CSCI 4830/5722 Computer Vision, Spring 2018
Instructor: Fleming
Homework 5 – part I, Due Sunday, April 22nd, by 11:55pm

Part I: The Paper

In this homework assignment, you will explore some of the tools used for deep learning in computer vision. To help you in this pursuit, we ask that you first read and summarize one of the seminal papers in the field.

Provided files:
A pdf file of the following paper is available on Moodle:
"*ImageNet Classification with Deep Convolutional Neural Networks*" by Alex Krizhevsky, Ilya Sutskever, Geoffrey E. Hinton, also known as "the AlexNet paper".

What You Have to Do: write a summary of the AlexNet paper. The summary should include:

- What was previous best approach and what were their best results?
- The paper's stated goal. Why it is worth studying the question posed?
- A description of the data set used
- A description of the architecture of the network: how many layers, which type, what role does each layer have, how are they connected and why?
- The methods used to reduce overfitting
- Stochastic Gradient Descent learning
- A description of the results
- Key points from the Discussion section of the paper: which parameters or layers are important and why? Can this be improved? Future research plans.
- The implications of the results for the specific area/topic of research, i.e., how the study has advanced knowledge in that area.

Here are a few suggestions on how to summarize a research article.

Summarizing a Research Article

(Adapted from: Summarizing a Research Article 2010, University of Washington)

Research articles use a standard format to clearly communicate information about an experiment. A research article usually has seven major sections: Title, Abstract, Introduction, Method, Results, Discussion, and References. Sometimes there are minor variations, such as a combined Results and Discussion section, or an overall General Discussion section in which multiple experiments are presented in one article.

1. **Reading the Article**

Allow enough time. Before you can write about the research, you have to understand it. This can often take a lot longer than most people realize. Only when you can clearly explain the work/study in your own words to someone who hasn't read the article are you ready to write about it. Here's how to proceed.

Scan the article first. If you try to read a new article from start to finish, you'll get bogged down in detail. Instead, use your knowledge of APA format to find the main points. Read the abstract first. The abstract is supposed to tell you the essence of the paper: what was studied, the method used, and a little bit of the results. Start by reading the abstract closely and making note of the key features of the paper. Then, briefly look at each section to identify:

- the research question and reason for the study (stated in the Introduction)
- the hypothesis or hypotheses tested (Introduction)
- how the hypothesis was tested (Method)
- the findings (Results, including tables and figures)
- how the findings were interpreted (Discussion)

Underline key sentences or write the key point (e.g., hypothesis, design) of each Paragraph; take notes in a separate notebook or in the margin of the paper. Although the abstract can help you to identify the main points, you cannot rely on it exclusively, because it contains very condensed information. Remember to focus on the parts of the article that are most relevant.

Read for depth, read interactively. After you have highlighted the main points, read each section several times. As you read, ask yourself these questions:

- How does the design of the study/algorithm address the question posed?
- What are the controls for each experiment? How are results compared effectively to previous work (or previous state of the art)?
- How convincing are the results? Are any of the results surprising?
- What does this study contribute toward answering the original question?
- What aspects of the original question remain unanswered?

Plagiarism. Plagiarism is always a risk when summarizing someone else's work. To avoid it:

- Take notes in your own words. Using short notes or summarizing key points in your own words forces you to rewrite the ideas into your own words later.
- If you find yourself sticking closely to the original language and making only minor changes to the wording, then you probably don't understand the study. Remember: you should be able to explain it in your own words to show you understood the work.

2. Writing the Summary

Like an abstract in a published research article, the purpose of an article summary is to give the reader a brief overview of the study. To write a good summary, identify what information is important and condense that information for your reader. The better you understand a subject, the easier it is to explain it thoroughly and briefly.

Write a first draft. Use the same order as in the article itself. The number of suggested sentences given in parentheses below is only a rough guideline for the relative length of each section. Adjust the length accordingly depending on the content of your particular article.

- State the research question and explain why it is interesting, comparing it with previous relevant work (3-5 sentences).
- State the hypotheses tested (3-5 sentences).
- Describe the methods/algorithm: design, materials (data set), procedure, what was manipulated [independent variables], what was measured [dependent variables], how data were analyzed (10-20 sentences).
- Describe the results. Were they significant? What differences were significant? (5-10 sentences).
- Explain the key implications of the results. Avoid overstating the importance of the findings (1-3 sentences).
- *The results, and the interpretation of the results, should relate directly to the hypothesis.*

For the first draft, focus on content, not length (it will probably be too long). Condense later as needed. Try writing about the hypotheses, methods and results first, then about the introduction and discussion last. If you have trouble on one section, leave it for a while and try another.

Edit for completeness and accuracy. Add information for completeness where necessary. More commonly, if you understand the article, you will need to cut redundant or less important information. Stay focused on the research question, be concise, and avoid generalities. The Methods summary is often the most difficult part to edit. See the questions under 'Reading interactively' to help you decide what is important to include.

Edit for style. Write to an intelligent, interested, naive, and slightly lazy audience (e.g., yourself, your classmates). Expect your readers to be interested, but don't make them struggle to understand you. Include all the important details; don't assume that they are already understood.

- **Eliminate wordiness**, including most adverbs ("very", "clearly"). "The results clearly showed that there was no difference between the groups" can be shortened to "There was no significant difference between the groups".
- **Use specific, concrete language**. Use precise language and cite specific examples to support assertions. Avoid vague references (e.g. "this illustrates" should be "this result illustrates").

- **Use scientifically accurate language**. For example, you cannot "prove" hypotheses (especially with just one study). You "support" or "fail to find support for" them.
- **Rely primarily on paraphrasing, not direct quotes**. Direct quotes are seldom used in scientific writing. Instead, paraphrase what you have read. To give due credit for information that you paraphrase, cite the author's last name and the year of the study (Smith, 1982).
- **Re-read** what you have written. Ask others to read it to catch things that you've missed.

Submitting the assignment:
Submit a pdf of your report through Moodle, as Hmwk5-partI before Sunday, April 22nd, by 11:55pm