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Drowning in Data, Thirsty for Knowledge: Upscaling Changi General Hospital Speech Therapist's Understanding of Data Science

Benjamin Chow
Speech Therapy | Rehabilitative Services | Changi General Hospital
Benjamin_chow@cgh.com.sg

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Background

Singapore's National Artificial Intelligence Strategy [1] has identified healthcare as one of the five industries primed to embrace data driven solutions. An impediment holding healthcare back is the clinicians' understanding of Data Science (DS).

In Colombia, researchers employed Machine Learning to predict dysarthria assessment scores with strong correlation as compared to scores assigned by STs themselves [2]. Dysphagia researchers in the USA have also demonstrated that Machine Learning can classify between normal and abnormal swallows [3].

There is limited evidence of DS use within Allied Health Professionals (AHPs) in Singapore. Expanding Allied Health Professionals' (AHPs) repertoire of analysing data is becoming more important if AHPs plan to derive data driven solutions to maximize care at an economical scale.

Approach

Changi General Hospital (CGH) STs were introduced to DS through a series of pilot presentations. As the topic is contemporary, the Head of Clinical Education was consulted on the benefits of upscaling the department's DS literacy and two clinical sharing sessions were allocated. The presentations covered the following:

First Presentation
- DS and Machine Learning concepts
- Differences between Biostatics and Machine Learning
- DS methodology and its characteristics in Research
- Barriers to adopting DS solutions in healthcare

Scan for first session

Second Presentation
- Computer Vision application in Video Fluoroscopy Swallowing Study
- Strategies to implement DS solutions in healthcare

Scan for second session

Outcomes

Based on the pilot presentations, CGH STs found the series informative.

Feedback during post-presentation discussions include:
- The presentations expanded CGH ST's perspective of DS
- STs are now more familiar with common DS concepts and terms
- STs have a better understanding on how and what DS can offer for patient care

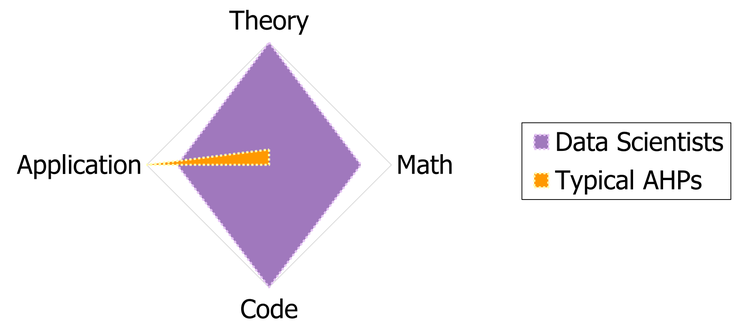
Overall, there was a general interest to learn more about DS and its clinical application. Moving forward there are plans for further DS teaching.

Lessons Learnt

What to teach

One of the observations from the series is that AHPs require a different set of skills to learn of DS as compared to data scientists. There are four facets to learning DS, which are required of data scientists: coding, mathematics, theory, and application. On the other hand, the value of DS is presented more effectively to typical AHPs when general theory and case examples are used. Technical competencies in mathematics and coding is less necessary for most AHPs as they will be only front end users of data driven solutions.

Figure 1. *DS skills for Data Scientists and typical AHPs*

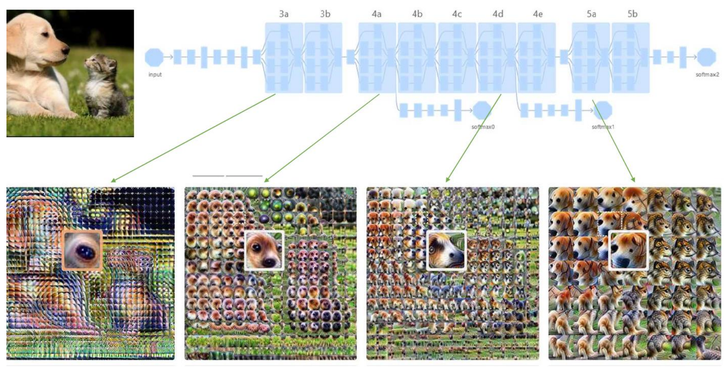


How to teach

Although pure lecture-based teaching is conventionally used to teach data scientists, conceptualizing DS models and their mechanisms is unfamiliar and complex to most AHPs; hence, this style may be less effective when teaching majority of AHPs. Interactive elements during teaching can augment AHPs' understanding on how machine learning models work.

For instance, when Convolution Neural Network (CNN) was introduced to CGH STs, it was described as a model for analyzing images. CNN has multiple layers; simpler features (e.g. patterns) are learnt in earlier layers and more abstract features are learnt in later layers (e.g. parts of an object). Complimenting the verbal description, CGH STs interacted with different layers of a CNN [4] to discover for themselves the kinds of features learnt at each layer.

Figure 2.
Screengrab of the interactive CNN where the features learned at each layer is visualized [4]



Scan to interact with CNN yourself (scroll to a fifth of the webpage for the interactive CNN)

Who should teach

Finally, the ideal candidate to conduct the series will be AHPs who are DS fluent themselves. The selection and explanation of examples can be more specific to the profession when the presenter and the audience share the same profession. These AHPs are also at a more advantageous position to help the department learn about DS as they are familiar with the gaps that need to be bridged.

Significance

The introductory series is an exploratory first step towards cultivating DS within the department. Elevating DS literacy helps the department to develop a more future ready workforce to meet the demands of the 4th industrial revolution.

As the trend to adopt DS expands in healthcare, AHPs with DS knowledge will be able to integrate clinical experience to develop alternative solutions; some of which may be better than decisions solely based on either clinical impressions or computers.

AHPs who are interested in DS should upskill in this area and in doing so they can be the bridging gap between the profession and any partnership with a data scientist [5]. Forming partnerships with data scientists is the next step towards generating ideas and solutions to compliment current clinical practice.

References

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