How AI could help veterinarians code their notes

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Scientists have developed an algorithm called DeepTag that would allow veterinarians to track the prevalence of disease in pets. Credit: U.S. Air Force Senior Airman Rito Smith

A team led by scientists at the School of Medicine has developed an algorithm that can read the typed-out notes from veterinarians and predict specific diseases that the animal may have.

As artificial intelligence continues to make inroads into human medicine, James Zou, Ph.D., assistant professor of biomedical data science at the School of Medicine, has found another use for it: animal medicine.

When pets visit an animal hospital, veterinarians type out notes in paragraph form to document the visit. There's no systematic or widespread infrastructure in place for pet electronic health records. And while hand-captured notes work fine to document one visit, in one clinic, it limits how the data can be used and shared.

"Unlike human electronic health records, there aren't standardized ways to map free text typed on a computer into codes that denote a specific type of disease," Zou said. "So there are millions of vet clinical records that are essentially wasted because they're so cumbersome to work with. Clinics don't have the infrastructure to extract information from these medical records, but there's a lot of really interesting information in them, and they might even come to bear on human health."

Now, Zou and his team have devised a solution, DeepTag, rooted in artificial intelligence. DeepTag is an algorithm that essentially reads the typed-out notes from a vet and predicts specific diseases that the animal may have. It boils down the paragraph of medical notes into codes that represent certain ailments, symptoms or diseases.

A paper describing DeepTag was published Oct. 24 in *npg Digital Medicine*. Allen Nie, a machine learning researcher, and research scientist Ashley Zehnder, DVM, Ph.D., share lead authorship.

Scanning for key words

There's been a tremendous amount of progress in the ability of AI to understand and apply natural language, Zou said. "AI is now much better at understanding human languages and being able to respond to them, and we're leveraging that progress to build algorithms that can scan across the paragraph to actually read the clinical notes and interpret each word," he said. "We're not explicitly telling the algorithm what words are associated with what disease. Instead, it's finding the key words that are associated with specific diagnoses."

In training the algorithm, Zou collaborated with the College of Veterinary Medicine at Colorado State University, where a group of veterinary experts annotated more than 100,000 clinical notes, assigning disease codes to each case. Nie used that data set to "teach" the algorithm the types of notes that paired with a particular disease. Then, the group further validated the algorithm's accuracy by testing it on pet clinical data collected from

private veterinarian offices.

Broadly speaking, DeepTag would allow veterinarians to track the prevalence of disease in pets, and in the future could be a tool to track clinical trials for animals.

A win-win

Before a drug makes it to clinical trial in humans, it's typically tested in mice or rats for efficacy and safety. But the biology of small rodents can be quite different from that of a person. A dog, larger in size and in some ways more reflective of human biology, could more accurately indicate how a human might respond to a treatment, once the hypothetical treatment passed the "rodent stage."

"Dogs, which were the majority of patients that we documented using DeepTag, are very good candidates for many of the drugs scientists develop for humans," Zou said. "And there's a growing interest in pharmacology and biotechnology to try to test, for example, new cancer treatments in dogs—it could be a win for both humans and their pets."

Likewise, just as is the case for sick people, there's sometimes a lack of sanctioned options to treat disease in pets, and clinical trials would be their best bet at recovery. But until now, there's been little infrastructure to keep tabs on how animals fair on new therapies.

Since the paper published, Zou has been discussing applying the DeepTag algorithm to large veterinary clinics around the country, and locally in the San Francisco Bay Area. Soon, Zou said, his team will have a publicly available platform that veterinarians anywhere in the world can use. "Once the platform is online, any veterinarian could go and use the platform to annotate their notes and see the results in real time," he said.

More information: Allen Nie et al. DeepTag: inferring diagnoses from veterinary clinical notes, *npj Digital Medicine* (2018). DOI: 10.1038/s41746-018-0067-8

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