Assignment 1 Response Sheet

2025 Semester 2

1 Instructions

Submission deadline: 17 August 2025, 23:00 (Week 2, Sunday) Please type your answers in the spaces provided. Do not repeat the questions in your answers. All tasks are compulsory.

Note that you must correctly cite and reference any sources you have consulted. You may use any internationally recognized referencing style such as APA or IEEE referencing.

Submit this document to the "Assignment 1 Main Submission" inbox by the published deadline.

Type your student ID number in the space provided below.

Student ID number: 490051481

2 Task 1: Research Topics & Leading Researchers

Research Topics:

My research topic is "how to use drones to inspect electricity transmission lines (i.e., powerlines) without human intervention." The main focus of this topic is not on how to implement a drone, as some companies have already achieved that. Instead, it emphasizes how to detect faults (e.g., broken insulators) in transmission lines by applying different algorithms to analyze images, selecting optimal shooting angles, or exploring other methods.

Explanation about how to choose leading researchers:

Since my research topic is quite specialized, most papers have limited citation counts or are published in lower-tier journals, such as MDPI. In addition, many researchers or institutions have only published a few papers directly relevant to my topic and do not focus primarily on this area. Considering these factors, I believe the following researchers can be regarded as leading in this field, and I will provide further justification later.

Leading researchers/representatives 1: Yongjie Zhai

He graduated with a Ph.D. in Thermal Engineering from North China Electric Power University, Baoding, China, in 2004 [1]. He is currently a professor in the School of Control and Computer Engineering at North China Electric Power University. This university has many collaborative programs with the State Grid Corporation, which lends it authoritative support. After reviewing some of his papers, I found that he has published many studies on powerline fault detection, such as using thermal images to analyze insulators [2] or power substation equipment [3]. To efficiently analyze thermal images, he proposed several algorithms, including FR-SOLOv2 and bidirectional feature pyramid networks. In addition, he also proposed a space model-guided deep feature perceptron network for insulator fault detection from aerial images [4], which are typically captured by unmanned aerial vehicles (UAVs). Lastly, he has a total of 37 publications with 513 citations, indicating an average of approximately 13 citations per paper. For these reasons, I consider him to be one of the top researchers in my field, and I can gain a deeper understanding of how to use UAVs to inspect powerlines by reading his articles.

Leading researchers/representatives 2: Kaiming He

He is a researcher at Facebook AI Research (FAIR) with 56 publications and a total of 319,190 citations [5]. He has received the Best Paper Award at CVPR 2009, CVPR 2016, and ICCV 2017, all of which are A-ranked conferences in the ERA ranking[6]. His primary research areas are computer vision and image recognition, which are closely aligned with my research interests. His most cited work, Deep Residual Learning for Image Recognition [7], with 139,225 citations, proposed a deep residual learning framework that achieved a 3.57% error rate on the ImageNet test set. He has also developed other influential algorithms for object detection, such as the Region Proposal Network [8]. Although his papers do not directly address the implementation of these algorithms for powerline inspection, UAV-based fault detection relies heavily on image recognition. For example, such algorithms could be applied to detect broken insulators or vegetation encroaching on powerlines. By studying his work, I expect to gain a deeper understanding of how to apply advanced image processing techniques to powerline inspection tasks.

Leading researchers/representatives 3: Australian Research Centre for Aerospace Automation (ARCAA)

This research center's main focus is on powerline inspection technology improvement [9]. It has published articles in relatively reputable journals, such as IEEE Transactions on Control Systems Technology with an Impact Factor of 3.9 and International Journal of Image and Data Fusion with an Impact Factor of 1.3. Although its website has not been updated since 2011, I can still use its publications as a starting point. Some of the technologies mentioned in these articles may be outdated, but they remain valuable because they are highly relevant to my research topic. For example, one article describes how to use UAVs to

automatically track linear infrastructure, such as powerlines. Considering this, I regard the center as one of the "top representatives" in the field.

3 Task 2.1: Leading conferences

For Section 2.1, I prefer to use ERA and CORE evaluation system than Scopus because my senior fellow apprentice said Scopus evaluation sometimes is not accurate.

International Joint Conference on Neural Networks (IJCNN)

The ERA score for this conference is A [6], and the CORE score is B [10]. Therefore, I consider it to be a credible conference. Regarding relevance, one paper [11] presented at this conference combines CNN models with the SVM method to address the challenge of detecting insulators' status against inconspicuous backgrounds in images. In addition, many other papers discuss using UAVs for powerline inspection, even if not solely focused on image recognition. For example, another paper [12] highlights the risks of UAVs not properly sensing powerlines and proposes a fusion of the Lobula Giant Movement Detector (LGMD) and a line-attention module neural computational model to resolve it. In conclusion, this conference is both reliable and relevant to my research.

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

The ERA score for this conference is A [6], and the CORE score is also A [10]. Therefore, I consider it to be a credible conference. Regarding relevance, one article [13] presents a model predictive controller (MPC) to assist UAVs in detecting powerlines while requiring less precise information about their locations. Other articles address challenges encountered during UAV-based inspections, such as motion blur affecting the ability to track powerlines [14]. This conference is highly relevant because it includes many papers that propose solutions to issues related to UAV powerline inspection.

4 Task 2.2: Leading journals

For this section, I will primarily use the Impact Factor to evaluate journals, since CORE and ERA mainly focus on conferences and many journals are not included in their rankings. Moreover, the Impact Factor is widely recognized and accepted by researchers as a measure of journal credibility. According to the advice of my senior fellow apprentice, an Impact Factor of around 5 is generally considered acceptable. Therefore, I believe that reporting the Impact Factor alone is sufficient for assessing a journal's credibility. For simplicity, I include only two representative papers from each journal to demonstrate its relevance. This approach is effective because citing only one paper may not adequately demonstrate that the journal is related to my research area, whereas including

two papers suggests that the journal consistently publishes research within a relevant scope, making the relevance less likely to be coincidental. Furthermore, I have verified that additional related papers are published in each journal.

International Journal of Electrical Power & Energy Systems

The Impact Factor of this journal is 5.0 [15], indicating that it is a credible journal. It not only provides a review article on previous powerline inspection techniques [16], highlighting the advantages and disadvantages of each method, but also includes papers on practical solutions, such as using LiDAR technology to reduce the time and cost of UAV inspections [17] or using optical images combined with deep learning to address inspection challenges [16]. Through this journal, I gained a better understanding of the historical development of UAV-based powerline inspection and it is quiet useful to use those papers as a start point for my research area.

Energy Reports

The Impact Factor of this journal is 5.1 [18], indicating that it is a credible journal. Regarding relevance, it includes a paper discussing how lighting conditions may affect the efficiency of detecting insulator faults using visual inspection, and proposes an illumination correction and compensation method to address this issue [19]. In addition, in real-world scenarios, some powerlines still use pointer meters. Considering this, another paper in this journal proposed a deep learning method that enables UAVs to read pointer meters, effectively recognizing the meters under various environmental conditions and camera angles [20]. These conditions are crucial to consider, as not all power grids are fully smart. Therefore, I conclude that this journal is relevant.

Electric Power Systems Research

The Impact Factor of this journal is 4.2 [21], and it ranks in the 84th percentile in the Electrical and Electronic Engineering category on the Scopus website, indicating that it is a relatively credible journal. Regarding relevance, one paper in this journal discussed the difficulty of analyzing insulator breakdown with insufficient training data and proposed a deep learning methodology to address this issue [22]. Additionally, other papers in this journal are related to my research topic. For example, one paper examined the limited battery life of UAVs and proposed a deep reinforcement learning-based algorithm to minimize UAV energy consumption [23]. This is particularly relevant since many powerlines are located far from urban areas, making UAV recharging challenging. Considering these factors, I conclude that this journal is relevant.

Electric Power Systems Research

The Impact Factor of this journal is 5.9 [24], which indicates that it is a credible journal. Regarding relevance, there is a review paper that not only focuses on UAV inspection for power lines but also analyzes common inspection tasks and other related technologies [25]. By reading this paper, I can gain a deeper

understanding of power line inspection tasks, which can then be used to optimize UAV-based power line inspection. In addition, other papers in this journal provide relevant content, such as one that proposes an advanced UAV system equipped with embedded processors and binocular visual sensors [26]. Considering both credibility and relevance, I believe this journal is highly suitable for my research.

5 Task 3

I will analyze the paper from four perspectives. The first is analyzing its achievements, the second is an analysis of its relevance to my research interests, the third is an evaluation of its structure, and the last concerns the journal or conference where it was published. In the final perspective, I will also consider whether I could publish my own paper there, taking into account both the difficulty and the format requirements that vary across journals and conferences.

Paper 1: Multi-patch Deep Features for Power Line Insulator Status Classification from Aerial Images[11]

In this conference paper, the authors mainly focus on the classification step, which aims to diagnose the status of insulators. It is also the first paper to apply a deep CNN architecture to fault classification [11].

The content of this article is directly related to my research interests. Compared with other challenges of using UAVs for powerline inspection, such as the limited power supply of UAVs [23], I am more interested in applying AI methods (e.g., machine learning) to recognize the status of powerlines. This article specifically focuses on insulators, which are among the most fragile components in powerlines.

The structure of this article also suits me well. It reads like a detailed explanation of an experiment: starting from the basic algorithm behind the method, then introducing the environmental settings and the dataset used, followed by step-by-step experimental procedures and the model architecture. The structure is very straightforward for a new researcher, so I can definitely use it as an example.

The conference where this paper was published is IJCNN, which has a B CORE ranking. This level is quite suitable for new researchers, since A-ranked conferences usually have stricter requirements, while C-ranked conferences are not widely recognized. Considering this, I believe that imitating its structure could help me publish my own paper at IJCNN.

Paper 2: Image processing in fault identification for power equipment based on improved super green algorithm [27]

In this journal paper, the author focuses on the fault detection of insulators and metal rust using the Super Green Algorithm, which leverages vegetation

features to help identify potential faults. Compared with other articles, this work not only emphasizes the improvement of image processing algorithms but also explores additional methods to enhance image recognition.

The content of this article is directly related to my research interests. As a Chinese researcher, I hope my work can be well adapted to the conditions in China, where many powerlines are located in mountainous areas. Moreover, the paper's focus on image recognition closely aligns with my academic interests.

The structure of this paper is more complex than that of a conference paper. However, since it is published in a journal, its quality and rigor are generally higher. Considering that I may also aim to publish a journal paper rather than a conference paper, this article serves as a valuable example. Unlike a typical conference paper, this journal provides a more detailed discussion of previous work and background (i.e., a literature review), which is an important component I may need to emphasize when writing my own paper.

This article was published in Computers and Electrical Engineering, which has an impact factor of 4.9 [28]. Although publishing in this journal is challenging, it remains achievable, especially since an impact factor of around 5 is generally regarded as a marker of a credible journal.

In conclusion, considering the background (relevance to China), the research area, and the publishing difficulty, I believe this paper can serve as a strong example for my own work.

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