



DECODING The Data Ecosystem



Big Data
in Agriculture
CONVENTION

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D³F: Differential
Disease Diagnosis
Framework

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To begin with it all seemed so *simple*...

Basic Android app for data collection and disease diagnosis/treatment

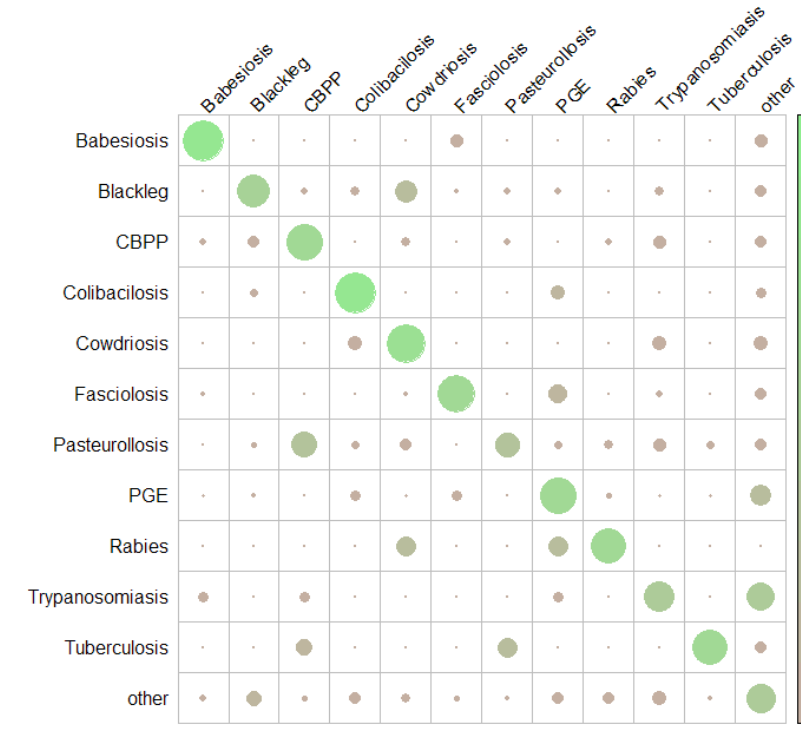
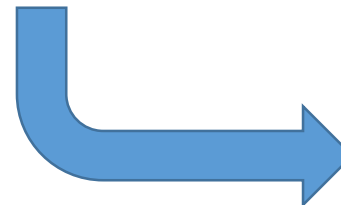
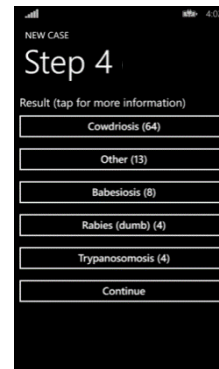
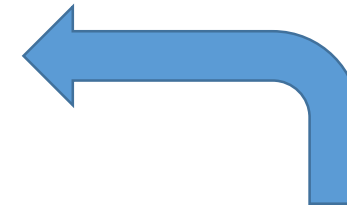
- geo-location and demographic details
- Bayesian diagnostic algorithm driven by 16 signs (syndromes)
- 12 commonly occurring diseases in Ethiopian cattle

A screenshot of the app's second screen, titled 'NEW CASE Step 2'. It contains a form for entering animal details. The fields are: 'Animal Identifier' (a text input field), 'Age*' (radio buttons for 0-6 months, 7-12 months, 13-24 months, and over 24 months), and 'Breed*' (radio buttons for Zebu, Ankole, and Cross (E/L)). A note at the top says '* denotes mandatory field'.A screenshot of the app's third screen, titled 'NEW CASE Step 3'. It contains a form for entering clinical signs. The fields are: 'Anaemia and Pallor (Lack of blood/pale membranes)' with radio buttons for Present and Not Present, 'Anorexia/Depression (Loss of appetite)' with radio buttons for Present and Not Present, 'Ataxia or Abnormal behaviour (Loss of movement balance)' with radio buttons for Present and Not Present, and 'Constipation (Scanty/small or pellet/hard faeces)' with radio buttons for Present and Not Present. Each field has a 'Reset' button.A screenshot of the app's fourth screen, titled 'NEW CASE Step 4'. It shows the results of the diagnostic algorithm. The results are: 'Cowdriosis (64)', 'Other (13)', 'Babesiosis (8)', 'Rabies (dumb) (4)', and 'Trypanosomosis (4)'. There is a 'Continue' button at the bottom.

Take expert knowledge, then learn from data

	A	B	C	D	E
1	Disease	Anaemia	Anorexia	Ataixa	Constipat.
2	Anthrax	2.5	88.1	2.5	5.6
3	Babesiosis	94.4	79.4	5.6	5.6
4	Blackleg	5.6	94.4	2.5	15.0
5	CBPP	8.8	91.3	2.5	2.5
6	Colibacillosis	11.9	94.4	5.6	2.5
7	Cowdriosis	32.5	79.4	97.5	8.8
8	FMD	79.4	32.5	2.5	29.4
9	Fasciolosis	26.4	90.6	36.9	5.0
10	LSD	18.6	89.2	2.5	2.5
11	Lungworm	35.6	36.9	9.2	9.2
12	Pasteurellosis	5.6	91.3	2.5	2.5
13	PGE / GIT parasite	70.6	50.0	2.5	20.6
14	Rabies	2.5	91.3	32.5	17.5
15	Trypanosomosis	91.3	79.4	2.5	8.8
16	Tuberculosis	20.6	32.5	2.5	5.6
17	zz_Other	79.4	11.9	97.5	94.4

Modify
Bayesian
Network



Generic framework for all livestock diseases?

1	Disease	Cattle	Sheep	Goat	Camel	Horse	Donkey	Comments
2	African Horse Sickness (AHS)					X		
3	Anthrax	X			X	X	X	
4	Ascaris (Foals only)					X	X	
5	Babesiosis	X				X	X	
6	Brucellosis			X	X			Not included for cattle; Considered important for goats but not for sheep (some debate re camels)
7	CBPP / CCPP	X		X				Contagious Bovine/Caprine Pleuropneumonia
8	Contagious ecthyma (ORF)		X	X	X			Also in camels? (Not referred to as ORF)
9	Cowdriosis	X	X	X				

Even without the $P(D/S_i)$ likelihoods – getting complex!

- now over 50 diseases (in 6 species)
- one species (camels) has >20 signs
- some 'choices' are specific to Ethiopia



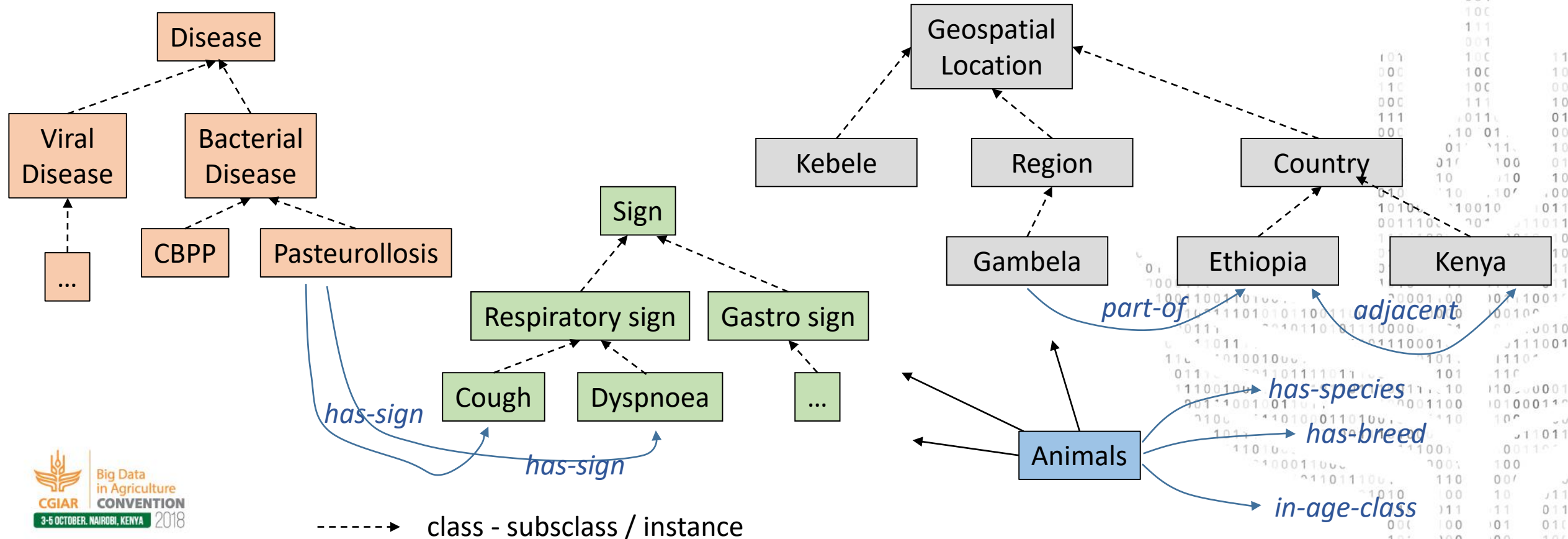
Just for Ethiopia we need, at least, 4 languages:

Amharic, Oromia, English, Afar

(Afar is transcribed in 3 separate scripts)

Use an *ontology*... what are they?

“logical and machine interpretable description of a knowledge domain, consisting of the domain’s concepts and their relationships”



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Fine, but what do they actually *do*?

- allow us to manage data complexity
- effectively share data / knowledge among users and systems

(more details at: datadrivensurveillance.org)

D³F and the AHSO (Animal Health Surveillance Ontology)

