Mini Project Report on

LAND COVER CLASSIFICATION OF SATELLITE IMAGE

Submitted in partial fulfillment of the requirement for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER ENGINEERING

Submitted by:

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CANDIDATE’S DECLARATION

I hereby certify that the work which is being presented in the project report entitled **“Land Cover Classification Of Satellite Image”** in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Computer Science and Engineering of the Graphic Era (Deemed to be University), Dehradun shall be carried out by the under the mentorship of **Mr. Hemant Pokhariya, Assistant Professor**, Department of Computer Science and Engineering, Graphic Era (Deemed to be University), Dehradun.

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Chapter 1

Introduction

(2 to 3 pages)

In the following sections, a brief introduction and the problem statement for the work has been included.

1.1 Introduction

Changes in land use and land cover are some of the main factors causing environmental change worldwide. In order to pinpoint the causes, processes, and effects of land use/land cover change, use/land cover change has been examined from a variety of angles. More often than not, especially in developing countries, the rapid changes in land use and cover are characterised by widespread urbanisation, land destruction, or the conversion of agricultural land to shrimp farming, which has a significant negative environmental impact[1].

Such changes have a significant impact on the local and/or national climate, which unavoidably has an effect on the environment on a worldwide scale. For example, changes in land cover brought on by humans have an impact on the global carbon cycle and increase atmospheric carbon dioxide[2].

Therefore, it is crucial to look at the changes in land use and cover in order to determine how they affect the terrestrial environment and create sustainable land use plans[3].

The temporal dynamics of remote sensing data can be used for this purpose to track and analyse changes in land cover. Understanding and evaluating the environmental effects of land cover changes requires current, accurate information[4].

Although such changes can be captured via remote sensing, obtaining the change information from satellite data necessitates efficient and automated change detection procedures.Using co-registered multitemporal remote sensing data, digital change detection is the process of identifying and/or describing changes in land cover and land-use attributes. The fundamental idea behind employing remote sensing data for change detection is that the method can spot changes between two or more dates that are out of the ordinary[5].

Information about changes in land use/land cover (LULC) is very useful for local governments and urban planners in setting future plans for the sustainable development.

The main objectives of this work were to study changes in LULC in Udham Singh Nagar, INDIA. Accordingly, Landsat-7 and Landsat-8 images of year 2000 and 2022 respectively were collected. These images were manipulated and analyzed for LULC and their changes in studied area[6].

1.2 Why satellite image classification?

Conventional ground methods of land use mapping are labor intensive, time consuming and are done infrequently.These maps soon become outdated with the passage of time in a rapid changing environment. In recent years, satellite remote sensing techniques have been developed, which have proved to be of immense value for preparing accurate land use/land cover maps and monitoring changes at regular intervals of time.

1.3 Supervised Classification:

Supervised classification is based on the idea that a user can select sample pixels in an image that are representative of specific classes and then direct the image processing software to use these training sites as references for the classification of all other pixels in the image. Training sites (also known as testing sets or input classes) are selected based on the knowledge of the user. The user also sets the bounds for how similar other pixels must be to group them together. These bounds are often set based on the spectral characteristics of the training area, plus or minus a certain increment (often based on “brightness” or strength of reflection in specific spectral bands). The user also designates the number of classes that the image is classified into. Many analysts use a combination of supervised and unsupervised classification processes to develop final output analysis and classified maps.

Table 1 shows a description of LULC classification scheme

Class	Description
Water	Includes all water bodies in the studied area
Agriculture	Includes the area used for cultivation of crops
Forest	Includes the area dominated by trees
Built up area	Includes construction activities for the urbanization (roads,houses,etc)
Barren Land	Land areas of exposed soil surface

Table 1.1 shows a description of LULC classification scheme

LANDSAT DATA:

Landsat images were used in this study to evaluate land use/cover changes over two time periods (2000 and 2022).Landsat data were downloaded for free from the earth explorer website established by the United States Geological Survey, http://earthexplorer.usgs.gov/. The studied images were acquired during the summer season. The acquisition dates and type of sensor are represented in table 2.

TYPE	Acquisition date	Source
Landsat 7	08/04/2000	USGS
Landsat 8	13/04/2022	USGS

Chapter 2

Literature Survey

Land Change Models are important tools for environmental and geomatics research concerning LUCC [7]. Monitoring and analysis of changes in LULC are needed in order to provide information on existing land use patterns and changes [8] for decision makers to support sustainable development [9]. LULCC models are used to improve and/or better understand the alteration of land use that is induced by human activities [10].

Remote sensing and geographic information systems are powerful tools in change analysis and simulation of LULC [11]. They are broadly used for understanding of LULC changes through determination of the past and the present. The accuracy of the analysis of past and present conditions plays a bigger role in the quality of predicted changes [12]. Continuous data from Landsat imagery provides valuable information that can be used as input for prediction studies. The challenge of precisely tracking land-cover and land-use change in a range of situations has been tackled by several academics[13].

Chapter 3

Methodology

The methodology adopted in this study is as follows:

(1) data collection

(2) pre-processing

(3) LULC classification scheme

(4) selection of training data samples

(5) image classification

(6) change detection.

3.1 LANDSAT DATA

Landsat images were used in this study to evaluate land use/cover changes over two time periods (2000 and 2022).Landsat data were downloaded for free from the earth explorer website established by the United States Geological Survey, http://earthexplorer.usgs.gov/. The studied images were acquired during the summer season.

TYPE	Acquisition date	Source
Landsat 7	08/04/2000	USGS
Landsat 8	13/04/2022	USGS

Table 3.1 The acquisition dates and type of sensor

3.2 Flowchart

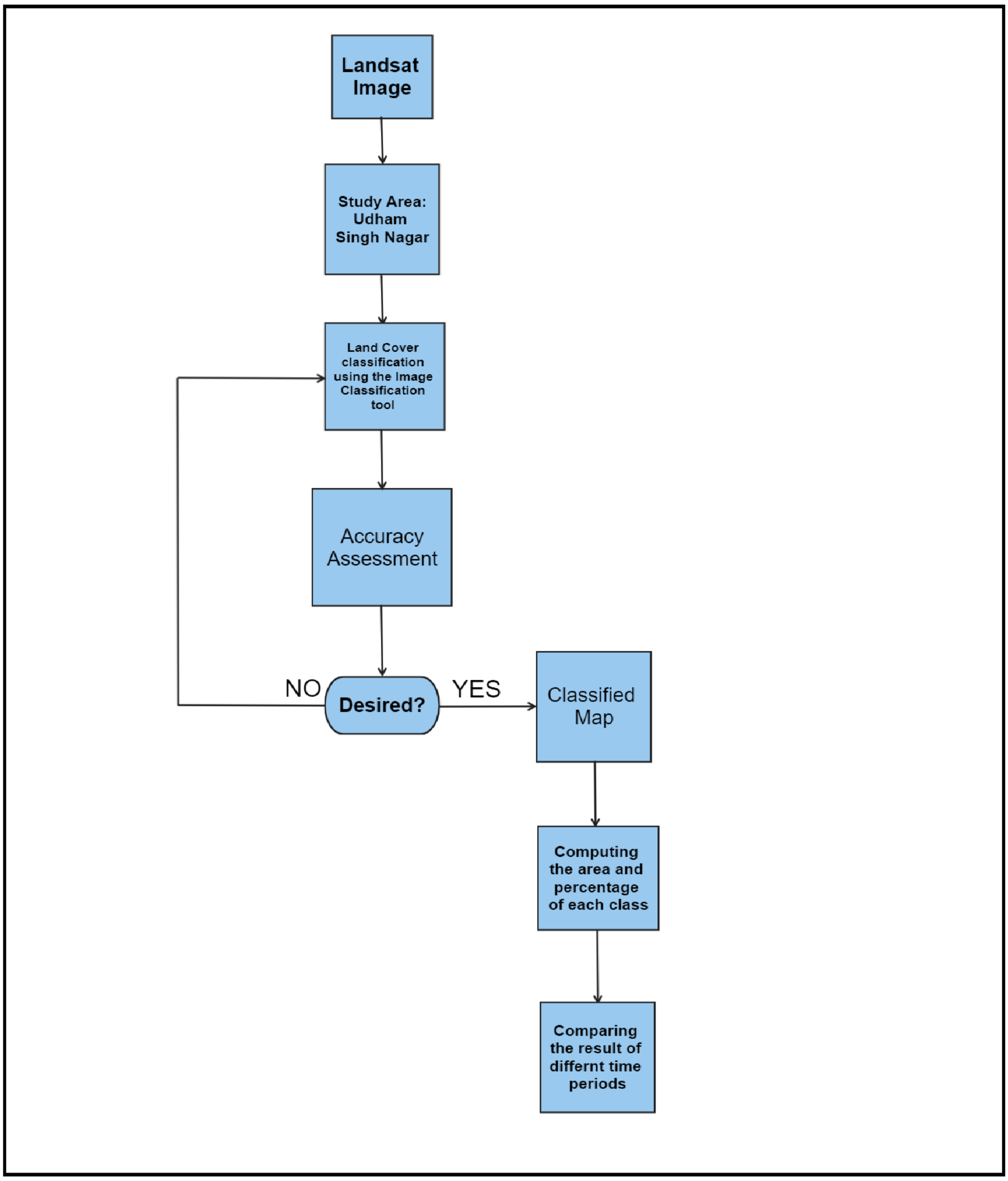

Figure 3.2 Flowchart

3.3 The Study Area and LULC Map Preparations

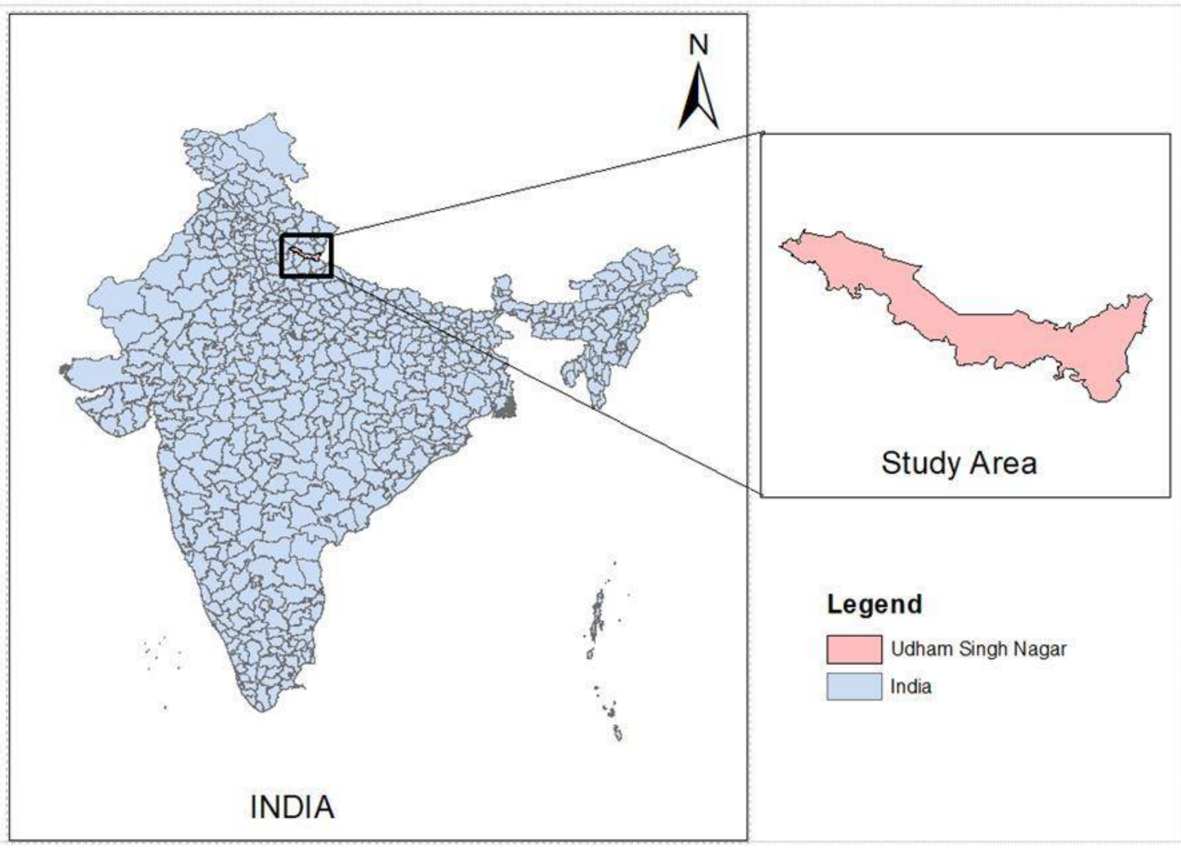

Figure 3.3 The geographical Location of Study Area

Two Landsat images were used in this study:2000 and 2022. The processing of the image classification was carried out using ArcMap 10.4.1 software.

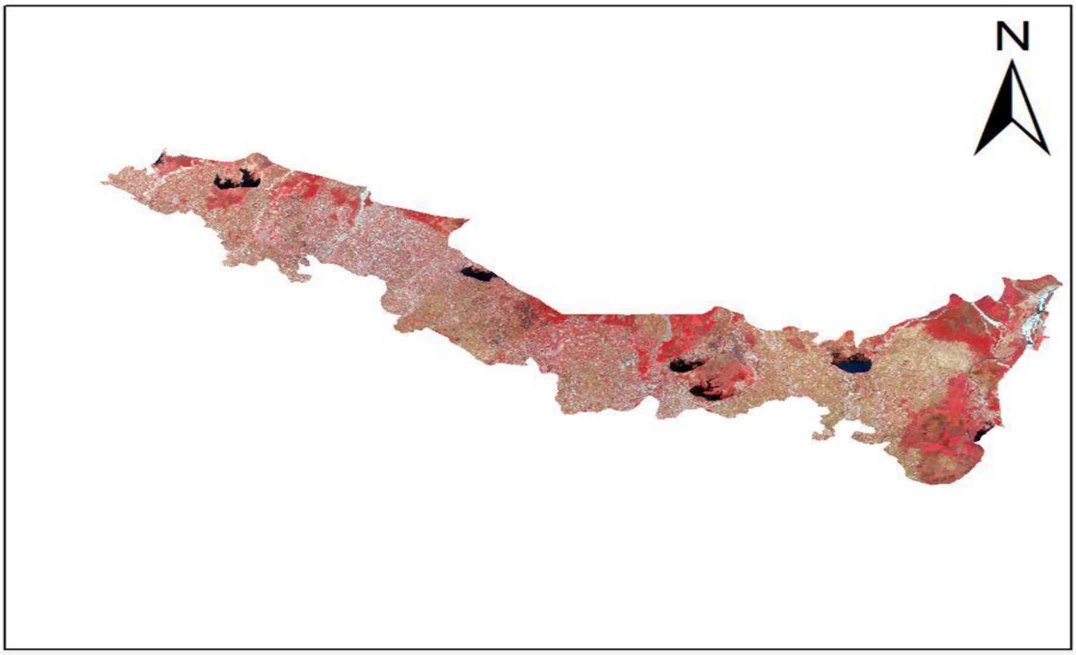

Figure 3.3 False Color Composition in 2000

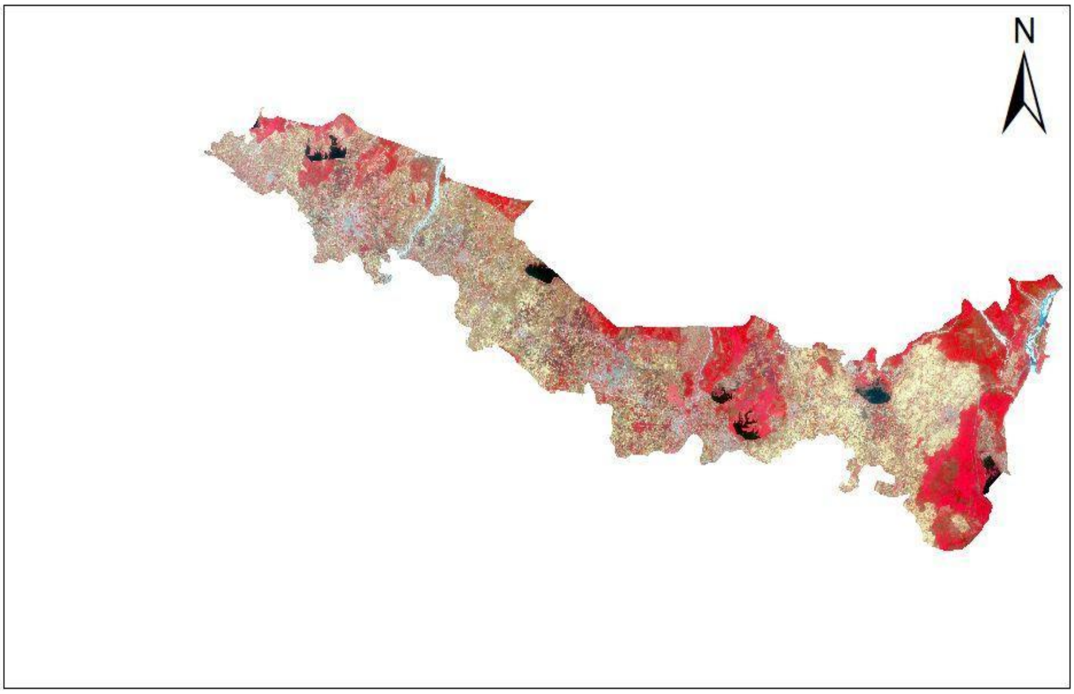

Figure 3.3 False Color Composition in 2022

Chapter 4

Result and Discussion

Interactive supervised classification was carried out to evaluate land use/cover in the studied area in 2000 and 2022 . It was carried out on the ArcGIS 10.4 software package. There were five land use / cover in the studied area. They are water, barren land, built up area, forest and agriculture.

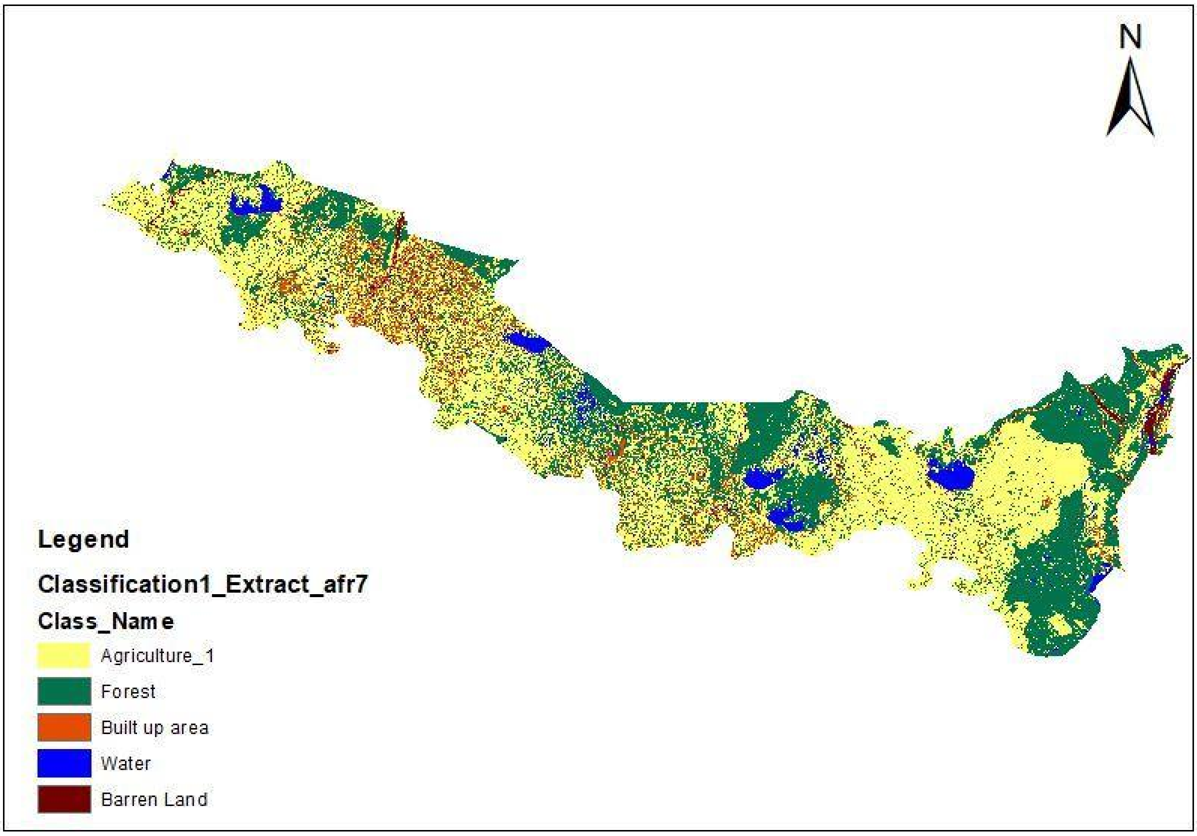

Figure 4.1 Classified Image of Study Area in 2000

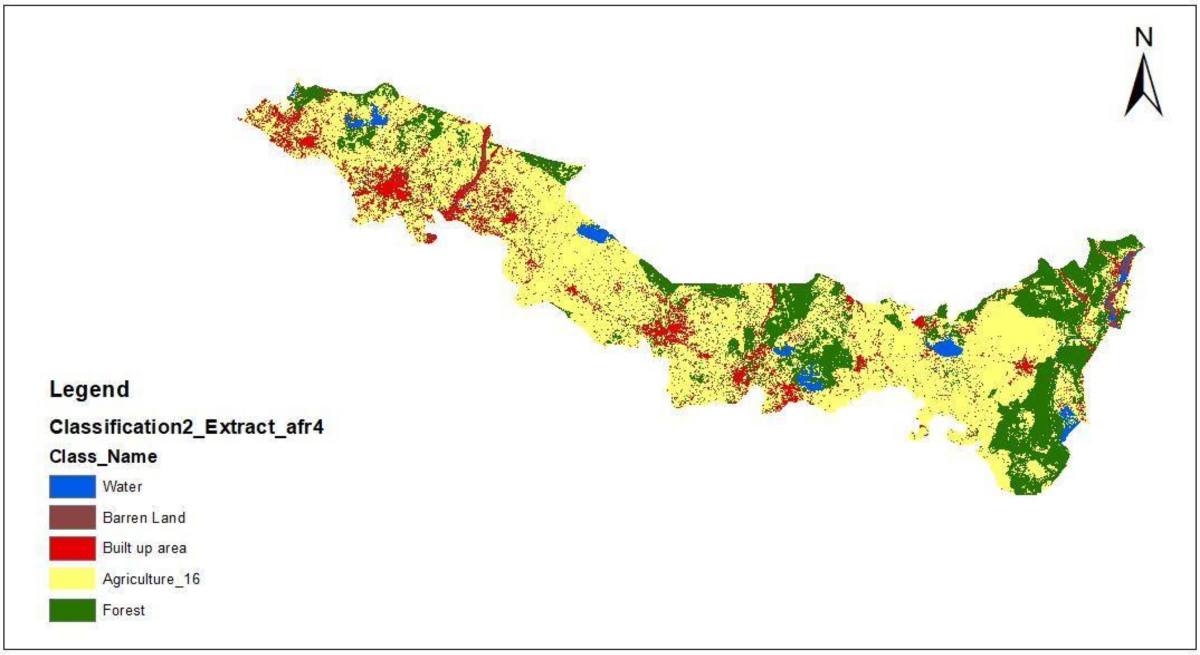

Figure 4.2 Classified Image of Study Area in 2022

OBJECTID *	Value	Class_name	Red	Green	Blue	Area	Percent
1	11	Agriculture_1	230	230	0	1452.3921	50.753805
2	12	Forest	0	115	76	1004.9598	35.118295
3	22	Built up area	230	76	0	223.9353	7.825413
4	32	Water	0	38	115	111.9915	3.91354
5	42	Barren Land	115	0	0	68.3631	2.388947

OBJECTID *	Value	Class_name	Red	Green	Blue	Area	Percentage
1	1	Water	0	92	230	73.3752	2.564094
2	16	Barren Land	137	68	68	29.9835	1.047773
3	31	Built up area	230	0	0	309.2589	10.807044
4	91	Agriculture_16	230	230	0	1755.5157	61.346452
5	106	Forest	38	115	0	693.5085	24.234637

Chapter 5

Conclusion and Future Work

In order to measure and comprehend the LULC changes in Udham Singh Nagar during a 20-year period from 2000 to 2022, remote sensing and GIS were combined in this study. The method utilised in this study is straightforward and reasonably priced. Multi-temporal satellite data was used to estimate the extent of land-use changes in Udham Singh Nagar. Between 2000 and 2022, there were noticeable changes in the LULC in the research region.

The LULC changes should be closely monitored in the future for the sustainability of the environment.CA Markov rule that is used for the prediction of LULC can be used for further extension of the work.

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