Remote Sensing essentials
Dr. Arun K. Saraf
Department of Earth Sciences
Indian Institute of Technology-Roorkee

Lecture-17
Digital Image Processing Software

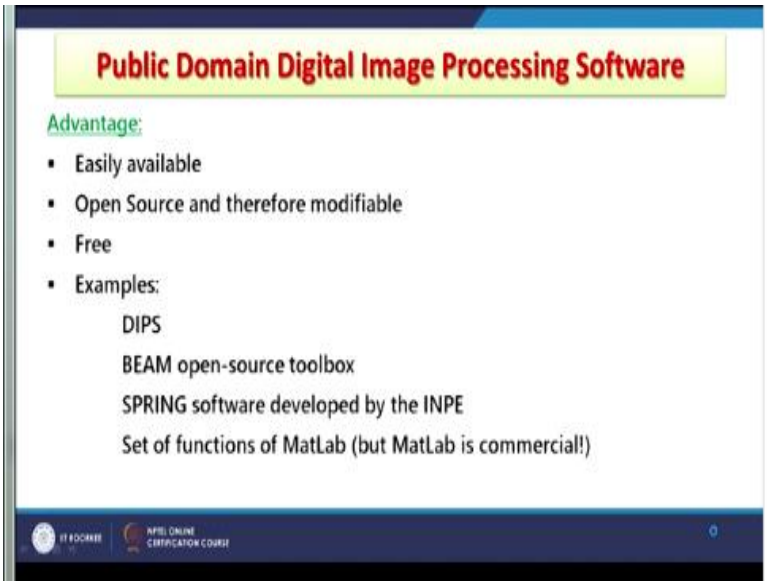
Hello everyone, and welcome to the next discussion which is on digital image processing software. And in this lecture we will be seeing different softwares and workings of some of them. And there are some commercial softwares and there are some public domain as well to improve our understanding about digital image processing basically digital image processing as I have just mentioned there are 2 types.

One is the public domain or open source generally available through internet. And sometimes you may get a very good software and open source without paying any money. However they sometimes you do not get the support or most of the time through these open source software you do not get the support. But there are discussion groups and others who may provide support or you know some digest and some web pages which may provide support against these softwares.

Nonetheless, there are free and if one would like to develop further, you can improve on that one also. And of course the next option which is expensive sometimes is the commercial option that we go for commercial software. However as written in the bottom of this slide that do not use pirated softwares. Because that is basically not ethical and also is destroy the software industry which India has benefited maximum in the because of software development world over.

So this is a **a** completely unethical to use pirate softwares. If one would like to use does not have the resources, financial resources, the best thing is to use open source softwares, what are the advantages in brief we will be seeing about the public domain or open source software.

(Refer Slide Time: 02:28)



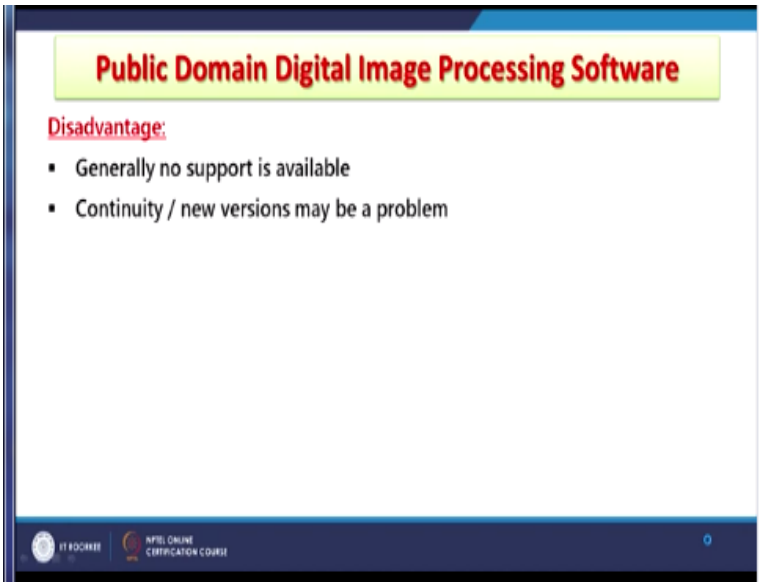
Though they are easily available on net generally, open source and therefore modifiable if one knows the programming one can modify there are some times extensions or tools software tools are also available which one can incorporate, so that is another. Of course free and for examples one software which I like most, though it is just for learning is a kind of tutorials software for digital image processing system that is DIPS very good software for learning.

There are some other open source softwares like BEAM open source toolbox, SPRING software developed by INPE. And then set of functions of MatLab again but MatLab is commercial. So one has to remember but these functions of MatLab and routines and extensions might be available which might be free. So this is non exhaustiblist there can be many more public domain or free digital image processing softwares are there.

Sometimes you may get simple photo editing software like photoshop or photo styler or irfanview or others. These can also be used for simple image enhancement, or that kind of processing you can use. But these softwares cannot be use seriously for especially I am talking about geo referencing. So that is not possible with these photo editing softwares but image enhancement part definitely you can do using the softwares.

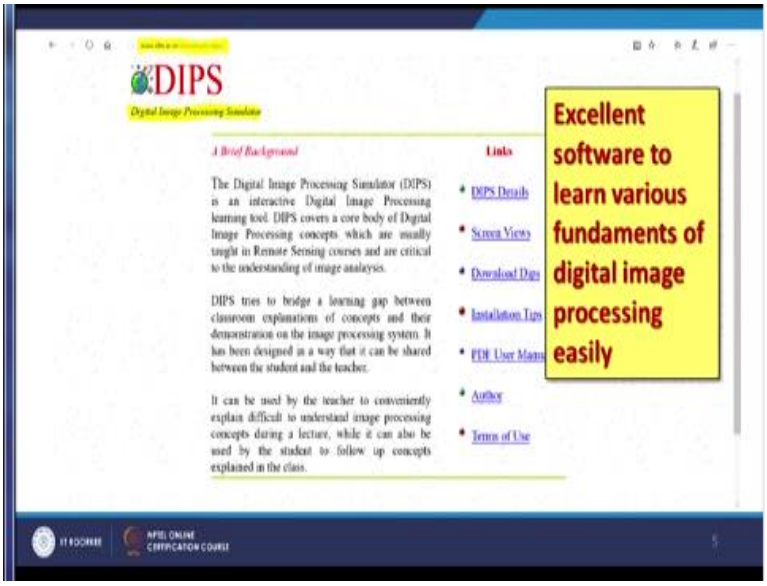
And then what we see that what are the disadvantages with these public domain softwares or you know open source software generally no support is available as I also discuss previously that you may get some support.

(Refer Slide Time: 04:34)



But not like in case of commercial software, you can ask the company or fellows there you know help lines and you get full support. Continuity new versions maybe a problem in a public domain softwares that maybe, now I take that example of public domain software that is DIPS.

(Refer Slide Time: 04:57)

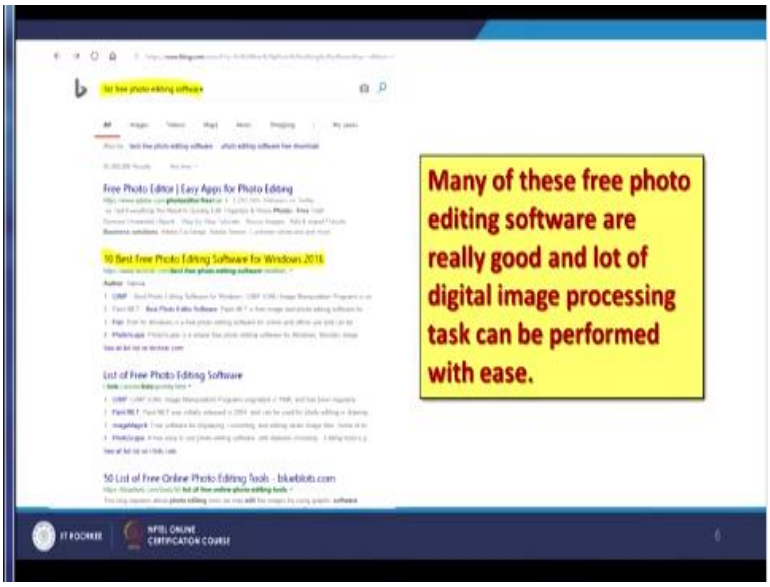


It is available and this is very good software which is basically digital image processing simulator and just as a very small software, it tells you how the processing is done. So processing

remains transparent and because the pixel values are shown not the grey values or colour values are shown. And therefore, whatever the changes which are happening in terms of pixel values during your processing is seen through this, that is why the last word or term is used as simulator.

So this stimulates how image processing is done and this can be downloaded free, of course link is provided here or you search net just with DIPS very good for learning. For beginners, those who would like to enter in digital image processing would like to understand the complete concept of digital image processing then this software is very good. As I have mentioned that excellent software to learn various fundamentals of digital image processing is easily.

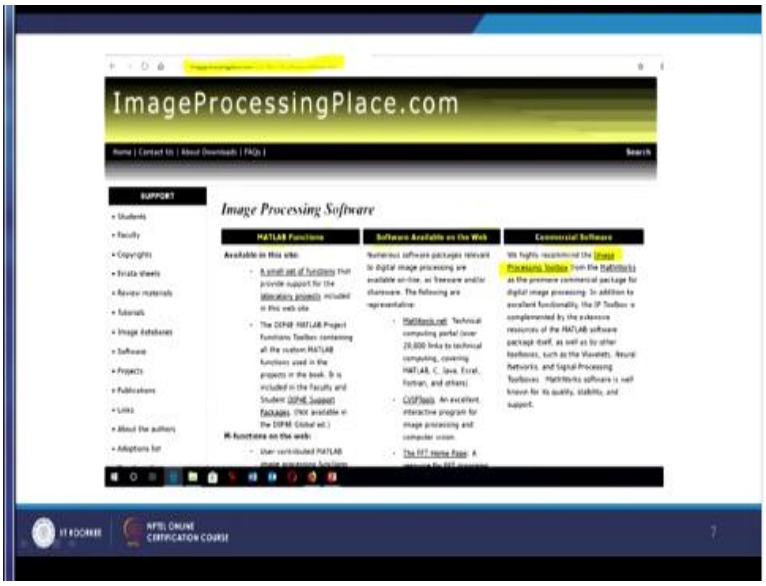
(Refer Slide Time: 06:08)



There are you know if you type like in a Google or Bing the list free photo editing software, there are various softwares are available like 10 best free editing photo editing softwares are there. But they lacks in geo referencing, also classification and some advanced level of object recognition and that kind of classification. So but for simple image enhancement is still the softwares can be used.

So many of these are free photo editing softwares are also good and lot of digital image processing tasks can be perform with ease.

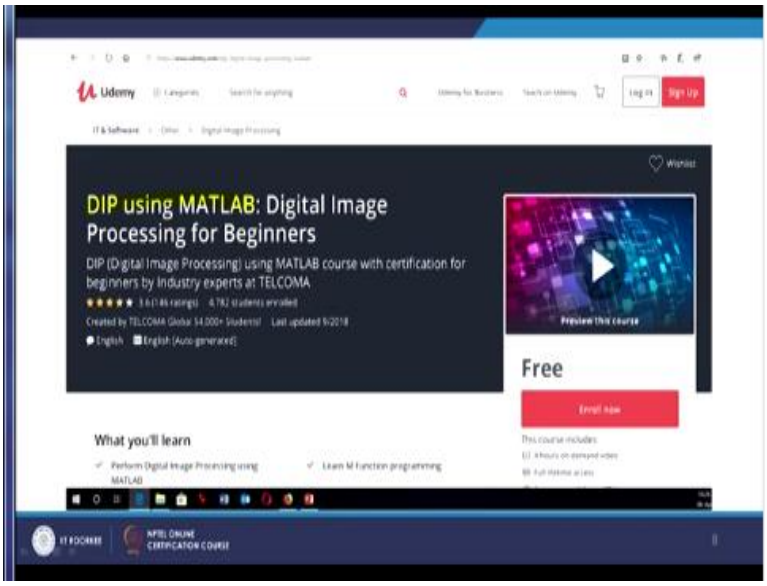
(Refer Slide Time: 06:51)



If because everyone cannot afford and spend lakhs of rupees for commercial software, so initially one can a start with these software. There is another source which is image processing place.com, where one can get you know functions like MatLab functions are there are software available on web all kinds of details are for commercial softwares for image processing toolbox. Is there one thing which I want to add if somebody is like interested in SAR interferometry especially using this sentinel data.

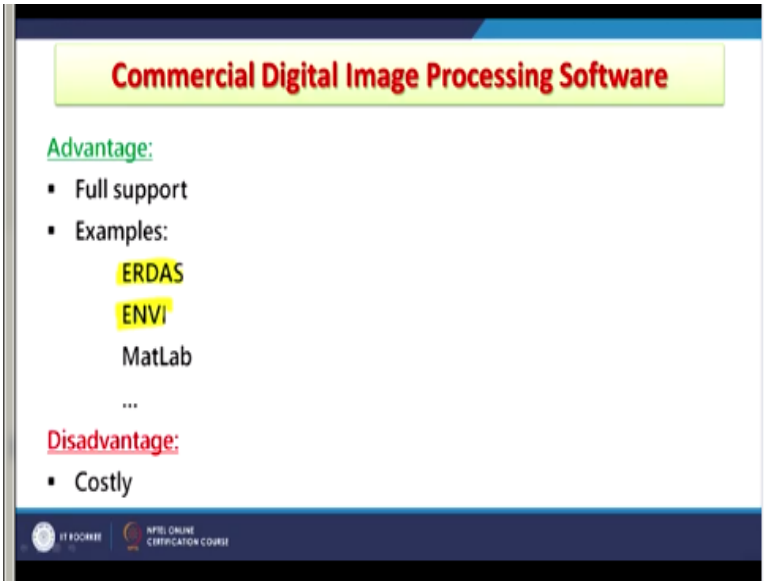
Then on the ESA web page European Space Agency site, you may get this software tool for INSAT or it snap it is called snap. So that is again in public domain open source you can just download and download the data as well interferometric data and can do the processing. So you only require internet connection and a good computer to do serious processing one initially one does not have to spend lot of money resources for buying commercial softwares.

(Refer Slide Time: 08:10)



Now as I mentioned that a DIP using MatLab also available lot of you know videos are also available lot of help is there. But MatLab itself is a commercial software, one has to remember this thing.

(Refer Slide Time: 08:24)



Now, what are the advantages with commercial digital image processing softwares. Of course the full support that is the biggest advantage whenever you are struck you want to do some advanced kind of processing which you are not able to maneuver it, you are not finding proper menus, you can ask support from them. If there are box you can report and hopefully they will be able to resolve your issues, so that is the advantage.

One of the biggest advantages with these commercial softwares, also updating is a very good with commercial softwares every 6 months or one year a new updates will come which is a improved version of the softwares box which have been reported by users must have been removed plus new things might have been added and so and so forth. So definitely there are advantage but since it sometime cost money.

Like example of very famous digital image processing software for satellite data is ERDAS which is a very popular very robust kind of software is there for digital image processing or satellite data. This is again commercial then another one is E N V I ENVI software which is again very good for digital image processing of satellite data MATLAB I have already mentioned.

So the original MatLab one has to have the other things the functions of MatLab can be download it from elsewhere. Again this is not exhaustive list and the purpose of this is not to promote anyone any commercial softwares either. It is just to give an examples the one which are available or which are popular among commercial DIP softwares, what are the disadvantages, of course very the cost.

Cost is the biggest disadvantage with the softwares sometimes also it is possible that you may get free old version of commercial softwares. So one can take advantage of that but of course not pirated one but sometimes company releases very old version of software maybe based on XP or maybe on Window 2000. The same data maybe available free of cost, so that maybe downloaded still up can do lot of work.

And it will also allow you to do geo-referencing classification and all kinds of digital image processing. So if does not have much money to spend on commercial software then this is one of the ways to achieve there.

(Refer Slide Time: 11:22)

This ERDAS software has been moving from one company to another, now in between it was with like or now it is form with the hexagon. And in India it is being promoted by other companies. So this is as mentioned in this advertisement is the world class remote sensing software. All kinds of processing tools are available and the graphic user interface that is GUI is also quite good.

So one can achieve very good results with this but of course it is costly, so very powerful, very user friendly and capable to perform almost all kinds, various kinds of well known digital image processing satellite data sets. Some of these softwares also support your own programming or modeling which you can do so. If you are having a task which has to be you know executed multiple times for various images.

Then these things can be done through modeling or a simple programming or a macro languages and those task can be achieved very easily rather than doing everything manually.

(Refer Slide Time: 12:41)

Now another software which I have mentioned the ENVI which is suit of products now in India it is being promoted by ESRI which also supplies ArcGIS which is GIS software. And we is equally good digital image processing software for satellite images. And one can think also ENVI is having LiDAR modules as well. If somebody is going for commercial software say if they are having some organizations or institute they are having funds to buy commercial softwares.

Then always look from 2, 3 end is before you decide which software. The first one is what is the user base world over of that software, who are whether ENVI is being maximum used or by LiDARS**.** This can be one of the criteria of deciding which software. And second one is whether software is in modular form or not, here modular means here that today I am having say 5 lakhs rupees.

I would buy some basic things of a particular software, tomorrow I am having another 2 lakhs rupees, I will buy few more modules, add-on modules with that software. So that thing should also be checked, whether it is a modular software or in one go everything has to be bought. Because that is the advantage with modular that as money comes you can keep adding new capabilities in your existing or basic installation.

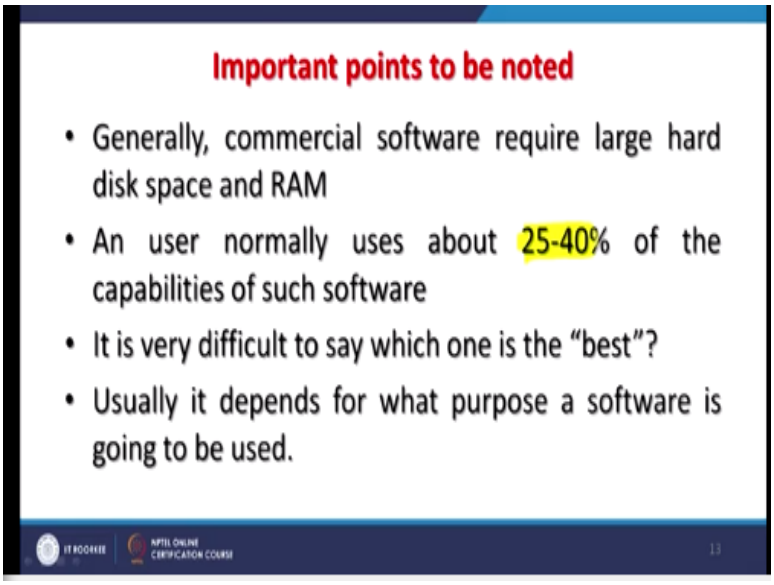
And third one is the discussion groups, if those commercial softwares also support discussion groups. Then these discussion groups are very useful to pose our own problems and get the solutions from others. Those who are working in the same field might have encountered the problems and they have might be having solutions. Of course, this is one reciprocal basis, so if you join some these discussion groups.

And sometimes you see a question, you know the answer you know the processing steps, you also help the community. So in that way these 3, 4 criterias if one follow then one can make a better decision about which digital image software to get for his own organization. ENVI as I have said also equally powerful capable of perform almost all kinds of well known digital image processing task, steps on satellite data. MatLab, very popular for various kinds of data processing including your digital image processing.

(Refer Slide Time: 15:32)

Of course, it may not be as user friendly as LiDARS or ENVI, but there are limitations but there are you know merits with that one also. So, again, very powerful and capable to perform all kinds of well known digital image processing steps. But may not be very easy not with ease as compared to more popular dedicated digital image processing software. Because MatLab is processing for various data, statistical analysis, all kinds of things MatLab is there. But LiDARS, ENVI and other softwares are dedicated for image processing of satellite data.

(Refer Slide Time: 16:15)



What are the important points here, some of them we have already discussed, but anyway just for completeness, I will be going. And in also in many times you might see that in the slides things come later, I speak before that. The reason is because I want to have a complete information along with the slides as well. So, sometimes slides have to carry that information also there might be sometimes repetition.

But it is for completeness we keep this information, so that the whoever is watching these lectures or videos should have all information. So, commercial software require large hard disk space and RAM. That is another sometimes disadvantage, suppose if you install LiDARS it will require large hard disk space. And when you launch this software, it will consume your RAM very significantly.

Because these are very powerful, very dedicated digital image processing softwares of satellite data. And therefore, one has to have a very good workstation or a high end laptop or desktop to perform serious task on satellite data. And they use a normally uses about only 25 to this is rough estimates of uses 25 to 40% of the capabilities of such software. That means that not all the menus or all the capabilities of individual softwares which you have installed will be used by you.

Because these are sort of general purpose satellite remote sensing data processing software. So, suppose if I am working in civil engineering domain, then I will be using those tools, those routines, functions, extensions of that particular installed software which are suitable for my purposes. I may not be using other capabilities of the same software which have been installed.

So, generally the users there you will find a rare users who are using all the capabilities of individual software. So, that is why this rough estimate is between 25 to 40% maximum be used the capabilities. But that does not mean that these software is will be used only by me, it may be used by others maybe having background of sciences maybe have been background or agriculture.

Then they will use the other capabilities of the software, may not be the same capabilities as civil engineer will be using. So that is I will give you example from IIT Roorkee, like for example for LiDARS software we are having 30 perpetual license installations through a license server. Now at a time any 30 people of the campus student faculty, research scholars can use that software.

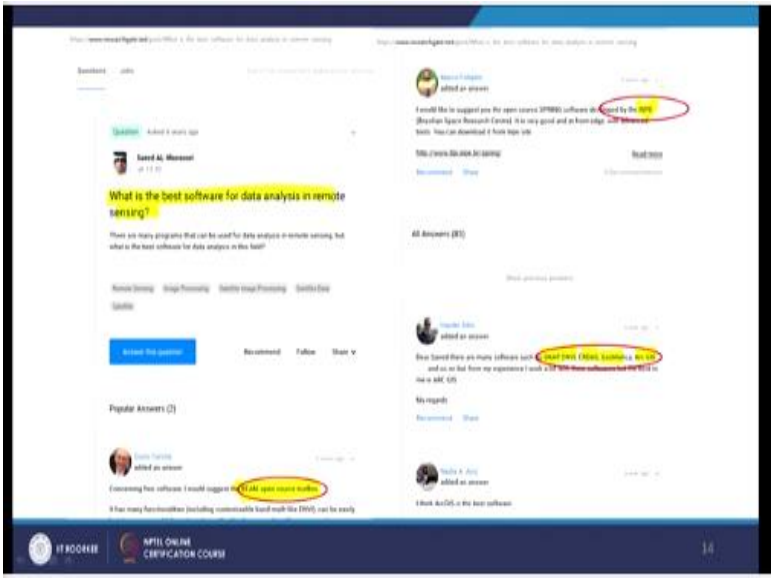
And it is being used by students of various departments maybe civil engineering, maybe earth sciences, maybe hydrology, maybe earthquake engineering, maybe and water resources engineering. So, people from different backgrounds for different purposes are using the same software but maybe of different capabilities. So, some basic capabilities will be used by all these users and some dedicated or special capabilities, particular capabilities will be used by different users, so that is why this average figure is 25 to 40% uses is there.

It is very difficult to say which one is the best, if you ask me or any expert that I am interested to buy or get one installation for my organization. So, kindly suggest to me which one is the best software, I have already discussed the criteria that if you follow those criteria, then you will be able to make a good decision. So, it basically depends on the purpose a software is going to be used.

If you are definitely going to use most of the time for satellite data processing, then once would go for dedicated satellite image processing softwares rather than MatLab. But if MatLab is

already there, in your organization or your institute, then one must explore the functions of MatLab which is already installed. In our again if I take the example of IIT-Roorkee, IIT-Roorkee is also having MatLab which is extensively used by various background people.

(Refer Slide Time: 20:54)



So, if you see the net in the questions which we will raise, what are the best softwares for data analysis and remote sensing. Sometimes you may get some biased opinion because these are after all individual opinions or companies might be answering these through individuals, they might be promoting. So, one should not be carried away by this comment, but they may be a little helpful .

Like BEAM, somebody has said BEAM open source toolbox is very good and there are some other like SNAP as I told you for SAR interferometry specially of the sentinel data. SNAP is very good, ENVI, LiDARS, geomatica, ArcGIS. Of course ArcGis is a GIS software not fully digital image processing software. But basic kind of image processing can also be done in ArcGIS.

So there are INAP which is gradually and is space agency software, there are many, many such softwares are available. The criteria I have already discussed with you, so if you are going to buy think about those criteria, analyze your requirements, analyze the purpose for what you are going

to use. And accordingly you must choose make decision for a appropriate software, one can definitely start as said in the beginning.

One can start if one is really beginner in the digital image processing of satellite data, one should start with first with the DIPS and that is digital image processing simulator. Learn the different steps and how in the background the digital image processing is done. Because in that particular software, you see the numbers the pixel values, so therefore, you can understand in much easier way, then using commercial softwares.

Commercial softwares, sometimes can be turned out to a black box you do not see how processing is done, you just see the results. But these softwares will let you know how processing has been done, how the pixel values are being changed, if I take a particular processing step. So, that is one another advantage and once you are through with DIPS, then you may go for some open source software.

Is still if open source softwares are not sufficient to fulfill your requirements for digital image processing of satellite data. Then, and if you are having resources then you can choose commercial softwares digital image processing softwares following those 3, 4 criterias. So, this brings to end of this brief discussion about the digital image processing software, thank you very much.