

Machine Learning Engineer Course

Day 22

- Paper Reading -



DIVE INTO CODE

Thursday September 16, 2021
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Agenda

- 1 Check-in**
- 2 Introduction**
- 3 Today's Objective**
- 4 Today's Task**
- 5 How to read**
- 6 Sample code**
- 7 To do by next class**
- 8 Check-out**



Check-in

3 minutes Please post the following point to Zoom chat.

Q. What did you learn in the previous week?
(Anything is fine.)



Quick Review (Keras)

A framework for DeepLearning written in Python.

Keras required a backend (i.e., a computation engine; it builds the graph-topology, optimizes it, and performs numerical computations) to train the network.

- **Keras Sequential Model API** (The model is built by instantiating `Sequential()` and stacking layer instances linearly by the `add()` method.)
- **Keras Functional API** (An instance of a layer can be invoked functionally. The output from a layer becomes the input of the next layer, and by connecting the input and output layers of a `Model()` instance as arguments, a model with a complex structure can be constructed.)
- **Model Subclassing** (It is suitable for developers who want to build models flexibly.)



Introduction - Background

- [1] A. Krizhevsky, I. Sutskever, and G. E. Hinton. Imagenet classification with deep convolutional neural networks. In NIPS, 2012. <https://papers.nips.cc/paper/4824-imagenet-classification-with-deep-convolutional-neural-networks.pdf>
- [2] K. Simonyan and A. Zisserman. Very deep convolutional networks for large-scale image recognition. In ICLR, 2015. <https://arxiv.org/pdf/1409.1556.pdf>
- [3] C. Szegedy, W. Liu, Y. Jia, P. Sermanet, S. Reed, D. Anguelov, D. Erhan, V. Vanhoucke, and A. Rabinovich. Going deeper with convolutions. In CVPR, 2015. <https://arxiv.org/pdf/1409.4842.pdf>
- [4] K. He, X. Zhang, S. Ren, and J. Sun. Deep residual learning for image recognition. In CVPR, 2016. <https://arxiv.org/pdf/1512.03385.pdf>
- [5] G. Huang, Z. Liu, L. van der Maaten, and K. Q. Weinberger. Densely connected convolutional networks. In CVPR, 2017. <https://arxiv.org/pdf/1608.06993.pdf>
- [6] Y. Chen, J. Li, H. Xiao, X. Jin, S. Yan, and J. Feng. Dual path networks. In NIPS, 2017. <https://arxiv.org/pdf/1707.01629.pdf>
- [7] B. Zoph, V. Vasudevan, J. Shlens, and Q. V. Le, “Learning transferable architectures for scalable image recognition,” CoRR, vol. abs/1707.07012, 2017. [Online]. Available: <https://arxiv.org/pdf/1707.07012.pdf>
- [8] Chenxi Liu, Barret Zoph, Maxim Neumann, Jonathon Shlens, Wei Hua, Li-Jia Li, Li Fei-Fei, Alan Yuille, Jonathan Huang, and Kevin Murphy. In ECCV2018, 2018. <https://arxiv.org/pdf/1712.00559v3.pdf>

- Many papers are published on the web.
- In some cases, conference presentations are made more than six months after the papers are published.



Introduction - Background

The field of machine learning, especially deep learning, is advancing very fast.

"A Partial History of CNN Models for Image Classification"

AlexNet[1] : 2012(NIPS)

VGG[2] : 2015(ICLR)

InceptionV3[3] : 2015(CVPR)

ResNet[4] : 2016(CVPR)

DenseNet[5] : 2017(CVPR)

DPN[6] : 2017(NIPS)

NASNet[7] : 2017

PNASNet[8]:2018(ECCV)

These are already implemented in many frameworks. Models trained on ImageNet, a large image dataset, are easy to use.

ImageNet ReaderBord:

<https://paperswithcode.com/sota/image-classification-on-imagenet>



Introduction - Background

- The influence of top conferences is huge.

Paper site arXiv <https://arxiv.org/>

(Reference) International Conference Ranking

**Top Computer Science Conferences - Computer Science
Conference Ranking**

<http://www.guide2research.com/topconf/>



Introduction - Background

- 1. Find a paper that fits what you want to do and get to know the techniques to do it. Use implementations if they are available.**
- 2. Try to keep up with the latest developments in the field. There is an environment where anyone can read the papers, both you and your competitors.**
- 3. To be able to identify what we should do when the techniques are published.**



Introduction - The Problem

- **I don't know which papers to read.**
- **I don't like English.**
- **I don't know what the paper is talking about**
- **I don't feel like I can do it even if I read it.**



Objectives of this project

【Objectives】

- 1. Take the first step in staying in touch with your paper.**
- 2. Be able to draw useful information from the paper.**
- 3. Gaining new knowledge from papers in the area you have been working on.**

【Do not aim to】

- 1. Fully understand the content of the paper you are discussing.**
- 2. Learn how to write a paper.**



Today's Task

"Read the paper and answer the questions."

Paper : Faster R-CNN[9]

[9] Ren, S., He, K., Girshick, R., Sun, J.: Faster r-cnn: Towards real-time object detection with region proposal networks. In: Advances in neural information processing systems. (2015) 91–99
<https://arxiv.org/pdf/1506.01497.pdf>

One of the most famous papers on Object Detection using CNN



Today's Task

【Problem】 Read the Faster R-CNN and answer the following.

- 1. What methods existed in the field of object detection?**
- 2. It is called "Faster", but what mechanism was used to make it faster?**
- 3. What is the difference between the One-Stage approach and the Two-Stage approach?**
- 4. What is an RPN?**
- 5. What is RoI pooling?**
- 6. What is the appropriate size for the Anchor?**
- 7. What kind of data set is used and what kind of index value is obtained compared to previous studies?**
- 8. (Optional) How are Faster R-CNNs cited in papers on object detection that are newer than FasterR-CNNs?**



Today's Task

【Conditions】

1. When answering, write which part of the paper shows it.
2. If necessary, go for prior research (papers cited) as well. At least two other papers should be used to answer the question.
3. You can also look at the article introducing the paper. However, look for the evidence in the paper for your answer.



How to read

The "I don't know which paper to read" problem

【Recommended way to enter】

1. Read what people you know have recommended.
2. Read what is being talked about.
3. Find a paper that has been accepted to a top conference and has an interesting title.

【Next step】

1. Read the articles that the paper you read cites or is cited in.
2. Search the arXiv for words in the field you want to know about.

*Pay attention to the quality of the paper! Is the content likely to be reproducible? Has it been peer-reviewed?



How to read

The "I don't know which paper to read" problem

【Not recommended way to enter】

1. You are too focused on one paper you found. (Research is difficult to understand from only one paper)
2. Read papers that don't tell you what you want to know.

【Both ways work】

1. Read papers with many introductory articles.
2. Read papers that do not have an introductory article.



How to read

The "I Hate English" Problem

【Recommended way to enter】

- 1. First of all, I'll read it roughly as it is.**
- 2. If you think it's impossible, try reading it alongside a machine translation.**
- 3. If I don't understand something, I try to figure out if it's because it's in English or if it's the same in Japanese.**
- 4. Try to distinguish between technical terms and non-technical parts.**

【Not recommended way to enter】

- 1. Start reading English reference books.**



How to read

The "I don't know what the paper is talking about" problem Common Structure

- **Abstract**
- **Introduction**
- **Related Work**
- **Proposed Method**
- **Experimental Setup**
- **Experimental Result**
- **Discussion**
- **Conclusion**
- **Acknowledgement**
- **References**

*In many cases, the discussion and conclusion are in a single chapter, but this is the basic flow for a paper that proposes something.



How to read

The "I don't know what the paper is talking about" problem

【Recommended way to enter】

1. Read the **outline** briefly. It is written in such a way that a person who is not familiar with the field can understand it by reading only that part. The **conclusion** may contain a paraphrase, so read that as well.
2. Look at the **figures, tables, and formulas**. The fact that they were put on a limited page must have been important.
3. Think about what you want to know from this paper.



How to read

The "I don't know what the paper is talking about" problem

[I'd like to know the context in which this paper was written]

- 1. In the front of the introduction, there is often a description of the state of the world and the issues that need to be resolved. A sentence like "In recent years..." is a good marker.**

[I want to know what's so great about this paper]

- 1. The middle to the back of the introduction often contains a description of the approach taken to the problem in this paper, with phrases such as "in this paper" and "we are".**
- 2. The back of the study also describes how it is superior (better) than the previous study.**
- 3. The results of the experiment are shown in numerical values when the method in this paper is not used and the differences from previous studies.**



How to read

The "I don't know what the paper is talking about" problem

【I want to know more about this field】

1. **Prior research** contains the history of the field. It is well worth reading if you want to know, because important papers from the past are presented with brief explanations. If there is a cited paper that interests you, go and look at it too.

【I want to know how this paper is doing】

1. Read the **proposed method**. Read the paper, distinguishing between the parts that are the same as in previous studies and the parts that are unique to this paper.
2. It contains examples of how to set up an **experiment** and how the **results** can be applied to data in a more concrete way.



How to read

The "I don't know what the paper is talking about" problem

【I'd like to be sure about that】

- 1. The experimental results are there to show the effectiveness of the proposed method. It is natural to say that the proposed method is effective after comparison, but let's see if the comparison is appropriate. Shouldn't we look at other conditions as well?**

【I want to know why】

- 1. The discussion describes the thoughts on the results. In the field of deep learning, it is important to note that most of the time, the only thing that is said is what was done.**



How to read

The "I don't feel like I can read" problem

【Recommended way to enter】

- 1. Look for implementations that have been published.**
- 2. If it is an implementation of a similar previous study, look for one that has been published.**
- 3. Differences from previous studies should be clarified.**

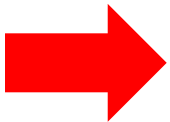
* "Recommended way to enter" will be dealt with in a future sprint.



Sprint 15 – Paper Reading

Explanation about this Sprint is given but please try it on your own first.

Sprint 15 – Paper Reading



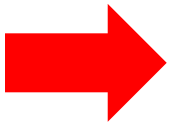
Please work on your own after class and submit your assignments on DIVER.



Sprint 15 – Paper Reading

A Sample Code of this Sprint is given but please try it on your own.

Sprint 15 – Paper Reading



Please work on your own after class and submit your assignments on DIVER.



ToDo by next class

Next class will be Zoom : Thursday September 23, 2021 19:30
~ 20:30



ToDo: Paper Introduction

<https://diver.diveintocode.jp/curriculums/1905>



Check-out

3 minutes Please post the following point to Zoom chat.

Q. Current feelings and reflections

(joy, anger, sorrow, anticipation, nervousness, etc.)



Thank You For Your Attention

