Dear Professor Phillips,

I have just returned from a wonderful visit to DC, and I hope you also had a fantastic start to summer! I am writing this email to rule out an outline for our research to which we can refer in the course of study and, secondly, to ask if it is convenient for you to set up a meeting with me. Generally, it is reasonable to divide the study into two parts. The first part is to design a program to acquire electric meter readings using computer vision methods; the second part is to use the data to suggest wisely using energy and other topics. I will stick to this structure in this email and in the future if you find it no problem.

Regarding the first part, computer vision, I consulted a friend majoring in CS for advice, as we talked about last time. We both agree that the framework I worked on last summer, which is to recognize meter plates and sub-plates using semantic segmentation tools like YOLOv5, is reasonable. However, machine learning utilities could generate considerable errors in identifying the pointer position and further producing the precise read; therefore, conventional methods are probably more reliable. Nevertheless, sufficient training data is necessary for the sake of model training, and quantitatively speaking, thousands of pictures of a single type of meter should be taken and annotated. I anticipate three to five days for each model of meter if I can quickly become familiar with the operation. But besides the labor, finding the right place to take the pictures is more important, which we need to discuss.

The second part is what we can do with the data. We wouldn’t be able to adjust electricity generation as the grid can, so what we can do is provide information and suggestions on usage at the consumption terminal. If we can pull the data out and make a power (derivative of energy) vs. time graph, we can find three potential patterns of change. First is abrupt changes, which could result from people going on vacations. But, it could also related to accidents, especially for older people. Younger family members would probably like to know if there is an unusual decrease in electricity. The second is peak regulation. Collaboration within the scale of communities could benefit the overall performance of the local grid, like having rules on using washers or charging electric vehicles at different times. But more importantly, if solar panels or other generators were installed in the community, our idea could be vital in maximizing the utilization of the generated electricity. Third is gradual long-term changes, which could serve as a monitoring method for inter-season changes or user comparison.

These are the current ideas I have for our program. While you may not have a profound understanding of the technique side, we should discuss procedures for collecting training data soon. Regarding using the data, we can indeed have more innovative ideas through exchanging thoughts.

Sincerely yours,

Su, Jia Cheng

Counterfactual.

Recurve: tool to determine counterfactual. by DOE NREL, for Ohm-Connect

Hi JC, good to catch up today. I think I need to learn more about how machine vision works to understand the need you expressed for hundreds of images to get started. I was wondering if even with a single image it would be possible to use AI to detect/assign discrete objects like numbers, arrows, circles or other features, even if we know that we’ll need more images to make the recognition robust against changes in lighting/glare/camera/sun angle etc.

Regarding applications, I think the use of recorded meter readers by someone other than the person with the meter could be very useful in the way you suggested but requires a lot of thought regarding privacy and consent, as without such protections, it could be used as a tool of surveillance for less noble purposes.

Anyway, I do have time to chat by phone tomorrow, after about 10:30 am Boston time. I’ll be in California from tomorrow through Sunday.

I appreciate the care and thoughtfulness you are applying to this project, and the new ideas you are bringing to it. I am convinced that the applications are way more than the couple of important ones we have identified together, and that this project has even more power in enabling all kinds of uses that empower the creator(s) of the data.