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Text Analytics in Veterinary Surveillance

The missing input

Modern computer-based veterinary reporting has made it much easier to work with the large amount of material generated by the field network. Even though some of the information returned from the field is now structured, much of it remains in the form of *free text*. The structured information is available for computer manipulation and analysis, although even then the user usually needs to work with cryptic codes and know field names and keywords. The free text component is simply of no use with conventional data systems.

The Axonwave Content Intelligence System (CIS) does sophisticated semantic analysis of texts. A simple text search engine could easily find a match with the word "correlation" in a document. But what if the document doesn't actually contain the *word* "correlation", but it does contain the *concept*? For example, the document could have the following text:

> In most of these cases of rabies, the inspector has found a bat infestation in the same building.

A traditional search engine would ignore this passage entirely, because it does not contain the word "correlation". On the other hand, through its Concept Specification Language, the Axonwave CIS could easily mark this passage as a match for the concept of "Correlation".

Scenario: two outbreaks

Outbreak of avian influenza at a small egg farm – history

The laying stock had begun drinking far less water in the few days previous. The producer requested a visit from a provincial veterinarian. Based on the now apparent symptoms of the affected birds, the veterinarian suspected avian flu and ordered action to limit the spread of infection. The outbreak was quickly contained through quarantine and depopulation. Serology results later proved the vet correct.

Second outbreak at a broiler/fryer operation – history

Two weeks later and twenty kilometres away from the previous outbreak, a similar situation unfolded. Because he had been alerted to the previous incident, this producer wasted no time in calling in the vet. The outcome was even better this time — prompt action almost completely prevented losses.

The big surprise with the second outbreak came when the serology results returned. The likely cause was an avian flu virus, like in the first outbreak — but the virus was *exactly the same strain*. This was brought to the attention of the regional epidemiologist.

Common source?

Two outbreaks with an identical agent so close in time and space were cause for concern. There was likely a common source for the infection; it was now important to determine what it was.

In the veterinarian's farm visit report for both incidents, all the coding information was readily available through the surveillance portal. Unfortunately, for "Infection Source" both reports had the entry "unknown". The reports indicated no movement of farm poultry between the farms and the feed sources were different. Follow-up telephone calls to the two producers failed to identify any other commonalities or communication between the two operations; for instance, there had been no vehicular traffic between the farms.

Examining the free text

Doing a text search through the surveillance portal for the terms "infection source", "vector", and "wild species" gave no hits.

The Axonwave CIS, however, was able to quickly locate this passage in the interview section of a field report:

> When asked about anything unusual around the farm, [name deleted] said that his hired hand found the lid on the feed bin knocked off. When he went to add new feed, he found a wing in with the feed. He thought it was from a Mallard drake. He figured that one of the dogs might have killed it.

The Axonwave CIS was able to mark this passage as a match for the concepts "Wild Species" and "Contamination", which the traditional search engine was unable to do.

Outcome

Armed with this new information the Agriculture department was able to call on the Fish and Wildlife division to conduct a field study, which confirmed that the local wild duck population was the natural reservoir for infection.

The department then issued warnings about the security of feed storage, ordered free-range populations confined, and in select cases, vaccination.

Conclusion

In this hypothetical example, the investigator might have found the text of interest in time to prevent a costly disaster by carefully reading through the field reports in question. In cases where very many documents must be examined, the likelihood of finding this "needle in a haystack" becomes less and less. The Axonwave CIS can be configured to "read" documents with understanding similar to that of a human investigator. Unlike the human investigator, Axonwave CIS is fast, consistent, never gets tired and doesn't skip over things. It can mine the text of thousands of documents and alert investigators to situations and patterns they might otherwise not discover.

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