

View Reviews

Paper ID

239

Paper Title

Local Binary Pattern Networks for Character Recognition

Track Name

First Round Submission

Reviewer #1

Questions

1. PAPER SUMMARY What is the paper about? Please, be concise (2 to 3 sentences).

This paper proposes convolutional neural networks with binary weights and activations to reduce the computational and storage cost during inference based on local binary patterns. The sampling patterns are data-driven. The experiment results show the effectiveness and efficiency of the proposed method.

2. PAPER STRENGTHS Please discuss, justifying your comments with the appropriate level of details, the strengths of the paper (i.e. novelty, theoretical approach and/or technical correctness, adequate evaluation, clarity, etc).

1. The proposed method significantly enhances the computational efficiency and reduces the storage cost by applying binary test instead of conventional convolutions.
2. The sampling patterns are self-adaptive so that the discriminative power are stronger than LBCNN.
3. The theoretical analysis is provided to prove the effectiveness of the proposed method.

3. PAPER WEAKNESSES Please discuss, justifying your comments with the appropriate level of details, the weaknesses of the paper (i.e. lack of novelty – given references to prior work-, lack of novelty, technical errors, or/and insufficient evaluation, etc). Note: If you think there is an error in the paper, please explain why it is an error.

1. The experiment is not convincing. As the computational cost of large CNNs is heavy, the quantization is usually applied for those networks. However, large networks such as VGG and ResNet are not compared in the experiment. Meanwhile, largescale dataset such as ImageNet is not used in the experiment.
2. The writing is not clear. There are many details that need to be explained clearly. pHow does the predefined table of the random mapping trained?

4. RECOMMENDATION

Borderline

5. JUSTIFICATION Justify your recommendation based on the strengths and weaknesses. Please be considerate to the authors and provide constructive feedback.

The proposed method makes contributions to increasing the computational and storage cost significantly. However, the lack of experiment analysis and results degrades the quality.

6. REVISION OPTION - QUESTION ONE If not accepted in this first round, should the paper be invited to resubmit a revised version of the paper? It would then be considered by the same reviewers and area chair. REVISION PREFERRED. Paper is close and does not need significant improvements.

7. REVISION OPTION - QUESTION TWO Please clearly indicate the issues that you feel should be addressed in a revised version such that the paper could potentially be considered for acceptance.

The authors should enhance their writing and conduct more experiments in challenging datasets and in largescale CNNs.

Questions

1. PAPER SUMMARY What is the paper about? Please, be concise (2 to 3 sentences).

The paper proposes LBPNet for character recognition, which uses learnable local binary patterns for feature extraction instead of convolutions. LBPNet is light-weight and compact and achieves accuracies comparable to CNN based approaches for character recognition tasks.

2. PAPER STRENGTHS Please discuss, justifying your comments with the appropriate level of details, the strengths of the paper (i.e. novelty, theoretical approach and/or technical correctness, adequate evaluation, clarity, etc).

1. This paper presents an interesting alternative to convolutions in deep neural networks.
2. Since LBP involves only logic operations, it is much faster than and has far fewer parameters than conventional CNNs.
3. The accuracies on character recognition datasets as reported in the paper are very close to those achieved by deep neural networks.

3. PAPER WEAKNESSES Please discuss, justifying your comments with the appropriate level of details, the weaknesses of the paper (i.e. lack of novelty – given references to prior work-, lack of novelty, technical errors, or/and insufficient evaluation, etc). Note: If you think there is an error in the paper, please explain why it is an error.

I have a few concerns regarding the experimental results:

1. What is the reason behind choosing a network structure of 39-40-80?
2. The baseline CNN has been made to match the architecture of LBPNet (again 39-40-80). However, a comparison with state-of-the-art is missing for most of the datasets. Especially for tasks like face recognition, it is known that deeper CNNs perform better. It therefore makes sense to take a deeper model as baseline, build an LBPNet with a similar architecture, and compare the performance.

4. RECOMMENDATION

Strong Accept

5. JUSTIFICATION Justify your recommendation based on the strengths and weaknesses. Please be considerate to the authors and provide constructive feedback.

The reported results look promising in terms of memory and inference speed. While the authors have shown that LBPNet achieves acceptably high accuracies for simpler tasks and small networks, it would be good to analyze the performance on deeper networks.

6. REVISION OPTION - QUESTION ONE If not accepted in this first round, should the paper be invited to resubmit a revised version of the paper? It would then be considered by the same reviewers and area chair.

REVISION PREFERRED. Paper is close and does not need significant improvements.

7. REVISION OPTION - QUESTION TWO Please clearly indicate the issues that you feel should be addressed in a revised version such that the paper could potentially be considered for acceptance.

Please refer to the paper's weaknesses mentioned earlier. Also, there are a few minor comments:

Sec 3.3, line 410: under controlled --> under control

Sec 4.2, line 504: and move all --> and moving all

Sec 5.2, line 637: on the three datasets is shown in Table 3 --> Table 3 only reports results on a single dataset

Questions

1. PAPER SUMMARY What is the paper about? Please, be concise (2 to 3 sentences).

The authors propose a convolution-free neural network consisting of learnable LBP kernel with space and time efficiency. The networks are evaluated on various datasets for character recognition, face and pedestrian recognition, traffic sign etc. and show good performance compared to baseline.

2. PAPER STRENGTHS Please discuss, justifying your comments with the appropriate level of details, the strengths of the paper (i.e. novelty, theoretical approach and/or technical correctness, adequate evaluation, clarity, etc).

1. Good performance for a network that does not consist of a convolution, and is space and time efficient.
2. Impressive implementation since none of the existing deep learning libraries can be utilized.
3. Results on wide variety of datasets.
4. Can be implemented on FPGAs with significant acceleration over CNNs.

3. PAPER WEAKNESSES Please discuss, justifying your comments with the appropriate level of details, the weaknesses of the paper (i.e. lack of novelty – given references to prior work-, lack of novelty, technical errors, or/and insufficient evaluation, etc). Note: If you think there is an error in the paper, please explain why it is an error.

Implementation or reproduction of these results may be extremely difficult since none of the deep learning libraries can be used.

Apart from just accuracy, it would be better to present discussions on noise sensitivity, need for regularization, effect of absence (and presence) of data augmentation etc.

Do the random projections work as an implicit regularizers?

4. RECOMMENDATION

Strong Accept

5. JUSTIFICATION Justify your recommendation based on the strengths and weaknesses. Please be considerate to the authors and provide constructive feedback.

Good formulation, experiments, results. See strengths and weaknesses.

6. REVISION OPTION - QUESTION ONE If not accepted in this first round, should the paper be invited to resubmit a revised version of the paper? It would then be considered by the same reviewers and area chair.

REVISION PREFERRED. Paper is close and does not need significant improvements.

7. REVISION OPTION - QUESTION TWO Please clearly indicate the issues that you feel should be addressed in a revised version such that the paper could potentially be considered for acceptance.

See weaknesses section.

Reviewer #7

Questions

1. PAPER SUMMARY What is the paper about? Please, be concise (2 to 3 sentences).

This paper proposes local Binary Networks (LBPNet) for character recognition, aiming to provide an important means to improve memory efficiency and inference speed. Specifically, it uses local binary comparisons and random projections in place of conventional convolution operations. Evaluations on several character recognition benchmark datasets and object classification datasets demonstrate the effectiveness and efficiency of LBP.

2. PAPER STRENGTHS Please discuss, justifying your comments with the appropriate level of details, the strengths of the paper (i.e. novelty, theoretical approach and/or technical correctness, adequate evaluation, clarity, etc).

This paper is fairly well written. The proposed method is novel in its learnable LBP kernel, and the effectiveness of LBPNNet's learning is proved via the optical flow theory and gradient descent. The results look good and the comparisons with CNN baselines are thoroughly conducted to prove its effectiveness.

3. PAPER WEAKNESSES Please discuss, justifying your comments with the appropriate level of details, the weaknesses of the paper (i.e. lack of novelty – given references to prior work-, lack of novelty, technical errors, or/and insufficient evaluation, etc). Note: If you think there is an error in the paper, please explain why it is an error.

I cannot see any significant weakness of the paper. A minor suggestion is that the form of references should be double-checked.

4. RECOMMENDATION

Weak Accept

5. JUSTIFICATION Justify your recommendation based on the strengths and weaknesses. Please be considerate to the authors and provide constructive feedback.

This paper proposes novel local binary pattern networks and shows promising results in character recognition. Since I am not an expert in character recognition, I will learn other reviews during rebuttal. So far I cannot see any significant weakness in this paper, so I would recommend a weak accept.

6. REVISION OPTION - QUESTION ONE If not accepted in this first round, should the paper be invited to resubmit a revised version of the paper? It would then be considered by the same reviewers and area chair. REVISION PREFERRED. Paper is close and does not need significant improvements.

7. REVISION OPTION - QUESTION TWO Please clearly indicate the issues that you feel should be addressed in a revised version such that the paper could potentially be considered for acceptance.

I cannot see any significant problem to address.