

Counting Cows: Tracking Illegal Cattle Ranching From High-Resolution Satellite Imagery

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global witness

Climate Change Impact of the cattle Industry

- Responsible of **8.8% of global emissions** (FAO)
- Over **1 billion cow** on the planet
 - Most populous mammal after humans
- Main Sources of emissions:
 - **Methane** from the digestion process
 - **Deforestation** to expand grazing areas



Illegal Cattle Activities in the Amazon

- Since 2004, important regulations prevents deforestation of the amazon
- Deforestations still happens
 - some of it is legal
 - but is believed that **most of it is illegal**
 - There is little transparency on the ongoing activities
- Ways to go around regulations:
 - **Forest fires can be triggered** to expand grazing areas
 - **Laundering**: It is believed that cows are move to the south to be sold and declared in a legal area.

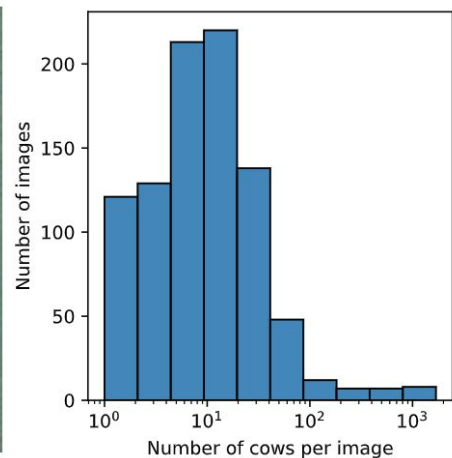
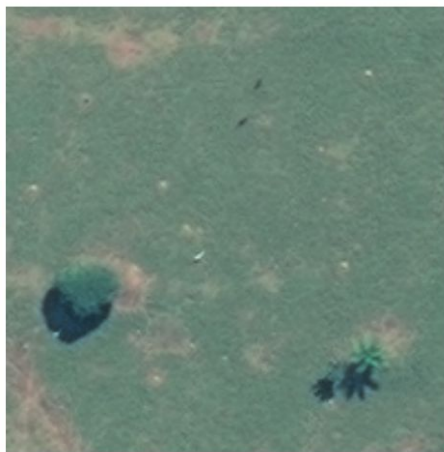


Goal

- **Develop tools to count individual cows**
 - **Compare what is counted to what is reported**
 - **Partnership with Global Witness for writing a report**
- Progress in this direction can also be used for
 - General census of large animals
 - Tools for policy makers

Dataset Collection

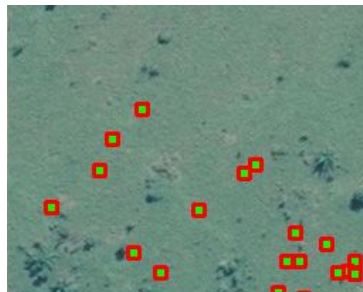
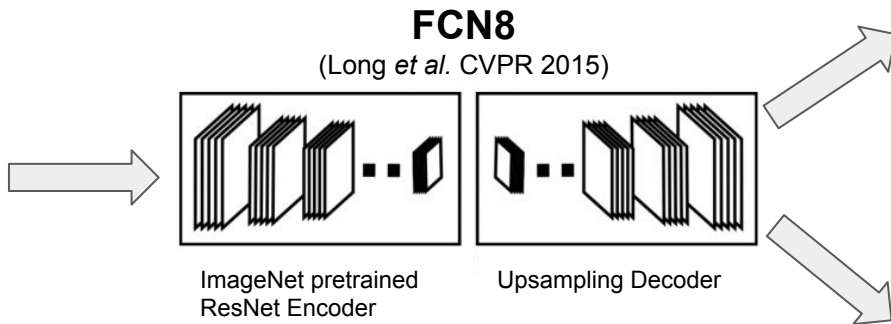
- Using geo-locations of ranches in the Amazon
- We collected
 - **12,252 WorldView (Maxar) images**
 - of size **500x500** pixels
 - with **~0.4m resolution**
- **~29,000 cows** were point-annotated by labelers
- The dataset will be released (License in negotiation with Maxar).



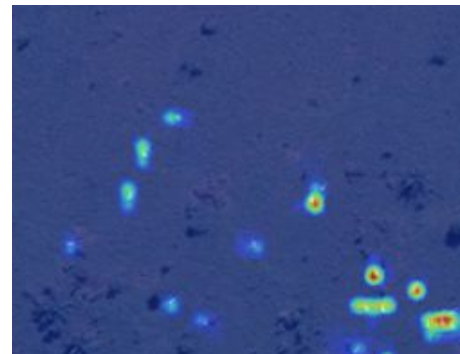
Method



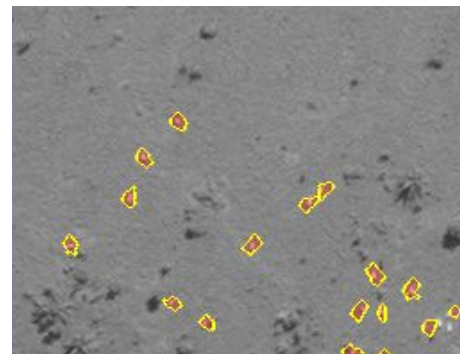
Input Image



Ground-truth

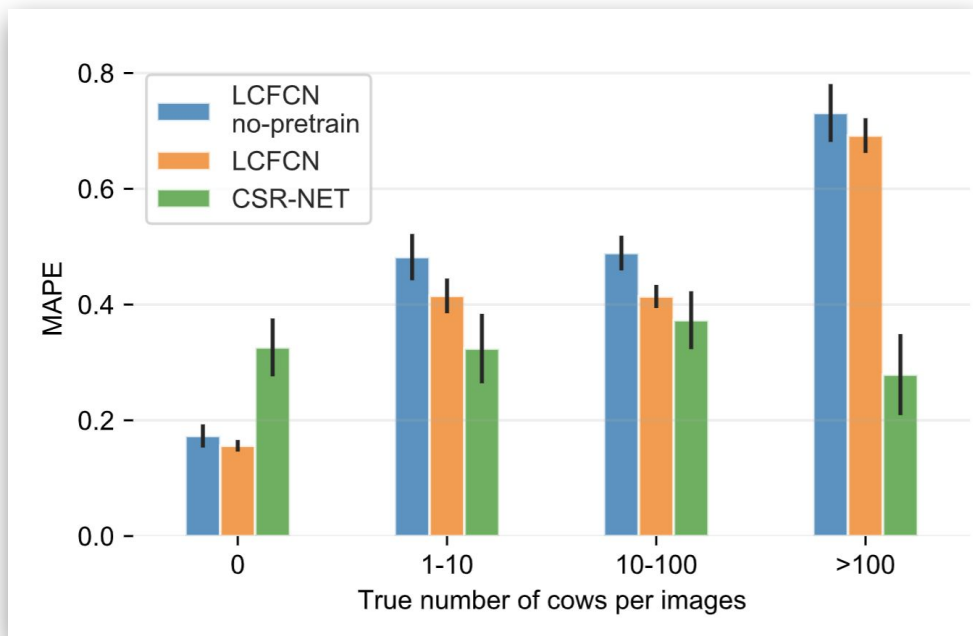


Density based
CSR-Net (Li *et al.* CVPR 2018)



Detection based
LCFCN (Laradji *et al.* ECCV 2018)

Mean Absolute Percentage Error (MAPE)



LCFCN: Detection Based approach

CSR-Net: Density Based approach

Conclusions

Counting cows

1

It is possible to count cows with current satellites images

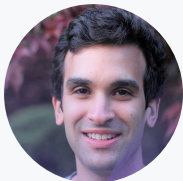
2

It may help track illegal cattle ranching

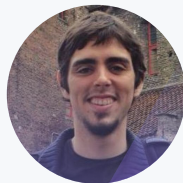
3

There is still room for improvement

Contributors



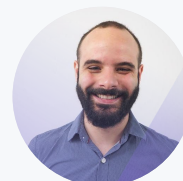
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