Geographic Information Systems
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Module-10
Lecture-46
Introduction to QGIS and Data Import

Good morning, welcome you all to NPTEL online certification course on geographic information systems. I am Chandan MC, a PhD student from Ranbir and Chitra Gupta School of infrastructure design and management, IIT Kharagpur. This module we are going to see GIS as a software, and this module has 8 different lectures. It starts from introduction to QGIS is to Bhuvan and Google earth applications. This is the first hands on session and in this session we will be in Introducing to QGIS and data importing.

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So, the concept covered in this lecture would be understanding the interface of QGIS, importing vector data, tabular data and raster data into QGIS interface. Then we would be looking about the properties and identification of feature and the attribute table followed by metadata inspection and properties viewing. After this we would be briefing about selection of features how to select various features, zooming in and zooming out functions in QGIS and also the panning extends. At the last we will also be seeing how to export data from QGIS.

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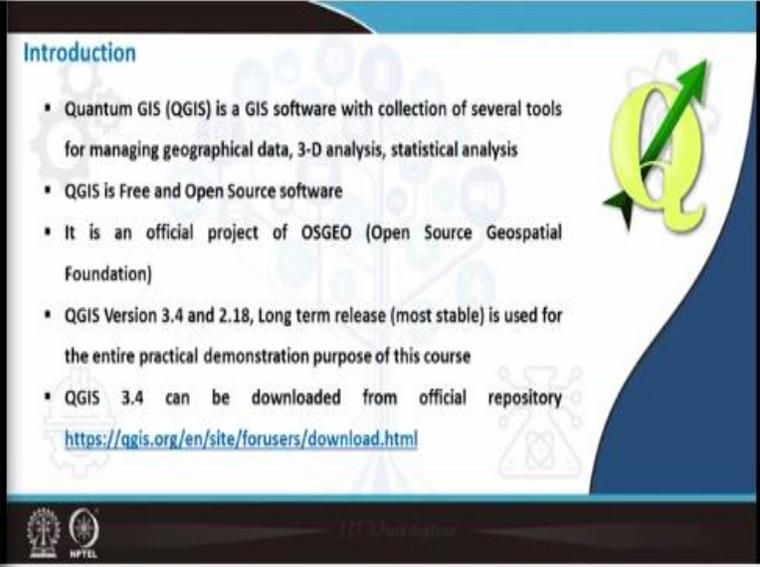
QGIS or quantum GIS is a GIS software with collection of various tools which is used for managing, analyzing and visualizing geospatial data. QGIS is a free and open source software meaning to say you do not have to pay anything for this software, and it is freely available online. QGIS is an official project of OSGEO that does nothing but open source geospatial foundation. And the version which we use in all our practical demonstration would be 3.4 and 2.18.

Please when you are downloading the QGIS make sure that you will download the long term release or a stable version. And QGIS 3.4 download can be taken from QGIS website along with it is manual.

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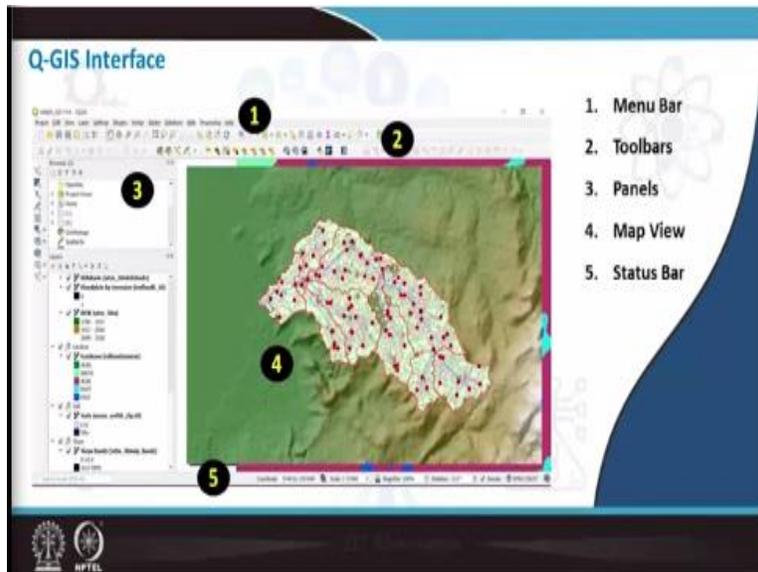
To brief about the QGIS interface, this is how QGIS interface looks and it has 5 important components. The first one is menu bar, second is toolbar, third one is panel, fourth is map view and the fifth is status bar. Now Let us straightly go to QGIS s and see how this interface looks in QGIS. **(Video Starts: 03:11)** So, what you can do is you can go to start and here you can start typing QGIS which goes to the QGIS version which you have installed in your system. So, here I am taking QGIS 3.14 that is desktop version.

So, if you click on that, it will automatically start opening the QGIS interface, once it is opened, this is how it looks. Now, as I already mentioned QGIS has 5 important components out of which the first one is menu bar. Menu Bar is located at the top you can see here and menu bar has the following features. The first one is project here you can manage a entire project you can save the project. Second one is edit, here you can copy the feature, paste the features and cut the features like this you can explore various editing options.

The third tab is view, this is basically to pan to the zooming extends or zoom out extends, then the fourth one would be layer. So this is very important toolbar, most of our addition of raster layers or vector layers can be done from the layer tab. The fifth one is setting, so here we can use this setting menu bar for various purposes like setting the internet proxies or setting the default font size and icon size such things.

After that we have plug ins, in detailed the plug ins installation and it is users will be taught by my colleague Prakash. But plugins are a core component of QGIS. The next tab will be vector, here there are a lot of vector related operations listed. And if you want to analyze any kind of vector data, we need to go to the vector menu bar. The next one is raster similar to vector, we have the raster menu bar and under this we have various raster operations.

And then you have database, meaning to say if you have a large set of data in the form of tables, this database can be used. And finally we have web toolbar, this is also one of the important toolbars in QGIS. So, web toolbars leads us to the Google earth interface or the Bing maps or OSM maps that can be integrated into QGIS, all those things can be found under the web section.

Then we have processing toolbar or the processing menu bar, here we can add various toolboxes which will be helpful in our analysis. Finally it also has the help content, meaning to say if you click on the help content it will lead you to and one more page which will tell you about each and every features of QGIS, so this is about the menu bar of QGIS. The second important thing is to the bottom section of the menu bar, this is called as toolbar.

Now toolbar also consists of various tools such as panning the map, zooming into the map, zooming out of the map, zooming to the extents or full zoom, and refreshing the views and you also have selecting features, settings, measuring distances, version options. Now let us say if you are not finding any of these options in the toolbar, you can easily bring that by right clicking on the toolbar space and here you can select various toolbar options.

As you can see I have already selected advanced digitizing toolbar, which is nothing but the digitizing toolbar located here, I also have attribute toolbar. Similarly I have database toolbar, managing layer toolbar, map navigation toolbar, quick OSM, vector toolbar. Like this you can also customize whatever you want in the toolbar section. Now the third important component in QGIS would be the panels, on to the left you can see 2 panels here.

The one is browser panel on the top and the second one is layer panel at the bottom. Browser panel leads you to your own PC disk wherein you can browse to various folders and various

files. And the layer panel manages the layers in the QGIS display section and here you can arrange the layers according to hierarchy, meaning to say if you have a raster you can put it at the bottom.

And if you have a vector point layer, you can put it at the top, so that the visibility of the vector would be at the top. And the next section would be map display area, you can see the white big space to the right, this is the map display area of QGIS. Whatever layers you add to the left that is the layer panel would be displayed at the map display section. And the last component of QGIS would be the status bar, status bar can be found at the bottom most portion of QGIS.

So here you can see status bar is divided into 5 important components, the first one is coordinate. Here whatever map you load that coordinates will be displayed, the second one is scale, you can also observe scale changes as you zoom in and zoom out. And the third one is magnifier, here you can set the magnifying extents from the 0 to 100%. Then the fourth one is rotation, here you can assign various angles for your map.

For example, 0 degrees is the normal and then if you want to turn it by 90 degrees you can set as 90 degrees. Last one is the coordinate information that is whether you are working in a lat long system or a UTM system that would be shown here in terms of EPSG code, EPSG means European petroleum survey group. So, they have developed a lot of codes for all kinds of projections and transformations.

So, the general coding for lat long system is 4326 and the UTM code starts with 326 and then whatever UTM zone url that particular number. Now, let us see how to import a vector database or a vector data into the QGIS. So, initially what you need to do is, in this particular exercise we are going to add an existing layer. Now for adding an existing layer, we have provided datasets which will be helpful for the practical sessions.

Here we have 2 important folders one is vector and raster all the analysis which we are going to do, all the files that are required to do the analysis are stored in these 2 layers. So, here let us first see what is there inside the vector folder, here you can see a lot of files are there and all these are

shape files. So, for example here I have BBMP wards, industry, rainfall, district, so all these are various layers that are used for our demonstration purpose.

Similar to this I also have a raster folder and there are certain raster images, so this folder will be circulated to you later. Now, let us see how to bring these shape files or vector files into QGIS, first go to the menu bar and in the layer tab you have the third option add layer. In the add layer section you can go to add vector layer. Once you click on add vector layer, there will be a new display to add the vector layer.

So here you have source and then vector datasets, what you need to do is you need to click on the radio button which is called us browse button which will lead you to the local disk space from your PC. Now, I will navigate this browse panel to where I have stored the vector datasets under the vector tab. Here I will choose rainfall dot shp, please make sure that you are choosing an shp file, because when you are trying to bring a shape file into a QGIS interface, there are also associated files along with dot shp extension **(Video Ends: 12:24).**

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I will quickly take you to the vector file extensions, shapefiles are most commonly used for storing geometric location and attribute information. So the extensions of shapefile include dot shp or the shape file itself. Along with this we have other 3 important extensions, the first one is dot dbf that is database file, here all the attribute information is stored. Then the second one is

dot prj file or the projection file, so dot prj file stores all coordinate reference system information.

Then the third one is dot shp or the shapefile itself, it stores all the geometry features, it maybe a point, a line or a polygon, then the last one is a shx, this stores the index of feature geometry. So whenever you are trying to open a shapefile in QGIS, these 4 or 5 files has to be there in your route folder. Along with the shapefile there are also other extensions, for example Google keyhole markup language that is dot kml open street maps that is dot osm, GPS exchange format dot gpx.

And geographic javascript object notation that is dot GeoJSON, these are other extensions for vector data files **(Video Starts: 13:53).** Now let us go back to the QGIS interface, here I am trying to open a shapefile named as rainfall and if you see the type it is dot shp, just select it and then say open. Once you open at the source, then you can click on add, so this particular layer will be added onto the left you can see in the layer panel rainfall has been loaded.

Now you can close this and now you can see the rainfall point data has been loaded to QGIS and it is displayed in the map display area. I will add one more shapefile layer to this I am once again going to the menu bar, layer, add layer, add vector layer. Now this time I will again go to the browse tab and here I will choose a shapefile named as district DIST. Then say open and add, I will close this window.

Now, you can see the district layer has been added this is basically a polygon shapefile, this has been added into the QGIS interface. The previously added point data that is the rainfall data is below district that is why it is unable to view. So, what you can do is you can pull this district downwards in the layer panel. So, now you can see the point data has been put on top of the polygon, this is how we load a vector into QGIS interface.

Now, let us see how to view the attribute information of this particular shapefile I will click on rainfall and then right click. Here I have something called as open attribute table, when I click on open attribute table QGIS takes me to another window which is the attribute table. Here you can

see the attributes are arranged according to the ID, each of the station that is each of the point data has ID, and then rain gauge name.

So, here we are trying to see what are the different rain gauges present at various stations. So, for example, there may be named by HDKOTE, BAILKUPPAE or something like that. Then corresponding easting and northing these are nothing but the UTM coordinates. And then I also have rainfall data for 5 different years. So, this is basically the attribute tables stored in the form of rows and columns and this particular storage would be stored in dot dbf, that is database file.

I will close the attribute table to know more properties or the metadata of this particular file, I will again right click. And here at the last I have something called us properties I will click on properties one more tab is open and in the property tab I will go to information. So, here we can view the information of this particular shapefile name is rainfall and the particular path from where we are taking this file.

And then we have storage format that is esri shapefile, geometry this is point type, coordinate reference system epsg, code for Mysore is 32643 that is UTM zone number 43, WGS 84 and this is projected coordinate system. Below that you can also see the extents of coordinates that is bottom left, top, right and to the left, unit is meters. Once you look at the properties or information of the shapefile, you can just close this tab.

Now, let us see how to identify various features of a vector, suppose I want to know without opening the attribute table I want to know a points details. So here in the toolbar, you have a feature called us identify features marked as i and a arrow. I will select this and I will zoom to the point where I need the information. For example this particular point I will choose this, once I choose the point there is one more tab opened onto the right, this is called as identify feature tab.

So here you can see the ID for this particular point is 16, rain gauge station name is Mysore DC office and corresponding east and north coordinates and followed by 5 different rainfall values that is for 5 different years, this is how you identify a feature on a shapefile. Once you are done

with the querying you can just close this tab. Now the next part is how to select these features, you can just zoom in or zoom out using this particular tab.

Once you go to the toolbar section, you can see this magnifier toolbar, I will select this and I can zoom on any of these points. If I want to zoom out, I will simply select the magnify out toolbar or zoom out toolbar and then select like this. So this is how you zoom into a particular point. Now, let us say I need to select only 2 or 3 points in this particular file, for selecting first you need to zoom into that particular location.

So let us say I have to select these 2 points I am just zooming here, once that is done, here in that main toolbar you have something called as select features when you click on that you will get 4 options. First is select features as such, select features by polygon, select features by free hand and select features by radius. Now I will select the first option select features and I will left click and draw, so that I can select these 2 points.

Now you can see the color of the points has been changed from blue to yellow, that means the features are selected. Now, if you want to save the selected features you can also save it will see this in the later stages. This is how you import query and get the information of a vector in a QGIS interface. Now let us see how to Get a tabular data into QGIS, I will go to project and say new I will discard the old project.

So, here I am going to add one more data that is a tabular data QGIS also supports tabular data when I say tabular data it is basically CSV file comma separated value file and before opening the CSV file, I will just show you how a CSV file looks in an excel. Go to the vector database and here in the file name tabular data 1 you can see it has an excel file, I will try to open this, this is how it looks in excel.

So, here I have ID, raingauge name, rainfall, latitude and longitude. Let us try to bring this data into QGIS I am going back to the QGIS interface. Now if I want to add this comma separated value file here, I will go to layer, add layer and add vector layer. So here this time I can choose

delimited text, and here in the file name I will browse for tabular data 1, select and say open. Now you can see the file format it has automatically taken CSV that is comma separated value.

And at the bottom you can also see it has also drawn the attributes of this particular data. One important thing here is you have to add the latitude and longitude information in the X and Y field. So here in the X field I am going to select longitude and in the Y field, I am going to select latitude. Once these settings are done you can also see the CRS that is coordinate reference system, it is 4326 WGS 84 which is nothing but lat long system once filling all these options I will just say add.

Now you can see in the layer panel the tabular data has been added and these are the 4 different points of the tabular data, this is how we add a tabular data into QGIS interface. Now the next task is to add a raster before adding the raster, I will just go to project and say new. It will ask you whether to save the current project or discard I will say discard, if you want to save you can save it as a project.

Similar to the vector addition raster also can be added from the menu bar, go to the layer section, add layer and here we can say add raster layer. Once again there will be one more tab opened with the source type. Now this time what I am going to do is I will select with the browse button, go to the field where you have kept the raster file. So here I have a raster file by the name Topo 56K 7, I will select this and press open, then say add.

It will ask for the coordinate reference system since this is a plain JPEG image, it does not have any coordinate reference system, I will just press cancel. So now you can see it has been added in the layer panel, I will close this. Now I can visualize the raster layer here onto the right in the map display section. So this is how we add a raster layer similar to a vector layer in QGIS interface, now I will also show you how to export the data.

Once again I will go to project, select new, and press discard to discard the raster information, I will go to layer, add layer, add vector layer. Here I will choose the district and rainfall shapefile rainfall dot shp add. Now let us say I need to export this particular file as this is in a UTM, so I

will export this as a lat long file, right click on rainfall, go to the auction export. Then you have an option called save feature as, click on that, it will take you to another window wherein you can export the layer.

So here the format you can choose what kind of shapefile format you need to export whether it is ESRI shapefile or GeoJSON or GML, KML or any other formats. Now I will just select ESRI shapefile, then I will click on the browse button. So here I will navigate to the folder where I need to save my vector layer. And here I will type new name that is rainfall lat long and then press on save. So here you can see the file name is being saved as rainfall lat long dot shp.

The next is layer name this is optional, and the next option is CRS that is coordinate reference system, you can see by default it is taking 32643 that is nothing but UTM zone 43. So now, I will go to the right tab which is select CRS. Here in the filter, I can choose lat long by pressing the lat long code that is 4326. So it filters out everything and gives you the corresponding coordinate information that is WGS 84 EPSG 4326.

This is latitude longitude at the bottom you can see it is for the entire world, then press ok and then again press ok. Now the layer has been successfully exported, if you want to see the properties of the exported layer, right click on rainfall lat long, properties. Here you can see the information rainfall underscore lat long is the name and geometry is point, coordinate reference system is geographic that is nothing but latitude and longitude.

And you can also see the extent is now modified from UTM to degree minutes seconds or decimal degrees. Once you get all the information you can close this tab, so this is how we export a shapefile **(Video Ends: 28:34)**
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Summary

- Understanding QGIS Interface
- Importing vector, tabular and raster data to QGIS
- Inspecting dataset with identify feature and attribute table
- Metadata and properties viewing
- Selection of features
- Data export
- Zoom in/out, zoom to extents/selected features, pan
- In the next session, we shall discuss about Georeferencing a raster image!

Now, to summarize today's class, we have understood QGIS interface, how QGIS looks, **(Video Starts: 28:42)** what are the different panels or what are the different toolbars. The first one is menu bar, second one is toolbar, third one is browser and layer panel, fourth is map display area onto the right and the last one is your status bar which shows you coordinate and other details. We also saw how to import a vector, tabular data and a raster data, the vector data being rainfall and district shapefile.

Tabular data, we also saw how to bring in a CSV file and raster file also, then inspecting a data set with identifying feature, selecting a feature and selecting various other features. We also saw how to view the metadata and attribute table of a vector, data exporting, zooming in, zooming out. And finally in the next session we will also see how to geo-reference a plain image, **(Video Ends: 29:42)** thank you very much.