Minutes of Meeting

SIAM class-5 , Date : 29-03-2025

Agenda:

Discussion of the Research papers:

- AlexNet
- VGG
- InceptionNet and GoogleNet
- ResNet
- DenseNet

Discussion points:

In every of the discussed research paper the main points discussed was the problem that is solved in the paper and how was that problem solved in that paper.

1. AlexNet:
   - Problem:
     - Vanishing Gradient & Overfitting
     - Computational Limitations
   - Solution:
     - By using ReLU Activation
     - By using Dropout regularization
     - By using a deeper architecture
     - By doing parallel training on 2 GPUs

2. VGG:
- Problem:
  - How much depth impacted our model's performance
  - How to balance the complexity of model with its performance
- Solution:
  - By using very small (3x3) convolutional filters but stacked them deeper to capture complex features
  - By introducing uniformity as all the convolution layers had the same kernel size (3x3) and max-pooling layers (2x2)
  - Using kernel of size 3x3 to increase the efficiency in terms of computation

3. **InceptionNet / GoogLeNet:**
- Problem:
  - Computational complexity
  - Sparsity
  - Overfitting
- Solution:
  - Use of InceptionNet where we introduces parallel convolution paths to the input with 1x1 , 3x3, 5x5, filters
  - Also the use of 1x1 convolution to reduce the number of parameters

4. ResNet:

- Problem:
  - Degradation problem i.e as network become deeper, the performance saturates and then degrades due to vanishing gradients.
  - Optimization difficulties i.e how to add make the architecture so that adding layer doesn't degrades the performance
- Solution:
  - By adding a residual block (introducing skip connections between the layers) in the network preventing the degradation problem and the identity short connection method in residual learning don't add any extra parameters
  - We did also use Bottleneck architecture to reduce the computation and make the effective use of parameters

5. DenseNet:

- Problem:
  - Vanishing Gradient
  - Effective use of the parameters
- Solution:
  - By forming a Dense block which have Dense connection between the layers i.e short connecting the layer to each of the layer in front of it, and several of these dense block are connected via transition

layer solving the problem of vanishing gradient

- o Now each layer have access to the feature map of all the previous layer thus the feature are being reused and make sure there is effective use of parameters

Homework tasks:

- ➢ Read all the papers discussed in the class.
- ➢ Learn about normalization (batch normalization, layer normalization, distance normalization).
- ➢ See the Kaggle competition and have a summary of it.
- ➢ To know the how the compression(reduction of feature map) is working in DenseNet