INVESTIGATING THE INFLUENCE OF LAND USE AND ALCOHOL OUTLET DENSITY ON CRIME IN JUJA

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Introduction

- According to annual crime reports from the National Police Service, Kiambu has been experiencing a steady rise in crime from 2,946 cases in 2014 to 6,932 reported cases in 2018.
- The highest reported cases of crime in 2018 are the use of dangerous drugs (22.26%), offences against other persons (20.98%) and theft (16.17%).
- The routine activities theory suggests that crime increases where opportunity available for criminal activity are higher (Trangenstein et al., 2019).
- Different land use types may influence the spatial distribution for crime (Pridemore et al., 2012).

Problem statement

- Increase in the rate of crime is unlikely constant throughout an urban or rural environment and thus its link with different land use types needs to be understood (Pridemore et al., 2012).
- Few studies have tested how both land use and alcohol outlet density interact to influence regional violence rates, all investigating the relationship in big cities of developed countries (Pridemore et al., 2012; Trangenstein, et al., 2019; White et al., 2015).
- Such a study has not been done locally.

General and specific objectives

The **general** objective is to investigate the influence of land use and alcohol outlet density on crime in Juja subcounty.

The **specific** objectives of the research study include:

- To spatially characterize the occurrence of crime in Juja sub-county for the years 2017, 2019, 2020 and 2021.
- To examine the spatial relationship of land use and alcohol outlet density with crime.
- To predict the occurrence of crime based on land use types and alcohol outlet densities.

Data & Materials

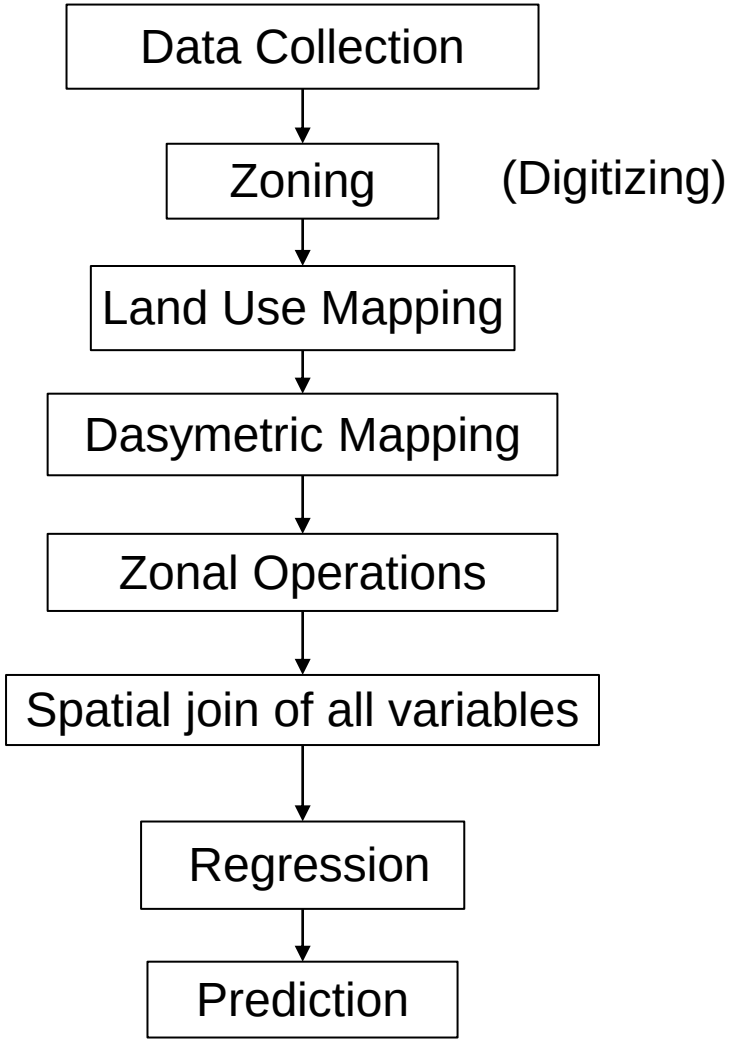
DATA	DESCRIPTION	FORMAT	SOURCE
Juja Subcounty	Polygon of Juja Subcounty	Vector (polygon) shapefile	The Humanitarian Data Exchange
Juja Subcounty Crime data (2017, 2019, 2020, 2021)	Distribution of crime	Tabular	Juja Police Station
Population dataset	Distribution of population by sub-counties	Tabular	2019 Kenya Population and Housing Census: Volume III
Alcohol Outlets (liquor stores, pubs, bars, night clubs, clubs, hotels, restaurants)	Distribution of alcohol outlets by sub-county	Tabular	Google Maps (Web Scraping)

Data & Materials

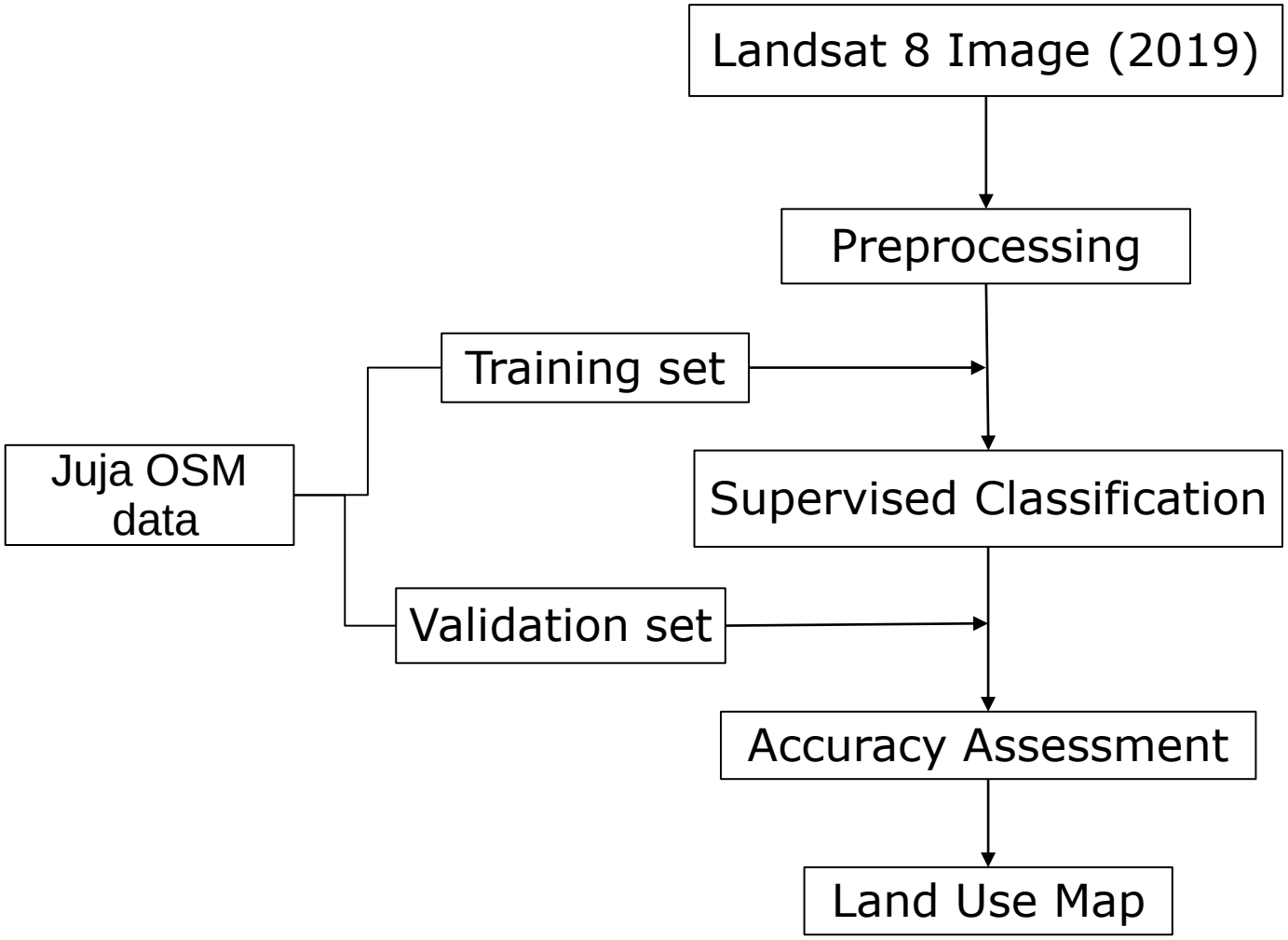
DATA	DESCRIPTION	FORMAT	SOURCE
Juja OSM Data	Juja Subcounty Geographic Database	Vector (Polygon, line and point) shapefiles	BBBike Web Map Service

IMAGE	SPATIAL RESOLUTION	TEMPORAL RESOLUTION	SOURCE
Landsat 8	30 m	16 days	USGS

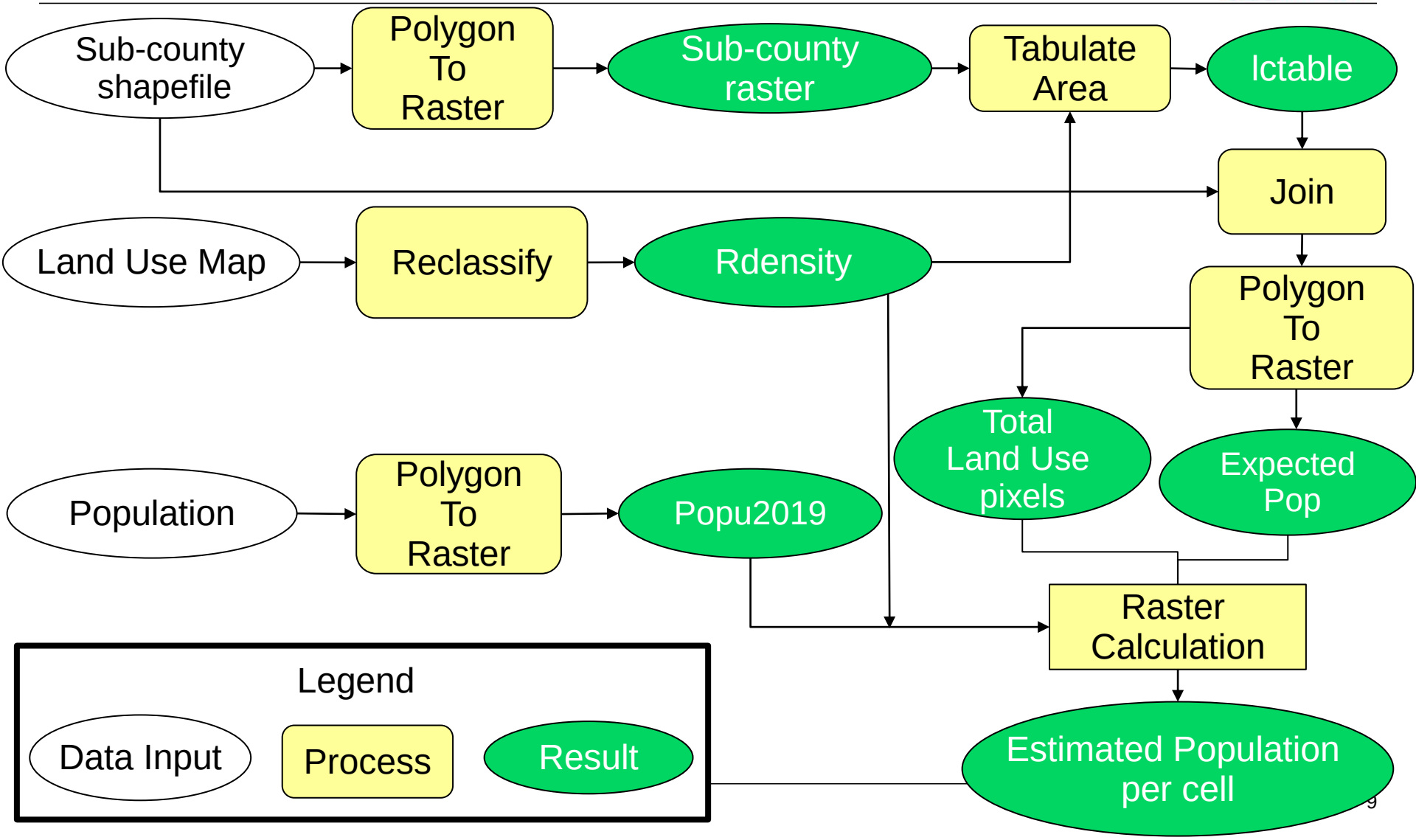
Overall Methodology



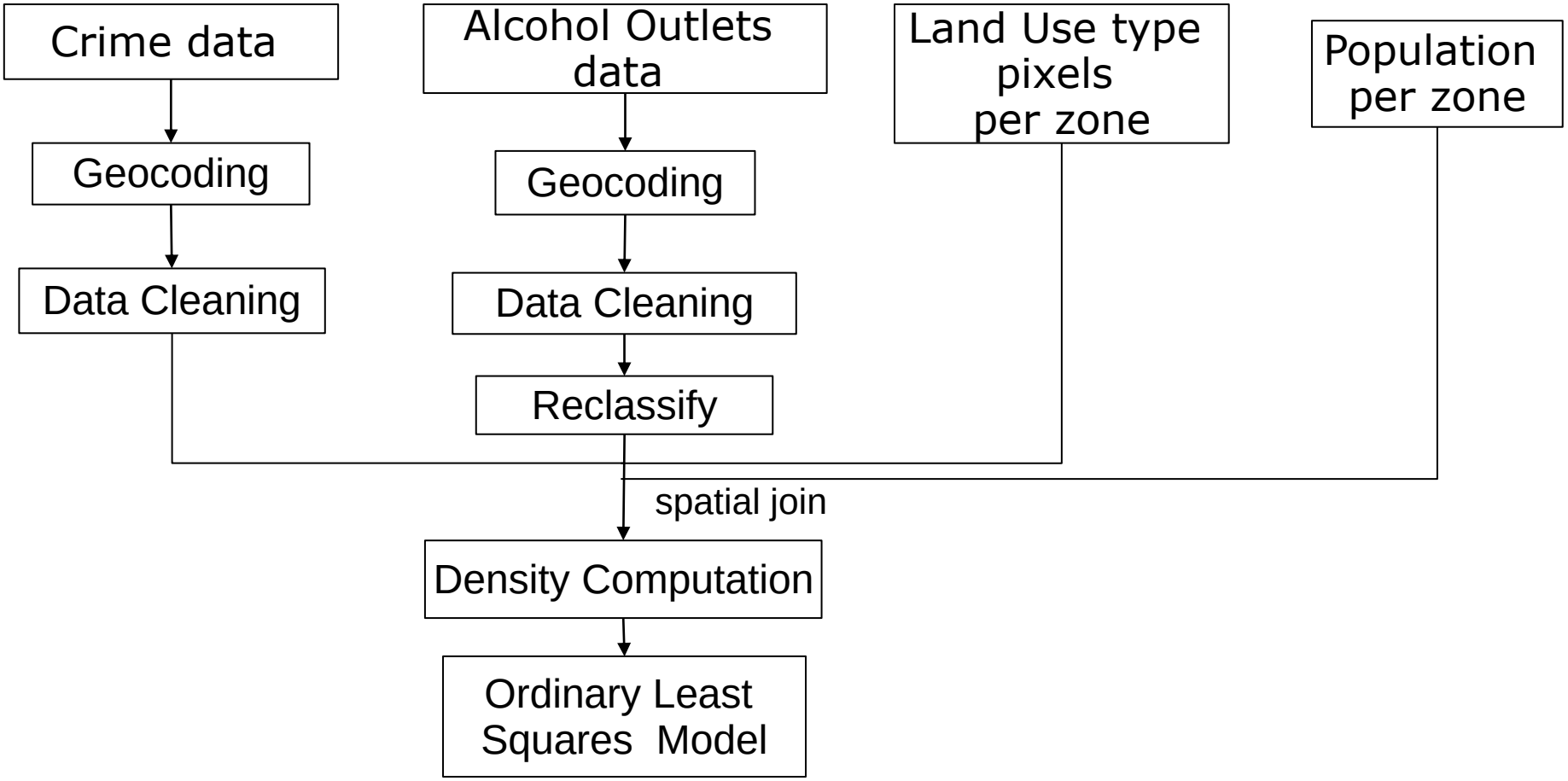
Land Use Mapping



Dasymetric Mapping

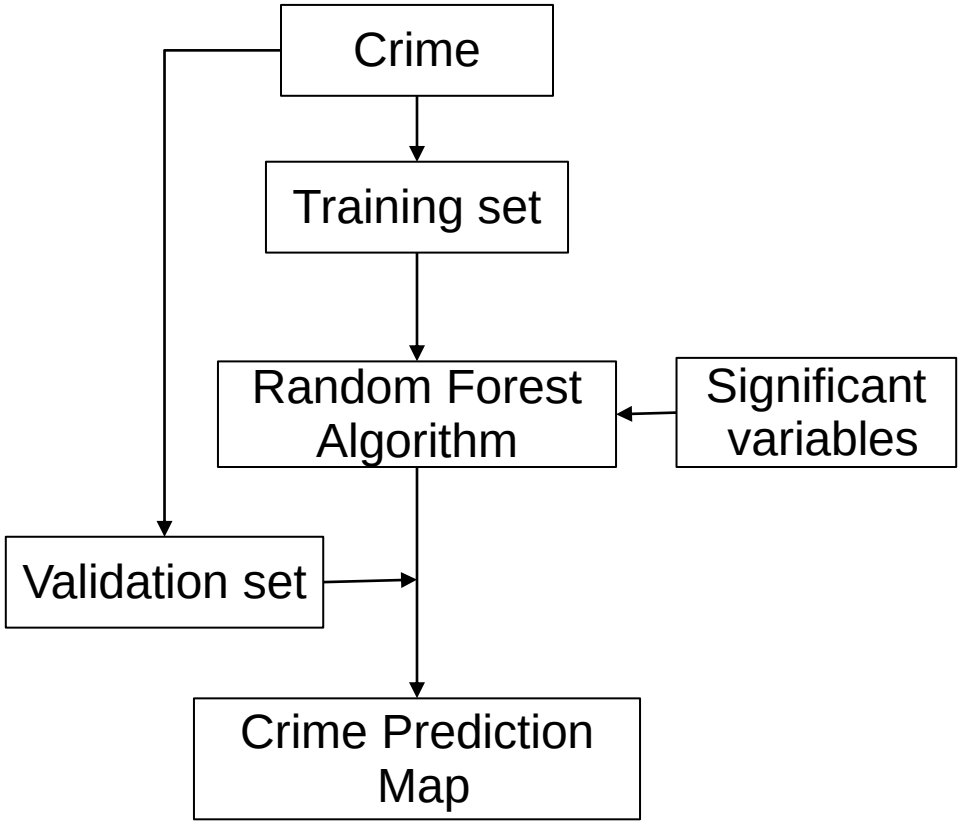


Regression



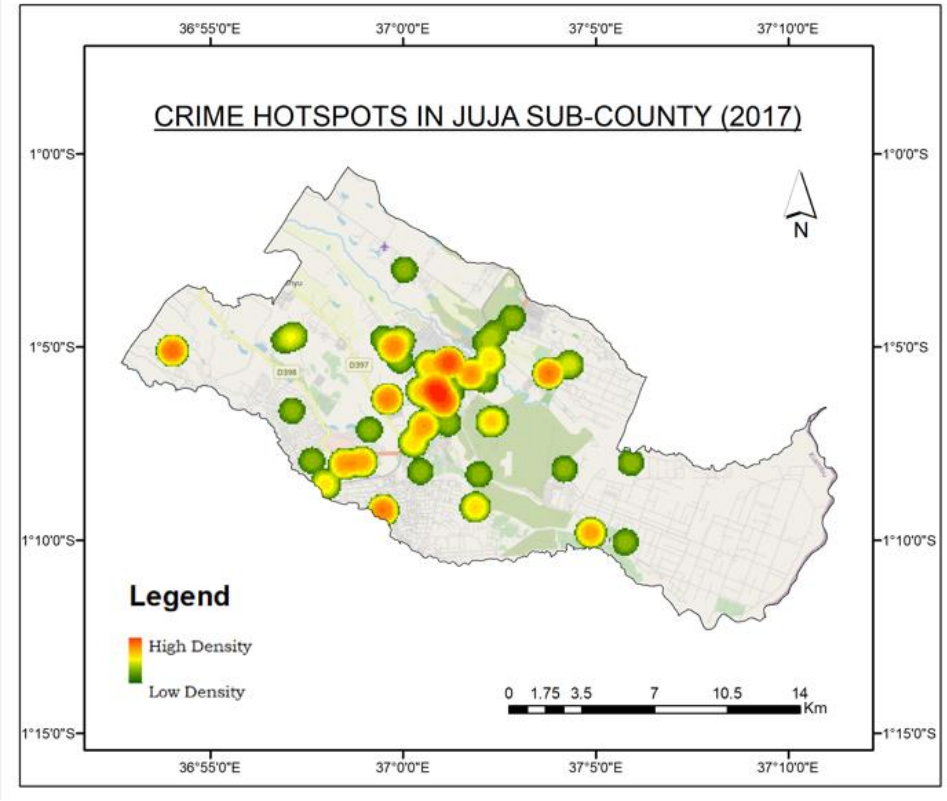
Alcohol Outlet Density = Outlet Count/ Zone Area

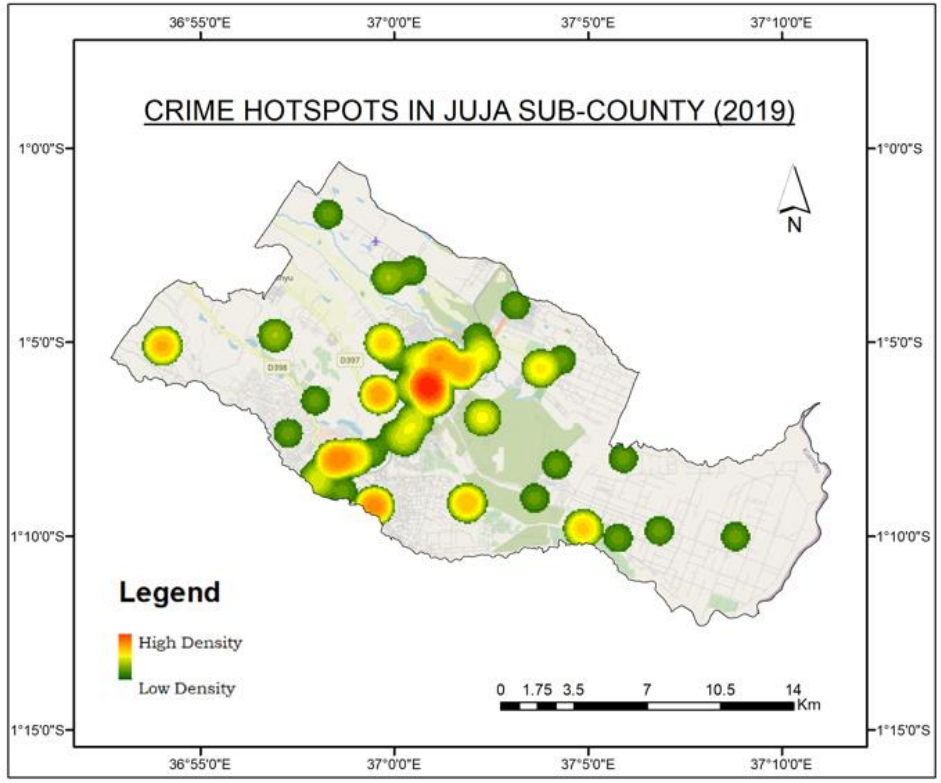
Prediction


Crime
Training set
Random Forest Algorithm
Significant variables
Validation set
Crime Prediction Map

Results

Objective 1





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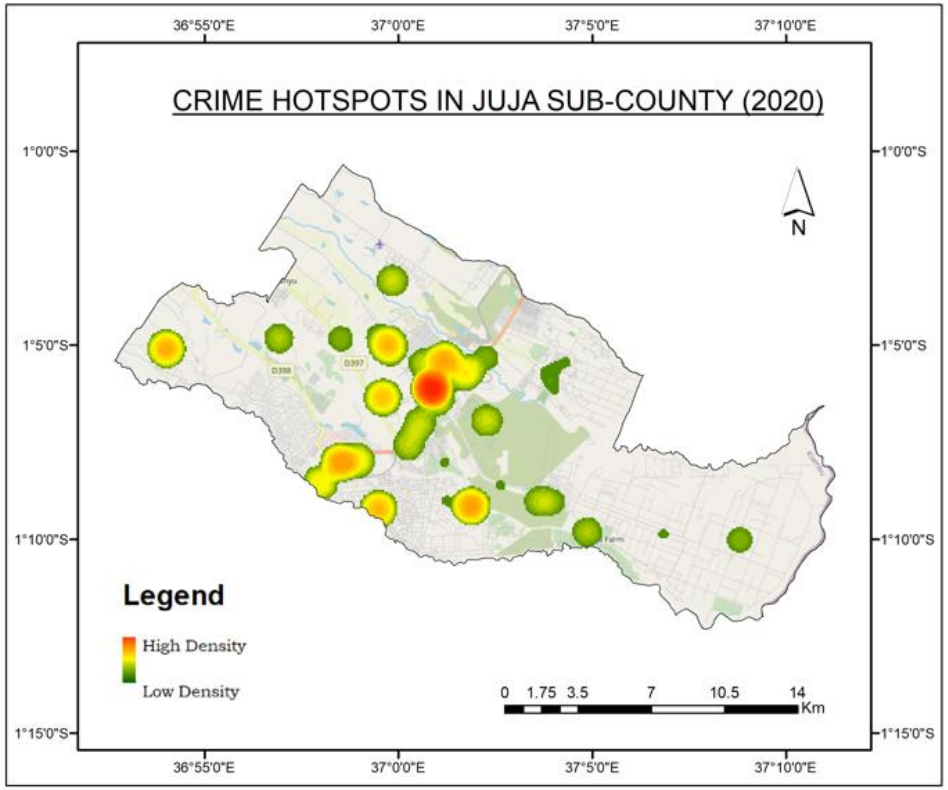
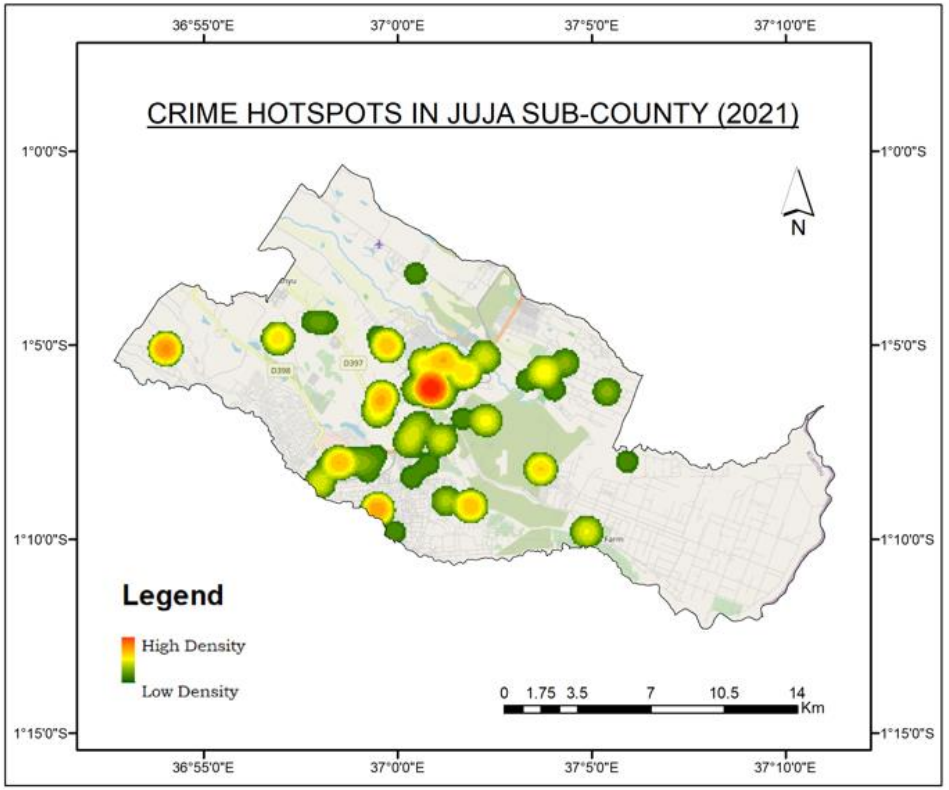
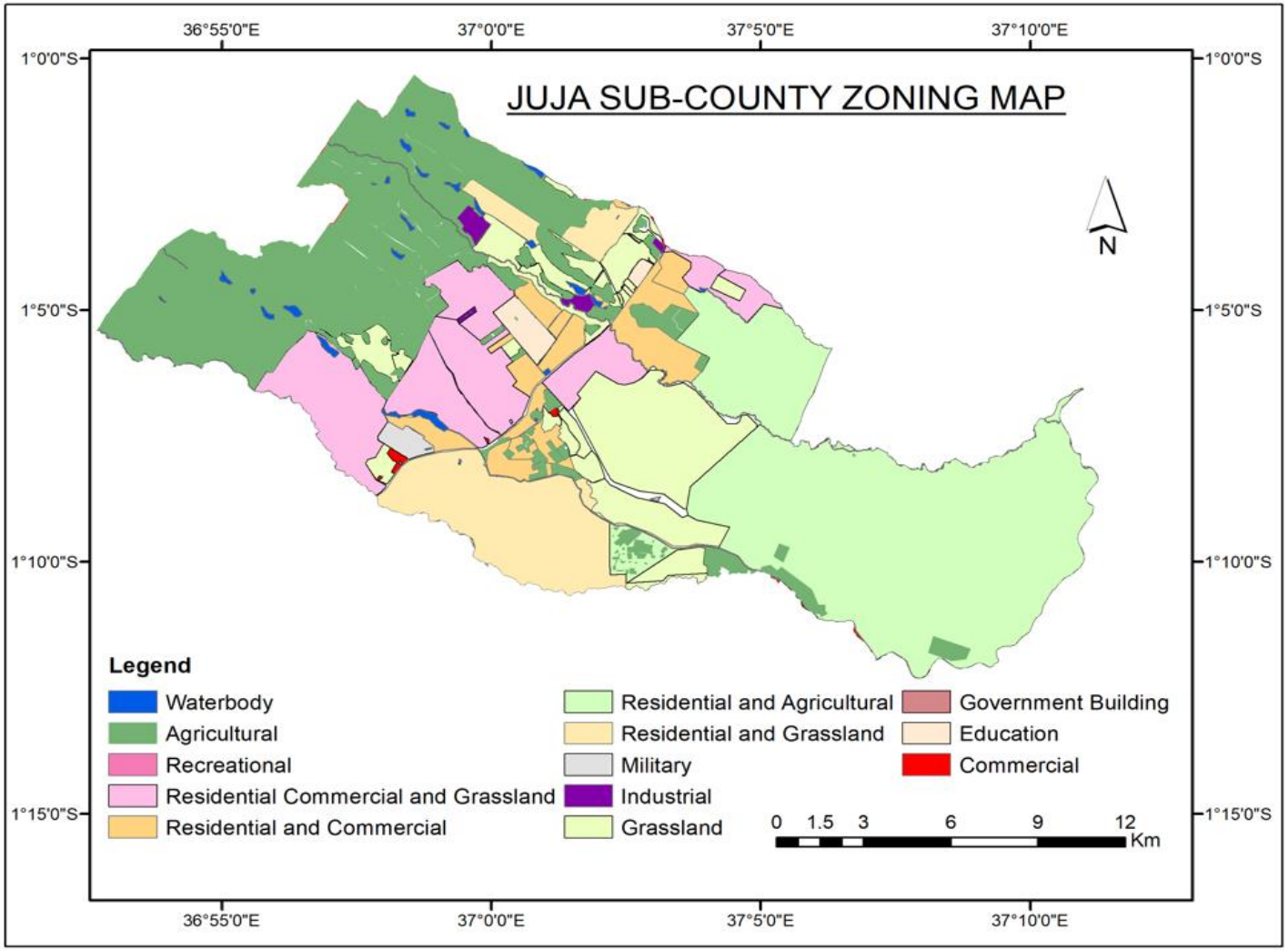
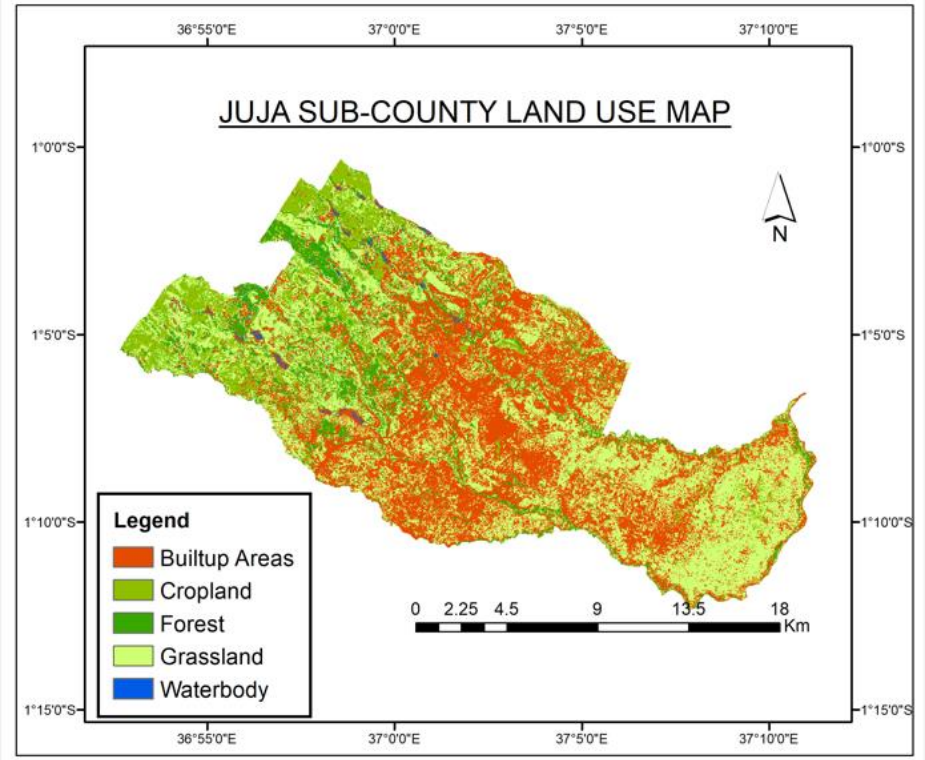

CRIME HOTSPOTS IN JUJA SUB-COUNTY (2020)
36°55'0"E
37°0'0"E
37°5'0"E
37°10'0"E
1°0'0"S
1°5'0"S
1°10'0"S
1°15'0"S
N
Legend
High Density
Low Density
0 1.75 3.5 7 10.5 14
Km

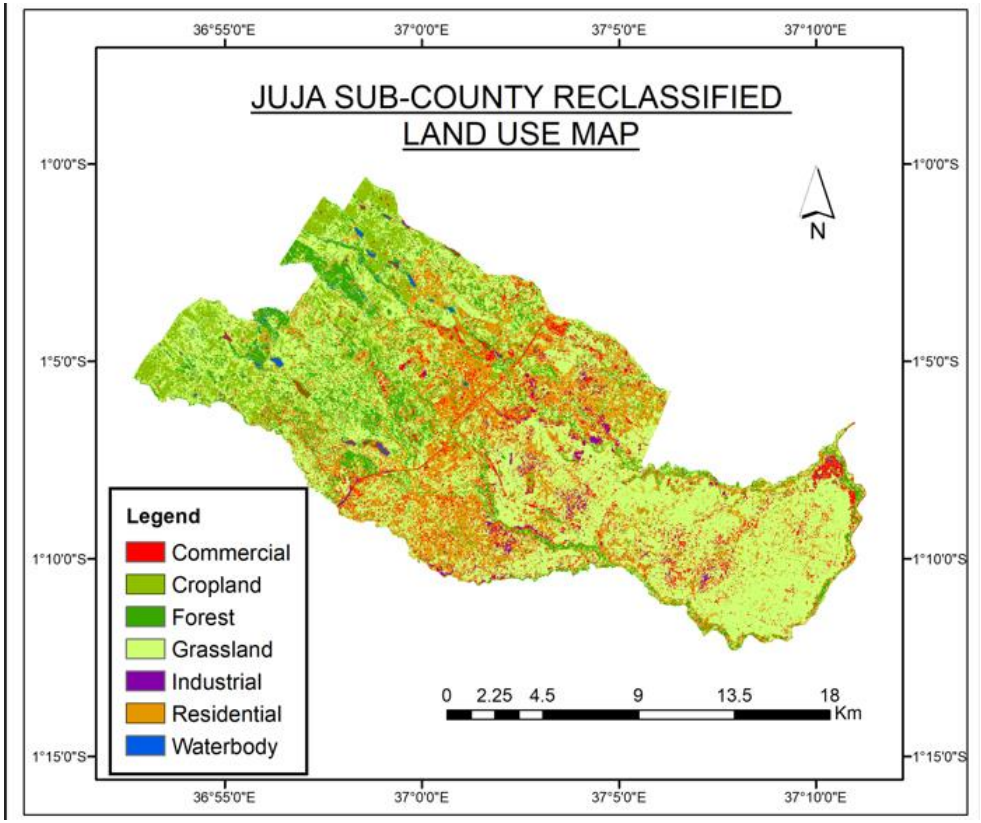

CRIME HOTSPOTS IN JUJA SUB-COUNTY (2021)
36°55'0"E
37°0'0"E
37°5'0"E
37°10'0"E
1°0'0"S
1°5'0"S
1°10'0"S
1°15'0"S
N
Legend
High Density
Low Density
0 1.75 3.5 7 10.5 14
Km

Zoning

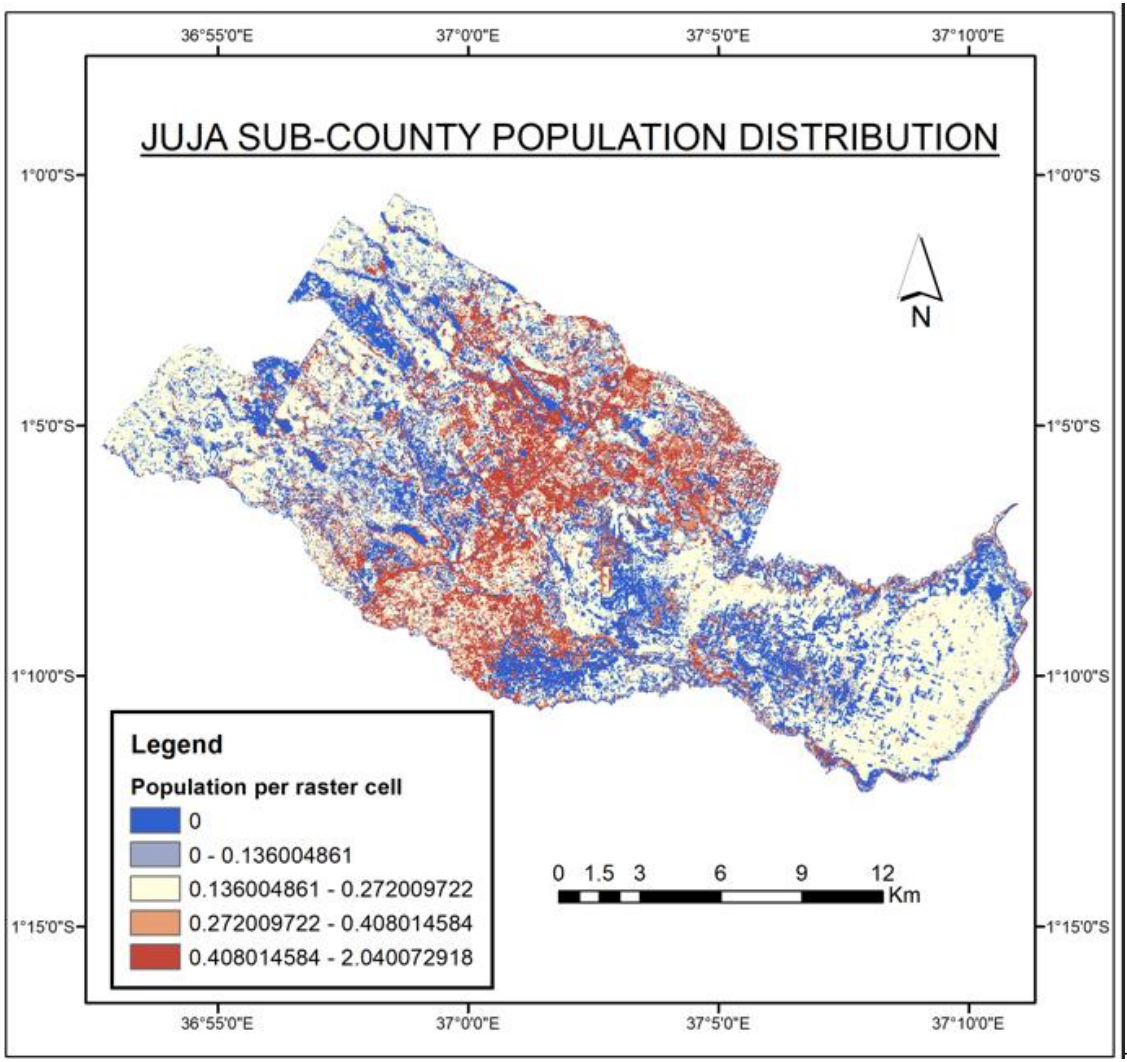

JUJA SUB-COUNTY ZONING MAP
36°55'0"E
37°0'0"E
37°5'0"E
37°10'0"E
1°0'0"S
1°5'0"S
1°10'0"S
1°15'0"S
N
Legend
Waterbody
Agricultural
Recreational
Residential Commercial and Grassland
Residential and Commercial
Residential and Agricultural
Residential and Grassland
Military
Industrial
Grassland
Government Building
Education
Commercial
0 1.5 3 6 9 12
Km

Land Use Mapping





Dasymetric Mapping



Regression

OLS Model Results (Significant Variables)

Dependent variable: Crime

Number of observations = 233

R^2 = 0.731083

Adjusted R^2= 0.716415

Mean Absolute Error = 5.664045

Variable	Coefficient (a)
Off Premise Density	-2.636871
Population	0.002039
Agricultural	0.005767
Residential	0.08087

Thank you for your attention! Questions?

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