

Disease Surveillance

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Background

- Spread of various diseases like Malaria, Dengue, Typhoid etc. across India
- Dependence of spread of such diseases on various factors
 - Population, education, employment, urbanisation, migration patterns, media, government interventions, heat strokes, climate change

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Tracking longitudinal relationships between diseases and urbanisation patterns

Data Survey

Table 2: Malaria in Jaisalmer District

	Year	Pokran Block	Nachana Block	Sangarh Block
Suspected malaria cases	2001	61,009	25,168	27,412
	2002	38,725	33,700	15,892
	2003	88,470	49,007	59,339
Positive cases	2001	8,708	3,483	1,188
	2002	3,375	1,890	915
	2003	9,498	3,580	3,684
PF cases	2001	1,663	379	502
	2002	177	143	135
	2003	734	853	739

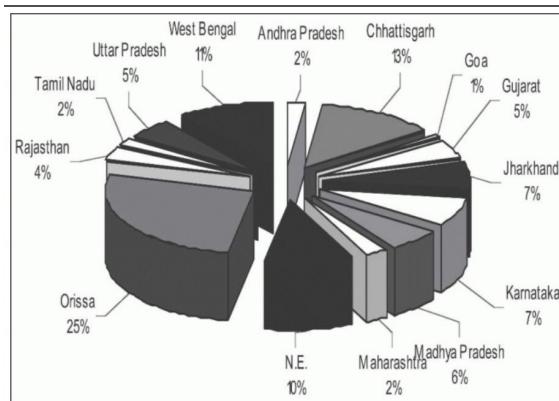
Source: Government of Rajasthan reports.

Table 3: Malaria Cases in Rajasthan

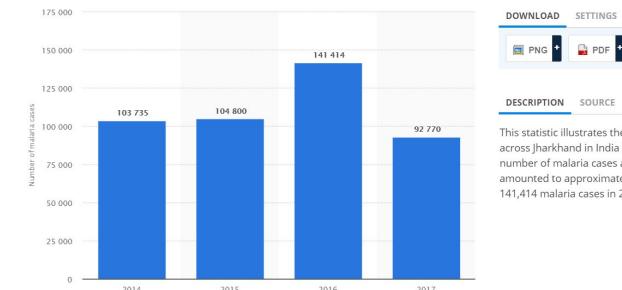
Year	Positive Cases	PF Cases	Per Cent Increase in Positive Cases	Per Cent Increase in PF Cases
1999	53,154	5,875		
2000	35,937	3,425	-32	-42
2001	1,29,233	17,405	+259	+408
2002	68,627	5,356	-46	-69
2003	1,42,738	16,481	+108	+208

Source: Government of Rajasthan reports.

2014 India



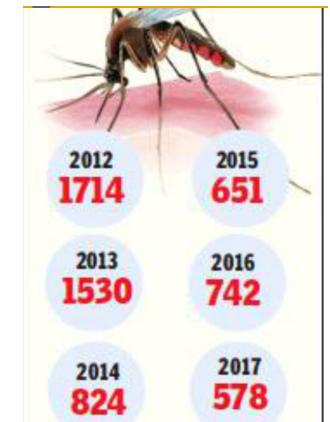
Number of malaria cases across Jharkhand in India from 2014 to 2017



DOWNLOAD
PNG PDF

DESCRIPTION SOURCE

This statistic illustrates the across Jharkhand in India fi number of malaria cases a amount to approximatel 141,414 malaria cases in 2016.



Objectives

- Extracting and classifying built-up & non-built-up areas for disease prone areas
 - Using Satellite Imagery Data to see urbanisation trends over the years
- Tracking relationships between diseases and extent of urbanisation
 - Understanding their correlation strength using statistical tests

Literature Survey

- Tatem, Andrew J., et al. "**Defining approaches to settlement mapping for public health management in Kenya using medium spatial resolution satellite imagery.**" *Remote Sensing of Environment* 93.1-2 (2004): 42-52.
- Bischke, Benjamin, et al. "**Multi-task learning for segmentation of building footprints with deep neural networks.**" arXiv preprint arXiv:1709.05932 (2017).

Classification of built-up & non-built-up areas

DATA:

- 20K datapoints by Goldblatt et al., marked as built-up & non -built-up
- LANDSAT Satellite Imagery: “*Landsat 8 Collection 1 Tier 1 TOA Reflectance*”
- Available for the years (2013-18) - 16 days Revisit Interval
- 11 Bands with resolution of 30m, based on wavelengths (0.43μm - 12.51μm)

CLASSIFIER:

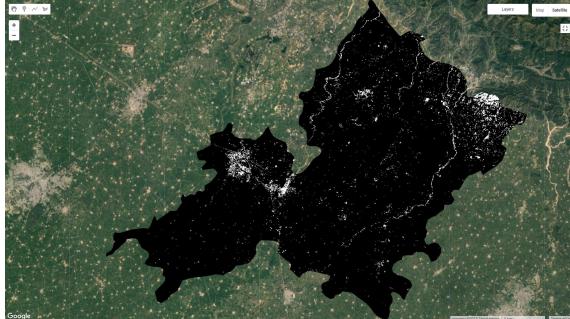
- Using Google Earth Engine
- CART Classifier (Classification And Regression Trees)
- Features Used: 11 Available Bands & customised bands (NDVI, NDBI, GSW, etc)

Issues with the available LandSat Images

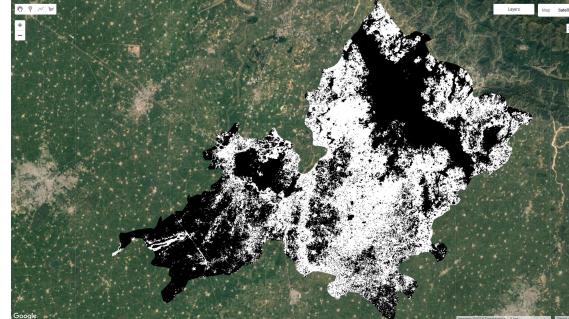
- Initial Experimentation:
 - Filter out comparable number of built-up & non-built-up points, to remove bias
 - Limit number of images to minimum cloud cover
- Urbanisation for images from 2015 unexpectedly high
- Further Experimentation:
 - For 2015, cloud cover significant, with high values of cloud scores
 - Use of Cloud masks, by Rodrigo E. Principe

AMBALA

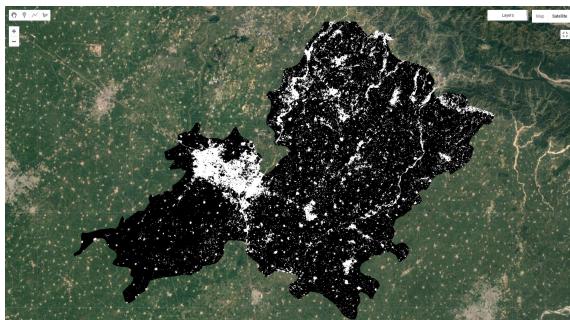
Simple classification



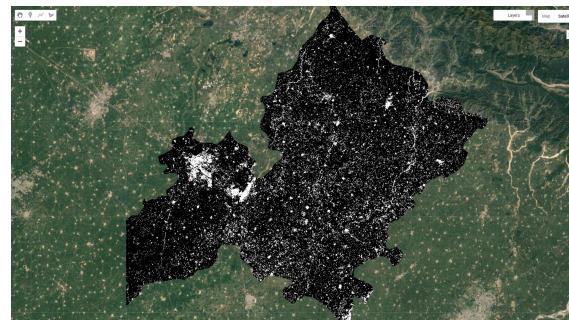
2014



2015



2016



2017

Original LandSat images



2014



2015



2016

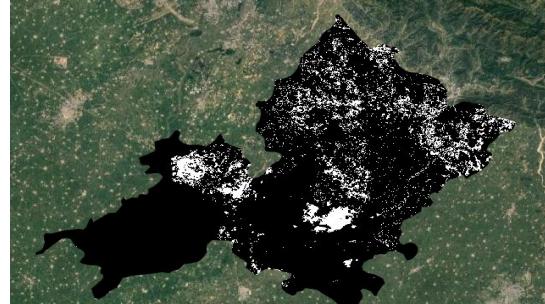


2017

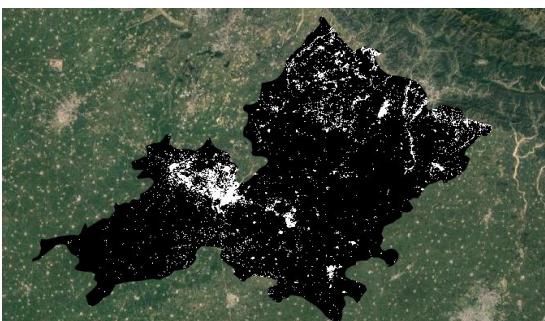
Classification after accounting for cloud cover



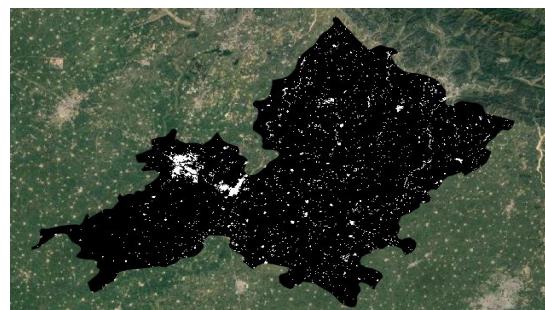
2014



2015



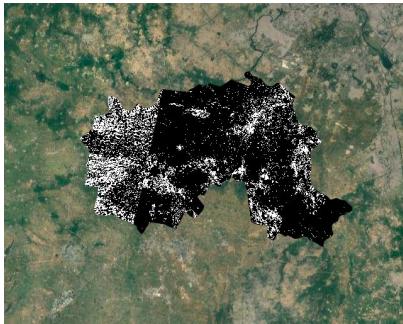
2016



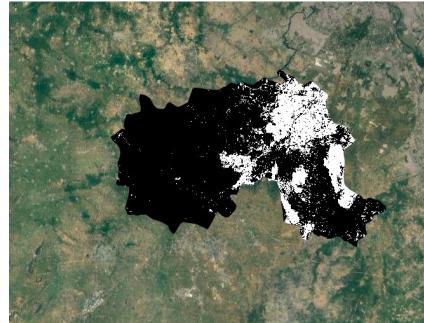
2017

GURGAON

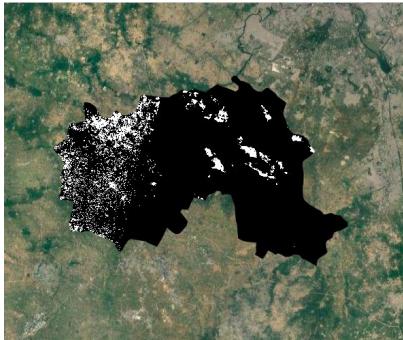
Simple classification



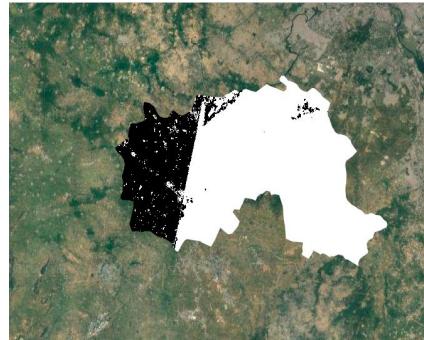
2014



2015

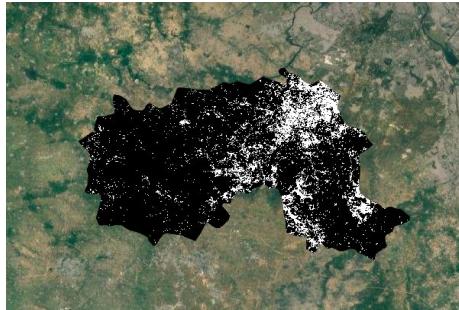


2016

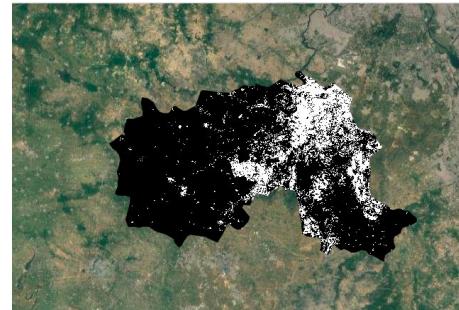


2017

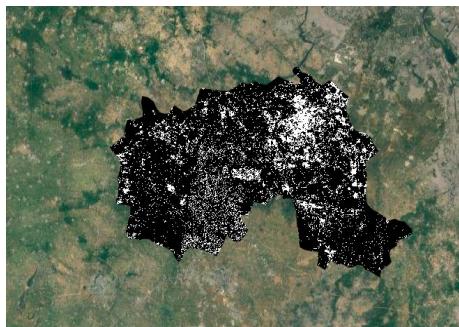
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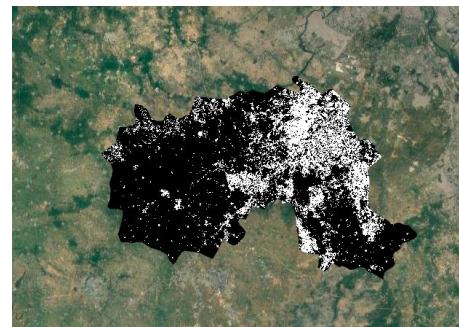
2014



2015



2016



2017

Timeline

Week 1-2

Literature survey

Week 3-4

Getting familiar with
Google Earth Engine

Week 5-6

Basic classification
and Data survey

Week 7-10

Experimenting with different
heuristics for classification

Week 10 onwards

Establishing correlations

Thank you
