{y}|\mathbf{X})).$$

Project Structure

```
| htr/
|   +-- models/      # library package
|   |   +-- teacher.py / blocks.py
|   |   +-- reader.py (Bentham loader)
|   |   +-- dataloader.py
|   +-- datasets/
|   +-- utils/
|   +-- scripts/
|       +-- train_teacher.py
|       +-- infer_demo.py  # inference demo
|   +-- data/          # dataset root (git-ignored)
```

プロジェクト構成 (README記載)



ソースコード

# モデルのコード部分

```
class TeacherModel(nn.Module):
    """HTR-JAND *Teacher* モデル - 論文 Sec. III-B および Fig. 3 に忠実な実装。"""

    def __init__(self, vocab_size: int, img_h: int = 64):
        super().__init__()

        # 同じ構造のCNNブロックを繰り返し作成するためのヘルパー関数
        def block(in_ch, out_ch, pool):
            layers = [
                FullGatedConv2d(in_ch, out_ch),
                nn.BatchNorm2d(out_ch),
                nn.ReLU(inplace=True),
                SEBlock(out_ch),
            ]
            if pool is not None:
                layers.append(nn.MaxPool2d(pool))
            return nn.Sequential(*layers)

        # ----- CNN encoder -----
        self.encoder = nn.Sequential(
            block(1, 32, (2, 2)),      # 64xW → 32xW/2
            block(32, 64, (2, 2)),     # 32xW/2 → 16xW/4
            block(64, 128, (2, 2)),    # 16xW/4 → 8xW/8
            block(128, 128, (2, 1)),   # 8xW/8 → 4xW/8 (height-only)
            block(128, 256, None),     # 4xW/8 → 4xW/8
        )

        feat_h = img_h // 16          # 64 → 4 after pooling schedule
        self.proj = nn.Linear(256 * feat_h, 256)

        # ----- Bi-LSTM -----
        self.lstm = nn.LSTM(
            input_size      = 256,
            hidden_size     = 128,
            num_layers      = 4,
            dropout         = 0.2,
            bidirectional   = True,
            batch_first     = True,
        )

        # attention 構造
        self.pos = PositionalEncoding(256)
        self.attn = CombinedAttention(256, heads=2)

        # 分類器
        self.fc = nn.Linear(256, vocab_size)

    def forward(self, x):           # x: (B, 1, H, W)
        f = self.encoder(x)         # (B, 256, h=4, w)
        b, c, h, w = f.size()
        f = f.permute(0, 3, 1, 2).reshape(b, w, c * h)  # (B, T, 1024)
        f = self.proj(f)             # (B, T, 256)
        f = self.pos(f)
        f, _ = self.lstm(f)          # (B, T, 256)
        f = self.attn(f)              # (B, T, 256)
        logits = self.fc(f)           # (B, T, V)
        return logits.log_softmax(2)
```

# データセット

Bentham データセットをとってきた  
zenodoってところから

# 推論結果

## データセット内のデータ

*of Exchequer Bills, in respect of size.*

笔 Predicted Text:

1

love

笔 Predicted Text:

(

hungry

笔 Predicted Text:  
twrgy

## 手書き文章

We are such stuff  
As dreams are made on  
And our little life  
Is rounded with sleep.

笔 Predicted Text:  
§ gi .

Something I was happy to hear today. The thing is that I was invited by Kouno, who is senior at part-time job. He invited me to a hackathon. The hackathon is about making an application using Google AI. The event offers a prize of 500,000 yen and is great chance to improve AI skill and team development skills. I'm looking forward to developing an app. There, I want show them my high skill and be told, "You are such a great engineer". Also, I want to earn the trust of my part-time job members and be entrusted development of app in part-time job.

At my other part-time job, there was another part-time job. I met Misaki. She is so cute and asked me to go to the station together. Going to the station together was really fun. It was so rainy but I had a only broken umbrella. Even so, she smiled and it warmed my heart. I think she must be an angel. I am to resign this part-time job after three weeks. I felt a bit lonely thinking that there is only three weeks left.

笔 Predicted Text:  
4e

## PCによる英文・単語

I am hungry.

笔 Predicted Text:  
:or .

## GPT作の英単語

hungry

笔 Predicted Text:  
turgy.

# 推論結果

## 考察

hungryなど単語かつ筆記体の文字については一番精度としてよい  
文章は全く認識できていない模様

データセットに偏りがあるまたはデータ読み込み処理がうまくできていないのでは??

## 原因調査

ランダムに20件データ画像と  
その画像に対応するラベルを表示  
(特段変な画像やラベルと画像との  
乖離はなさそう....)



## 今後の展望

文字ごとの画像に特化したデータセットを構築し、それ用いて事前学習を行うことで、モデルの基礎的な文字認識能力の強化が図れるのでは？？

てかそもそもそんなデータセットあるの？？（要検討）