**Project work on Cloud Computing Services using Microsoft Azure**

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# **Abstract**

Cloud computing is ever increasing in demand. The concept of software services available as utilities made possible for the companies to switch to cloud computing that they can use the resources on demand. Azure, Amazon web services (AWS) are the market leaders in this area. The purpose of this project is to explore Azure by setting up a virtual machine, creating a webpage and deploying it to Azure, setting up an Apache Hadoop Cluster, run MapReduce word count example on the cluster and thereby providing a hands-on experience on cloud computing.

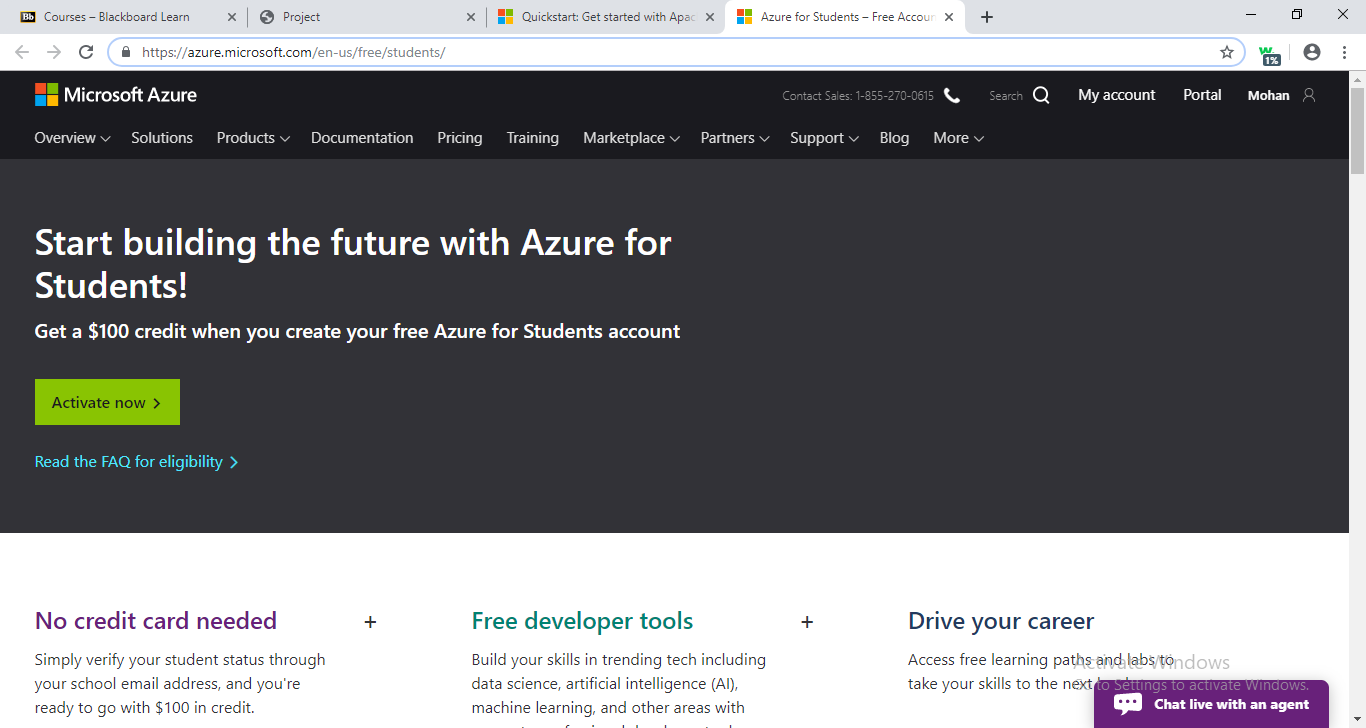
# **Introduction**

There are different ways to create a virtual machine in Azure. We use power shell for the development of VM, use visual studio to build a website that contains CSCI 650 course syllabus and deploy it to cloud server, setup an Apache Hadoop cluster on HDInsight and run MapReduce jobs for word count.

# **Project Experiment**

## **Task 0: Create Azure Account**

Clink on the link - <https://azure.microsoft.com/en-us/free/students/> suggested as per reference [1]. The below page appears.

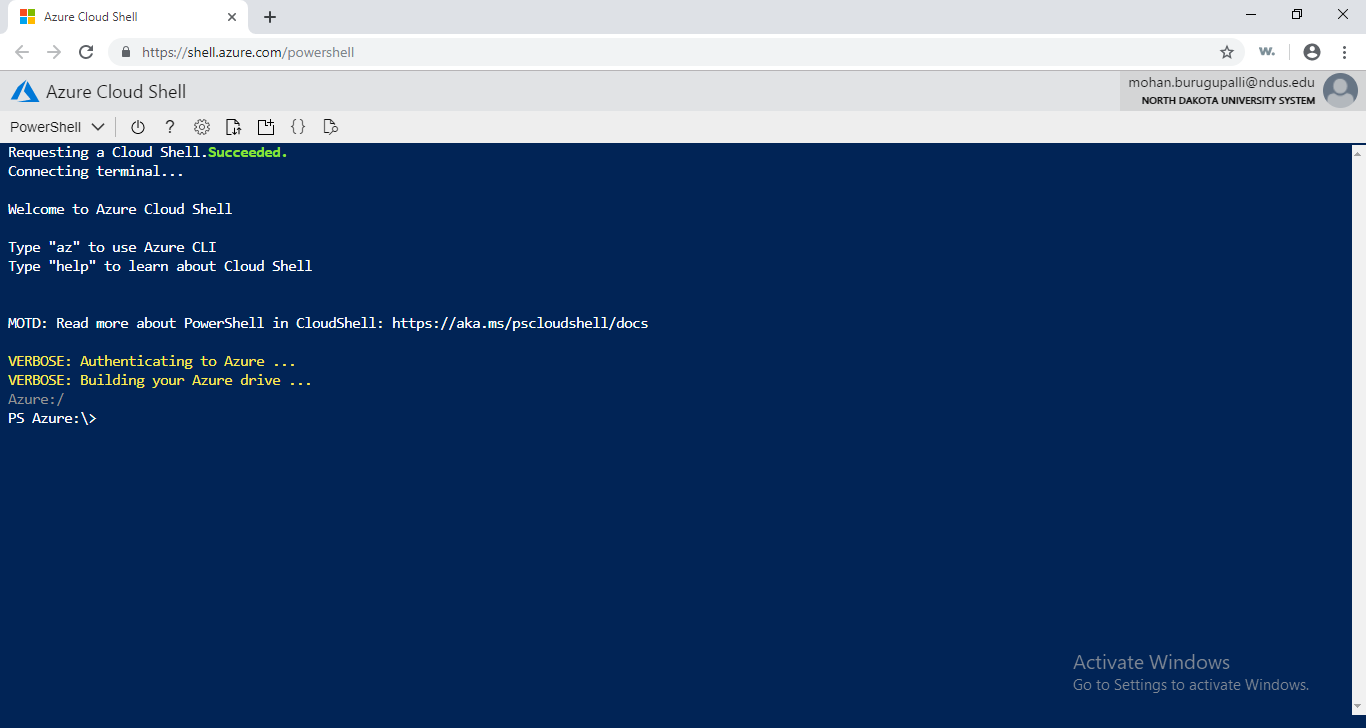


Click on Activate now and login with valid mail-id and details.

## **Task 1: Create a Virtual Machine**

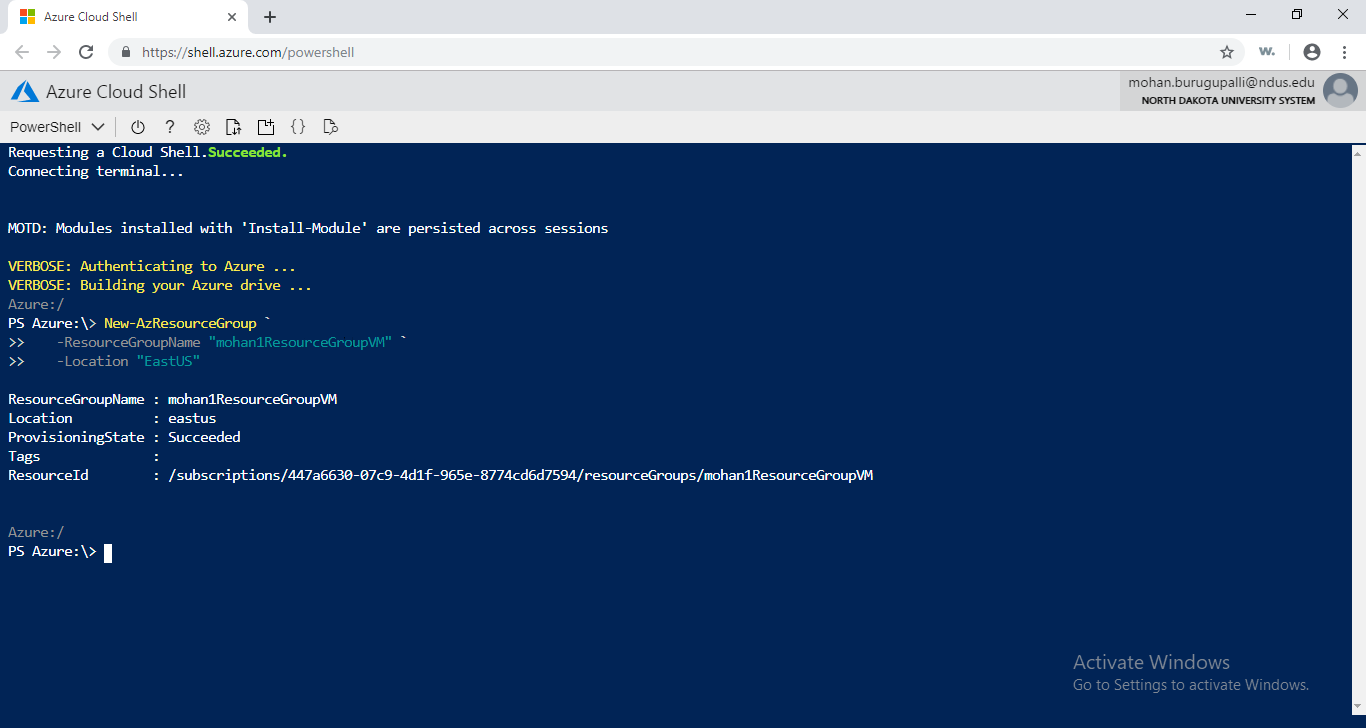
### **Launch Azure cloud shell**

There are multiple ways to create virtual machine using Azure [2]. I have used Azure PowerShell to create the virtual machine [3]. Launch Azure power shell using the url <https://shell.azure.com/powershell> [3] and login with the mailid credentials that is used to activate the Azure subscription. Azure cloud shell will open as below.



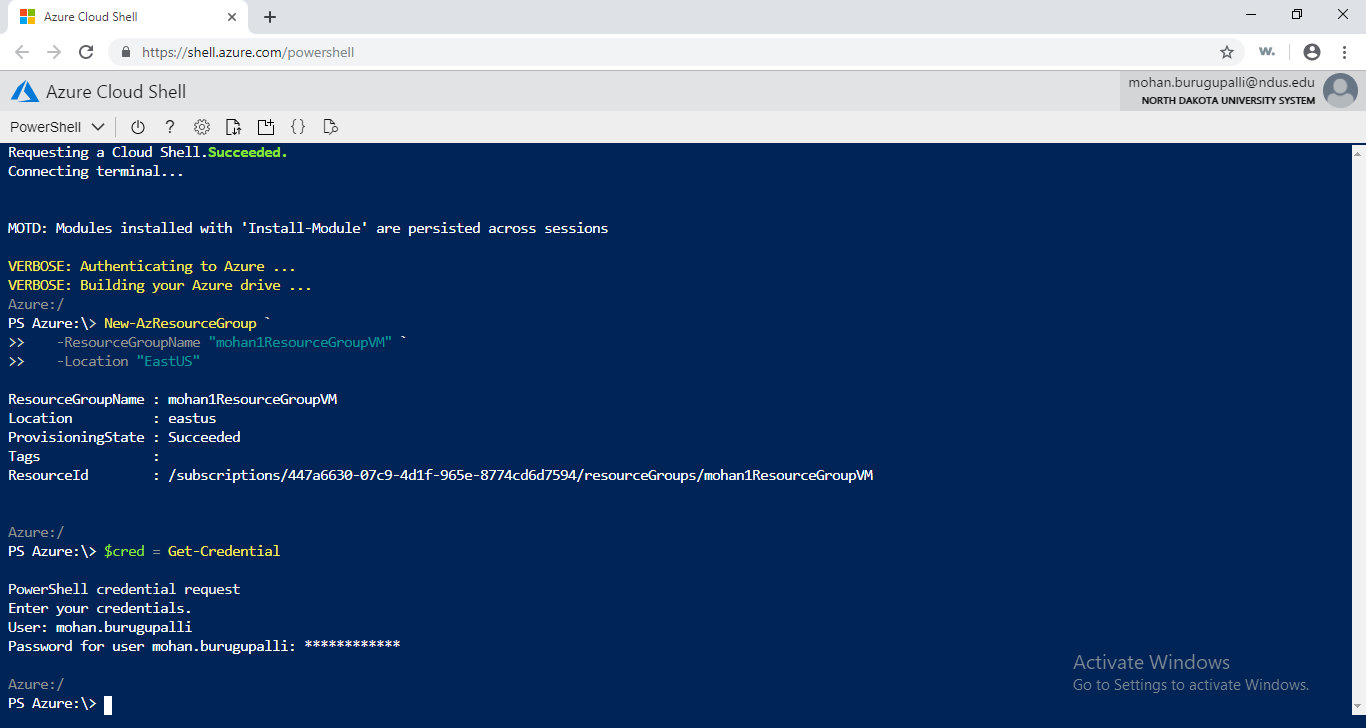
### **Create Resource Group**

In Azure, resources are operated and deployed in a resource group. Hence, we should create resource group at the first step. The command ‘New-AzResourceGroup’ is used as shown below. We are creating a resource group with the name ‘mohan1ResourceGroupVM’ and in the location ‘EastUS’.

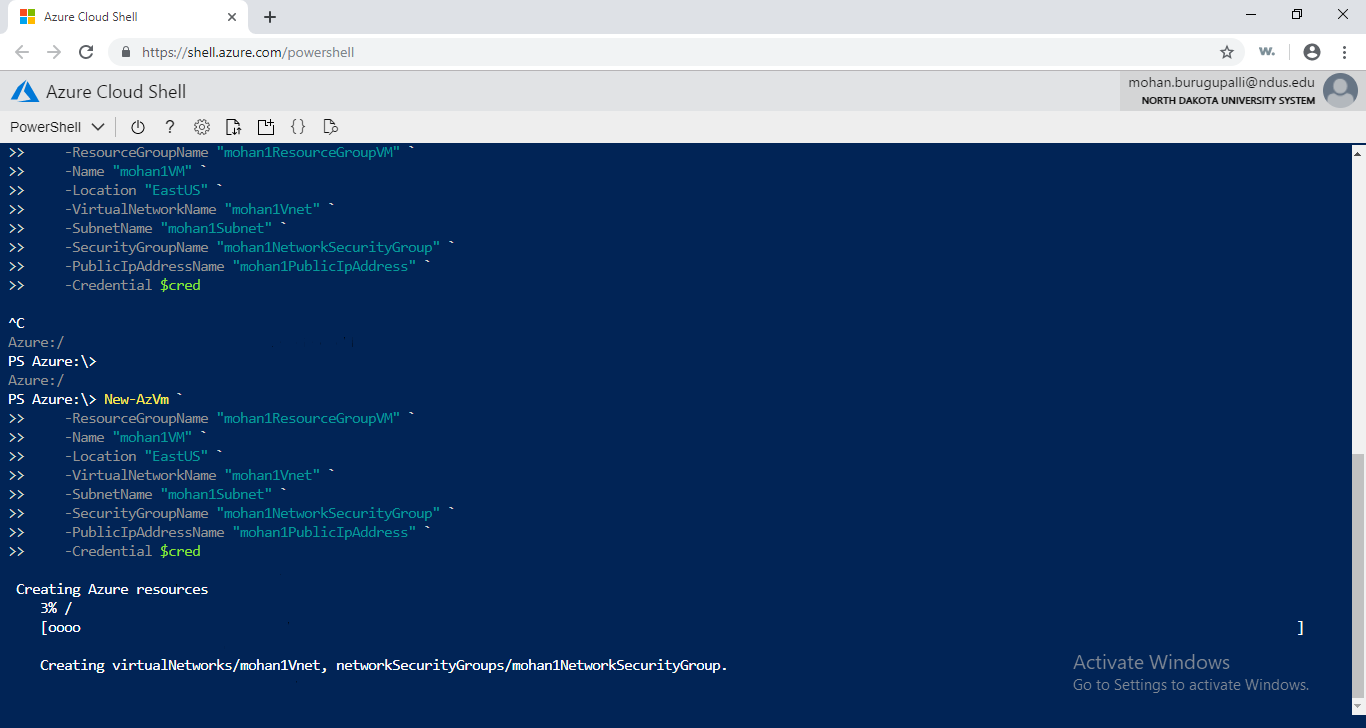


### **Create a Virtual Machine**

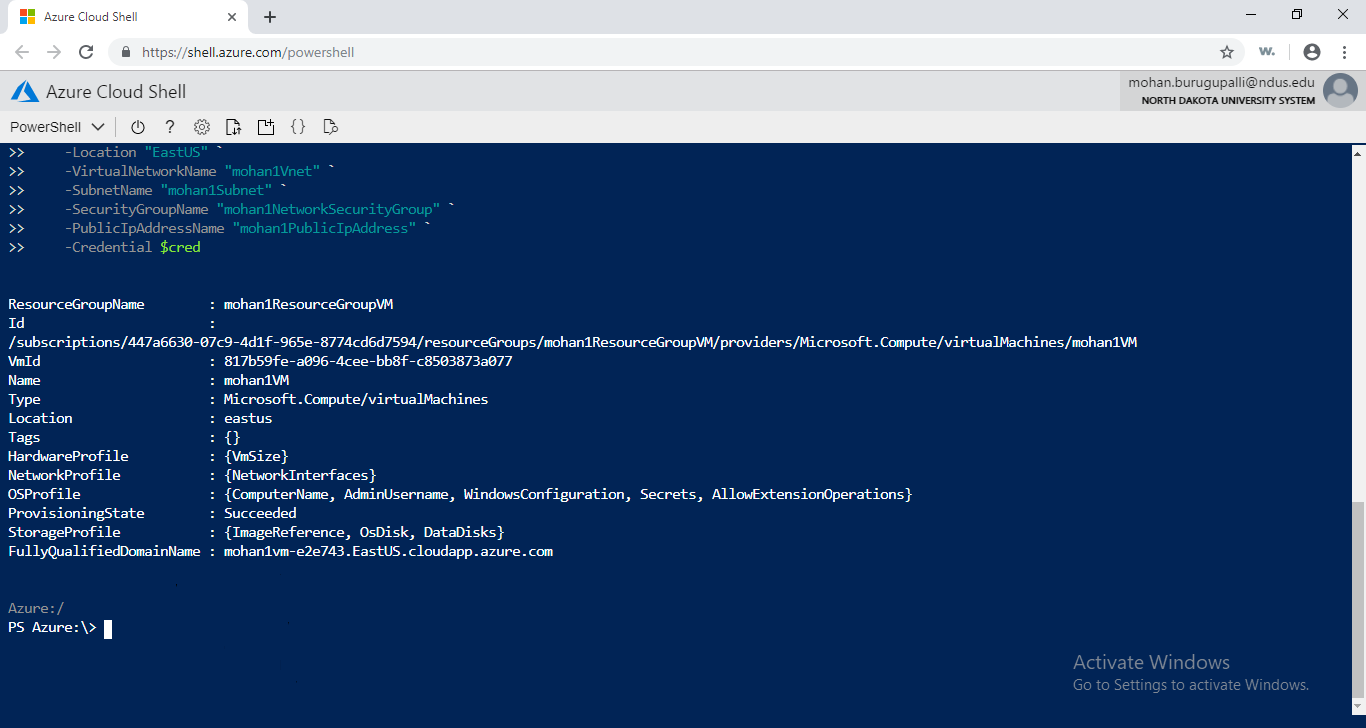
Set username and password to access the virtual machine using the command Get-Credential



Create the virtual machine with the command New-AzVM as shown below. It describes on which resource group, location, security group, virtual network, sub network, credentials the virtual machine should be developed.



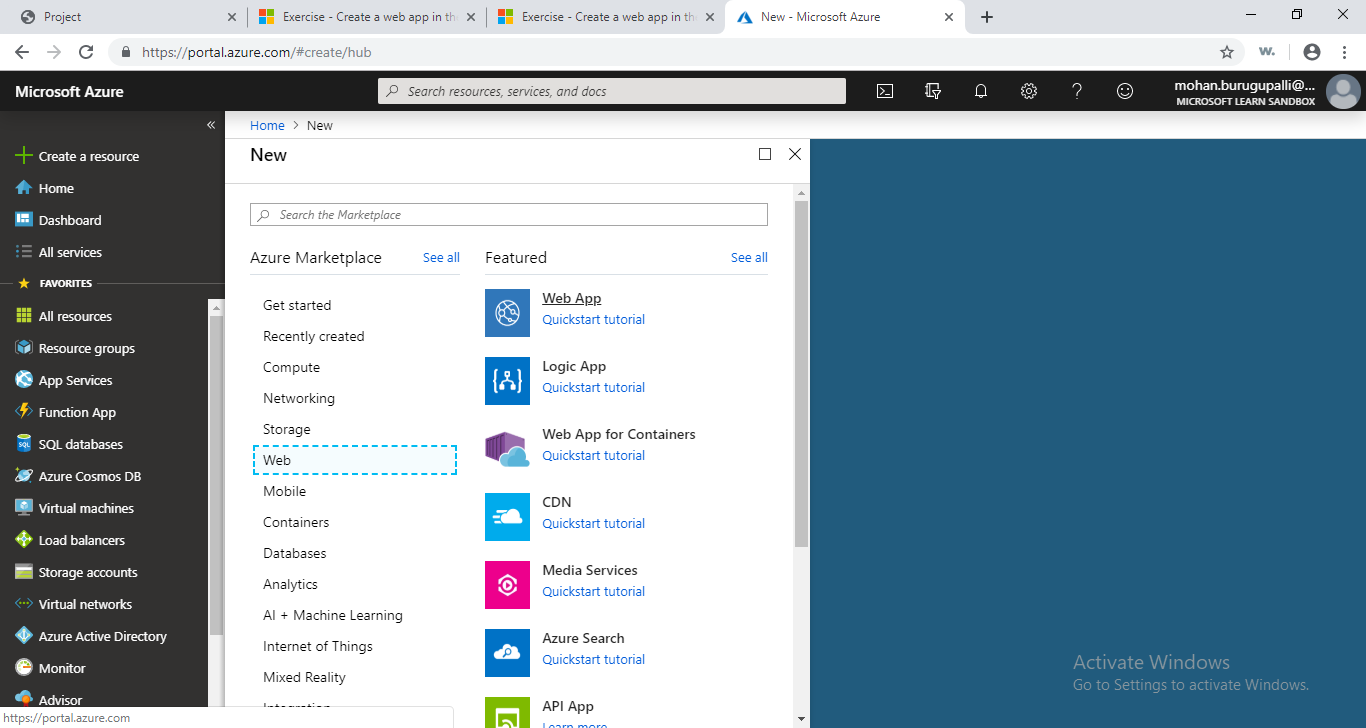
The virtual machine is created with the given details.



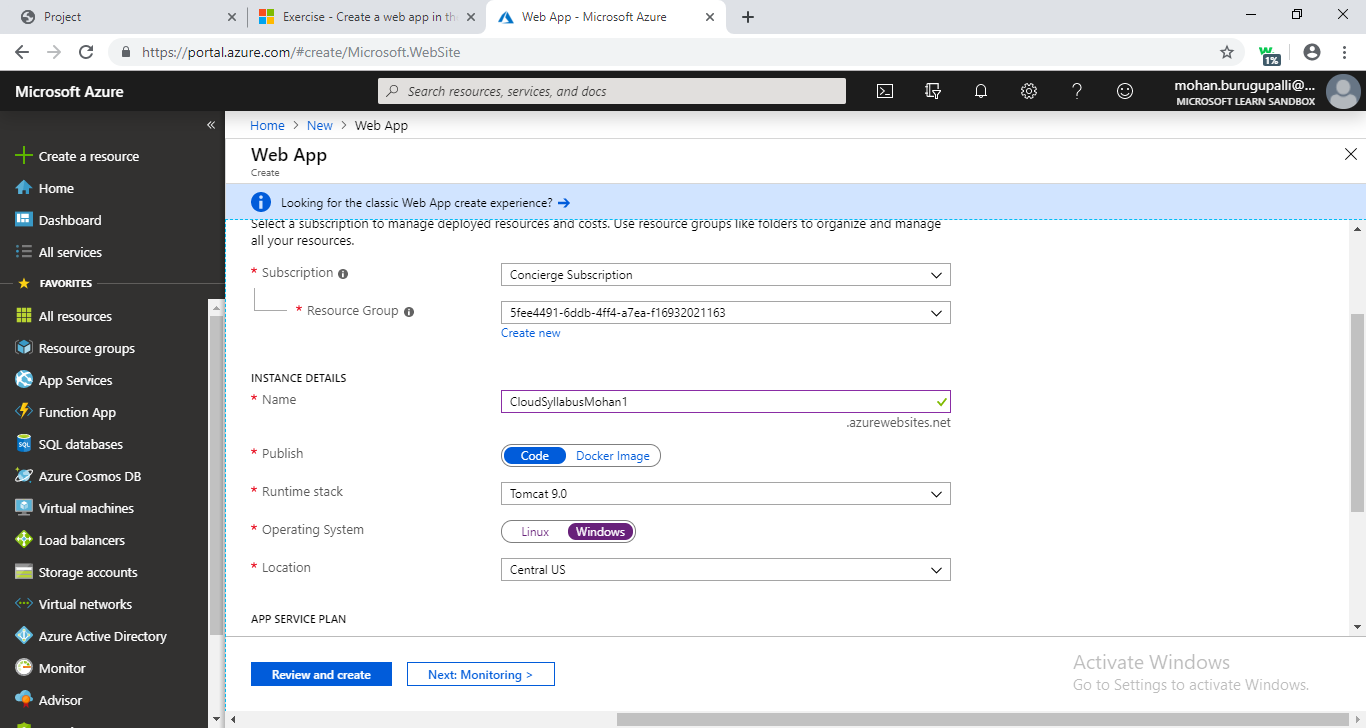
## **Task 2: Create and deploy a website to Azure.**

### **Create a web application**

Activate the sandbox and connect to Azure portal. Click on create resource on top left and select web>webapp



Provide the details of App name, Subscription, OS, publish, runtime stack and sandbox resource group as below.

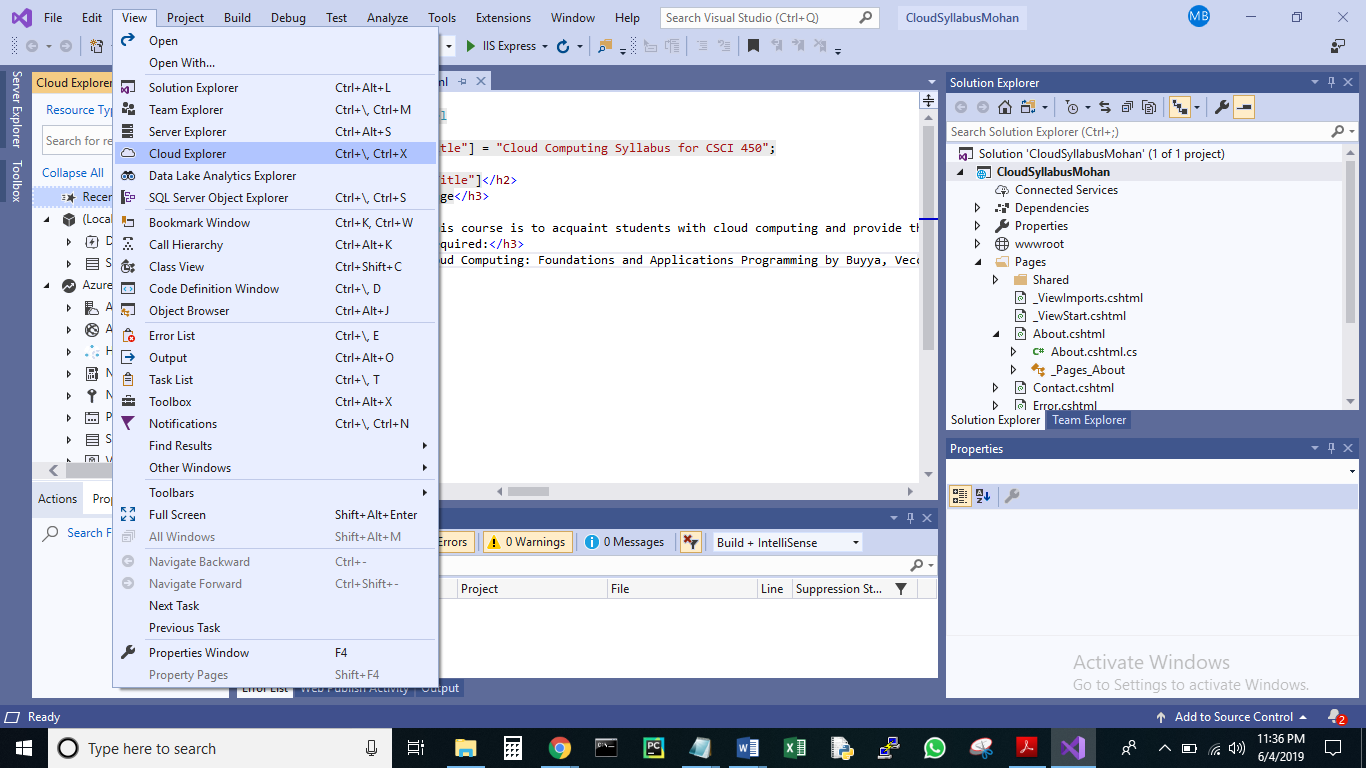


Setup App service plan and click on create.

A website can be created and deployed to Azure in number of ways. I have used Visual studio to create a website and deploy to Azure

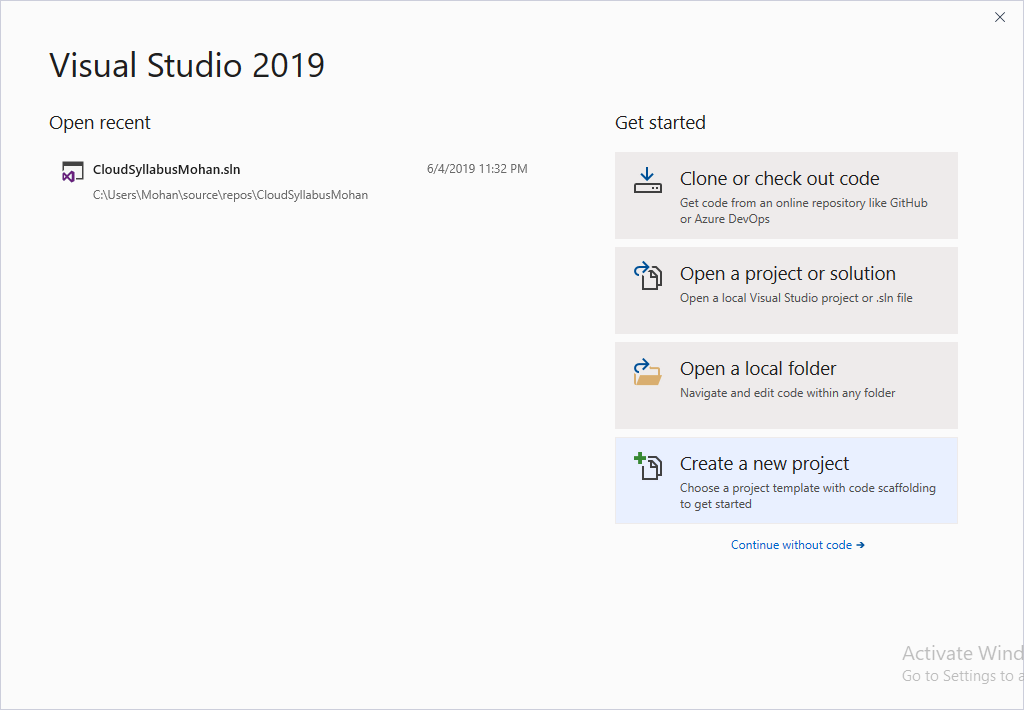
### **Environment setup for visual studio to connect to Azure**

Install Visual Studio and while installing select Azure development under Workloads to setup environment. For the systems which have visual studio already installed modify the environment to check the Azure development workload. Check if we have Cloud Explorer under View tab to verify.

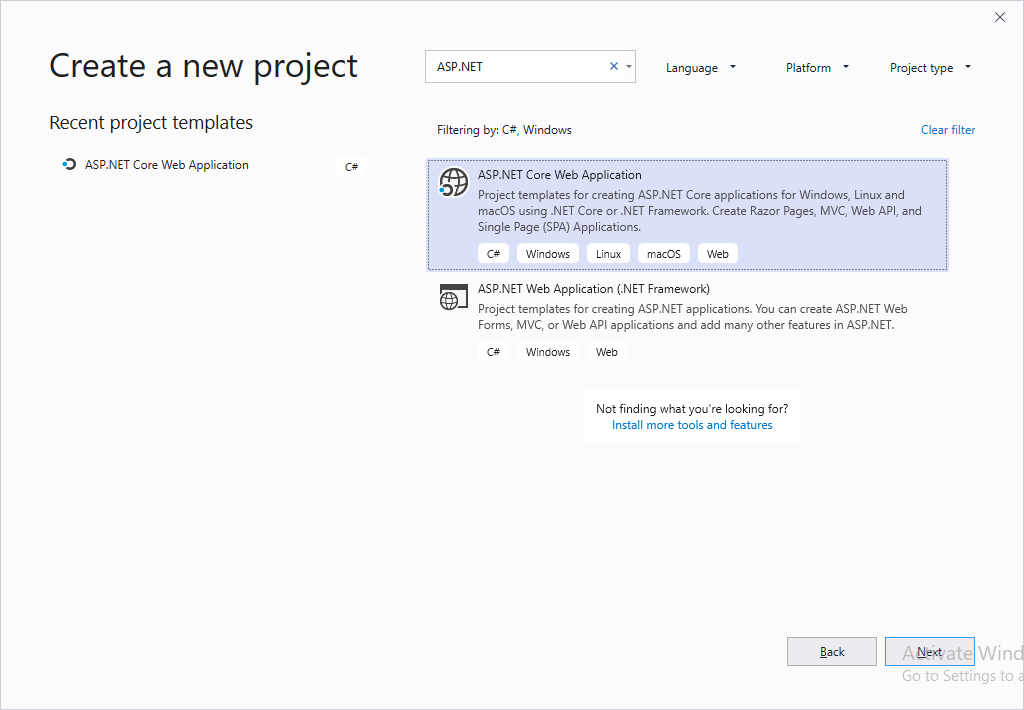


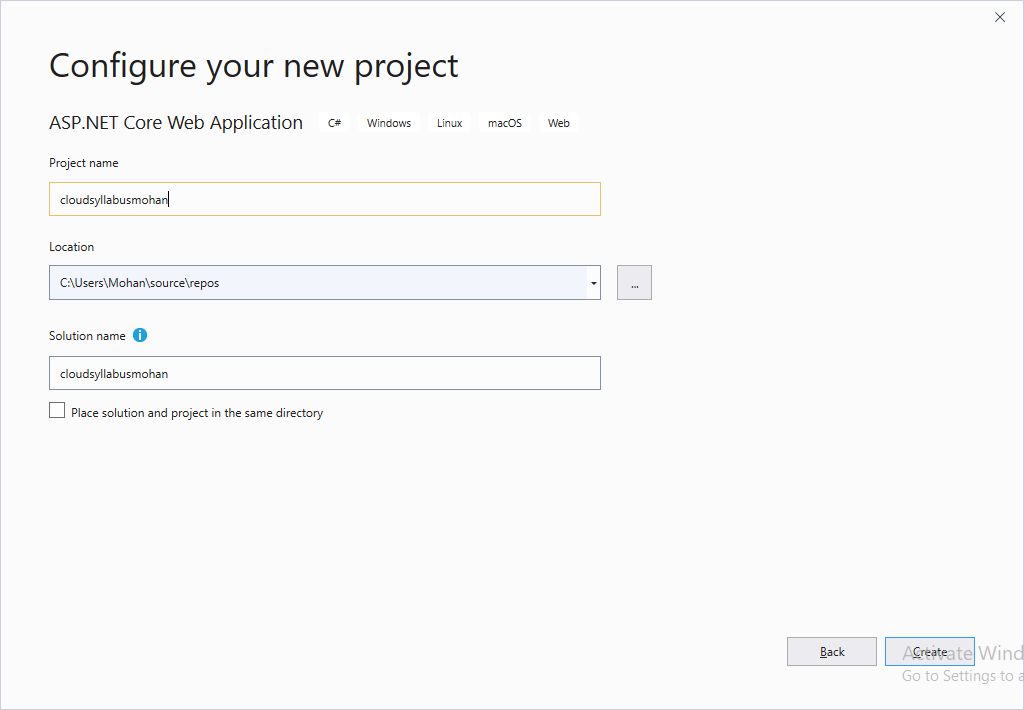
### **Create a project using Visual studio for website development**

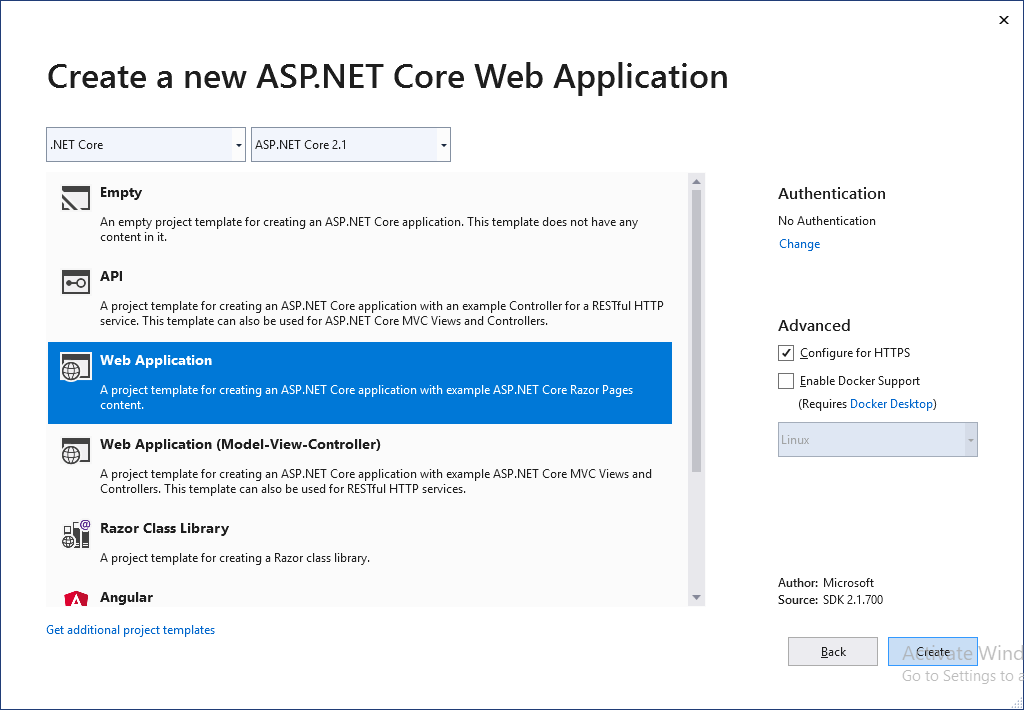
Open Visual studio and click on ‘create new project’



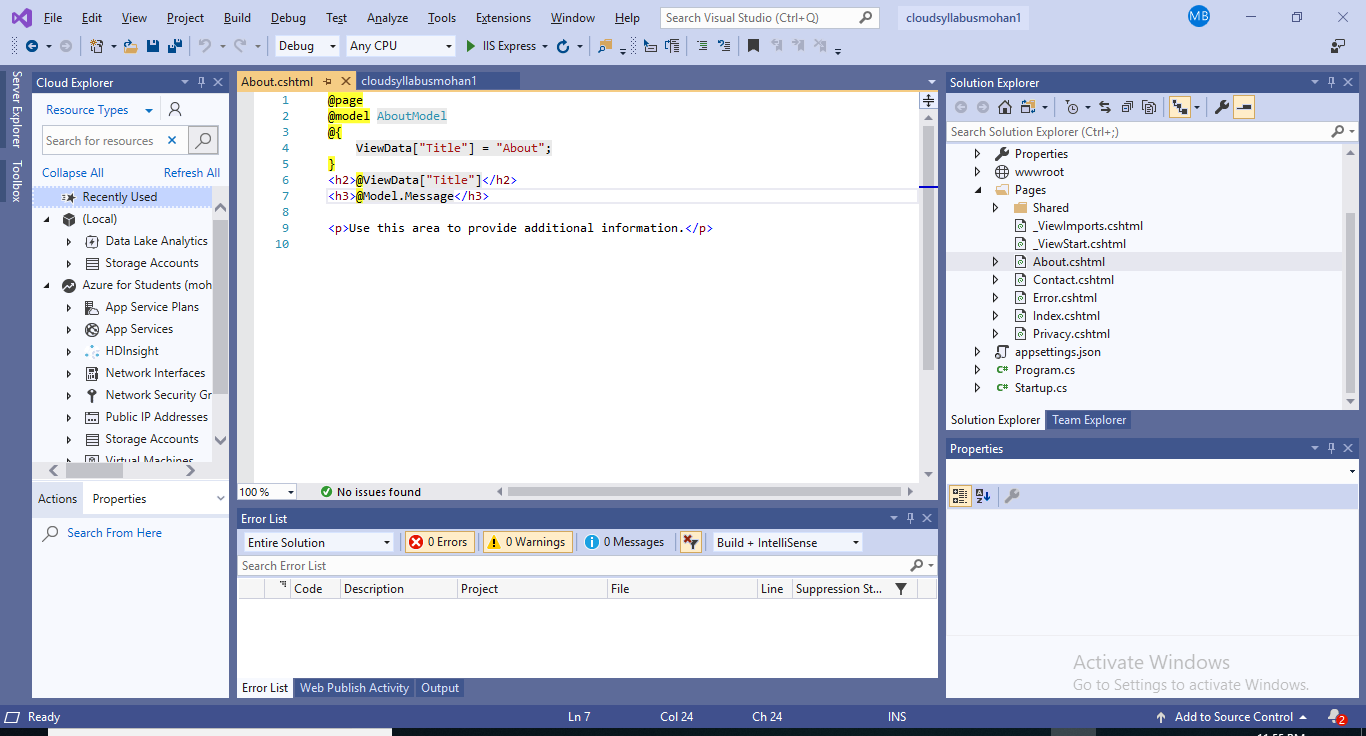
I have selected ASP.NET Core web application for the project as below.



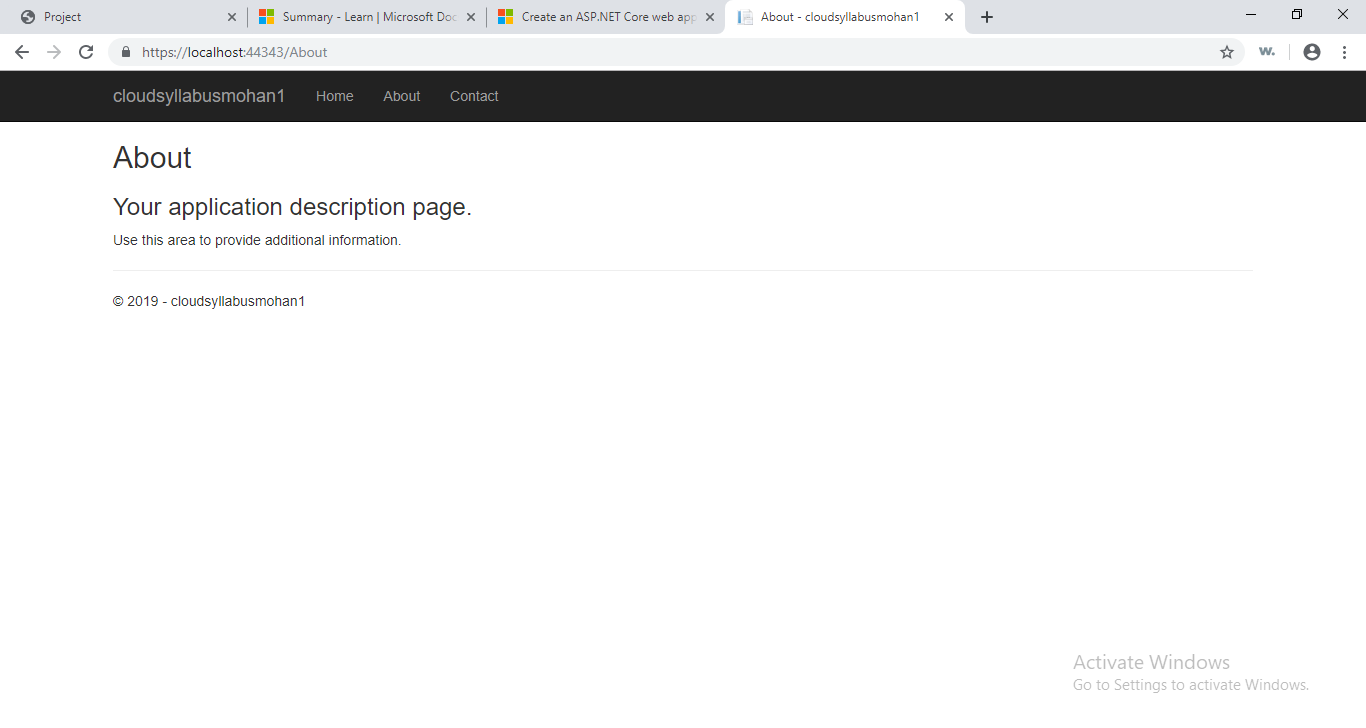




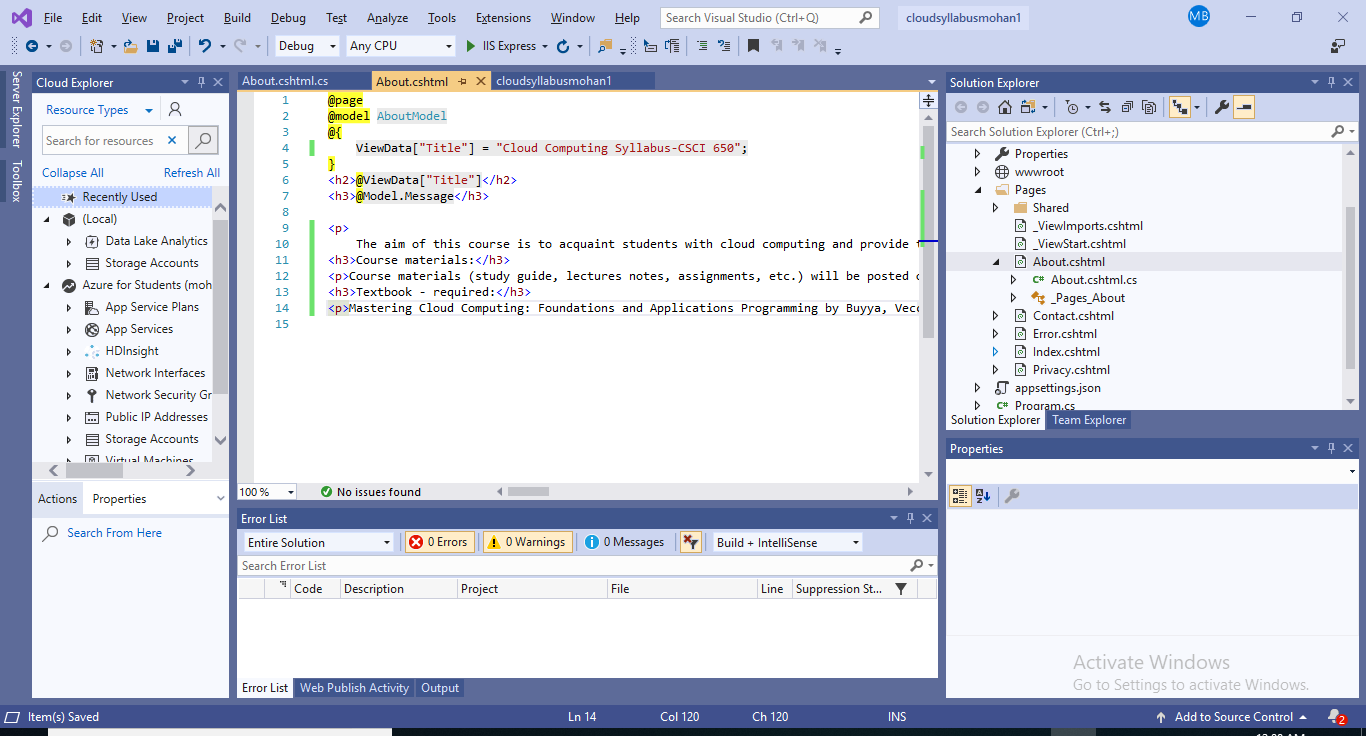
In the solution explorer > pages select ‘About.cshtml’. It displays the code in it.



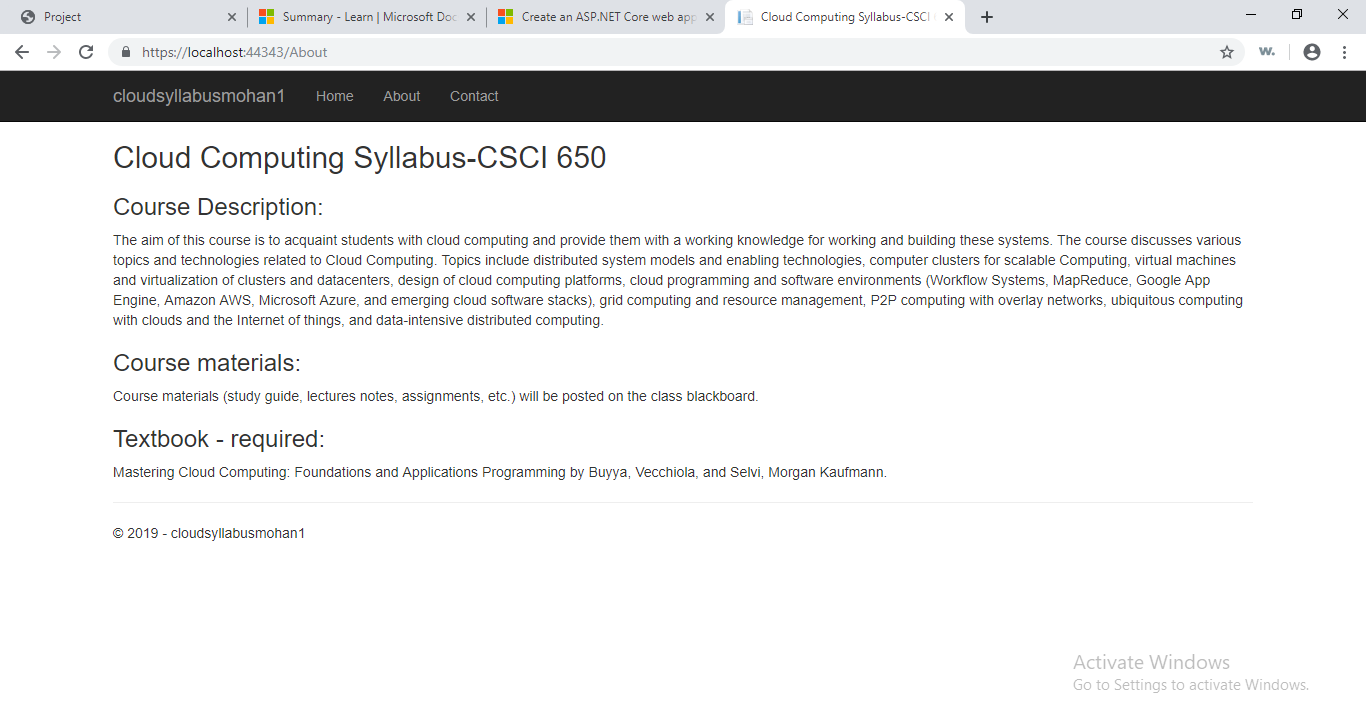
Open ‘About.cshtml’ in a web browser and it displays the about information as in the code as below.



Update the About.cshtml with required data. I have updated it with Cloudy computing syllabus details as below.

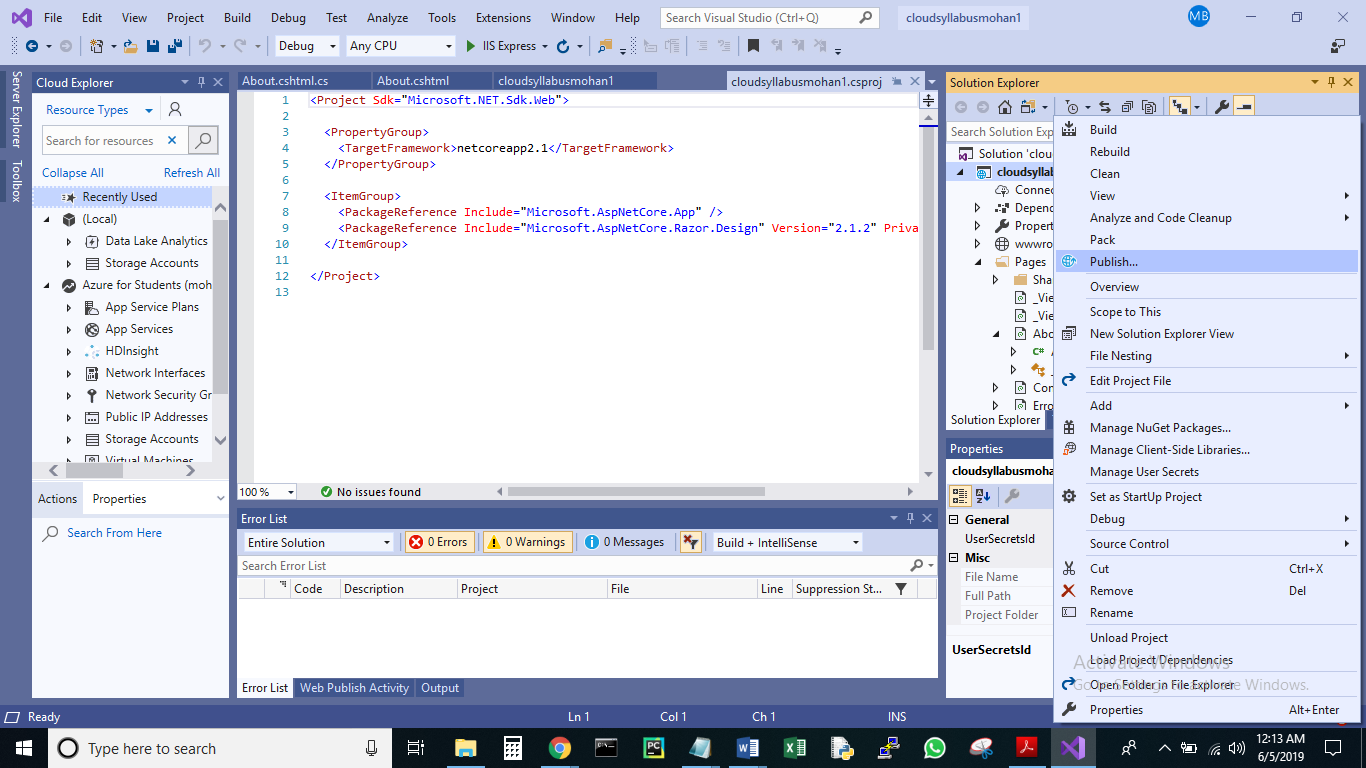


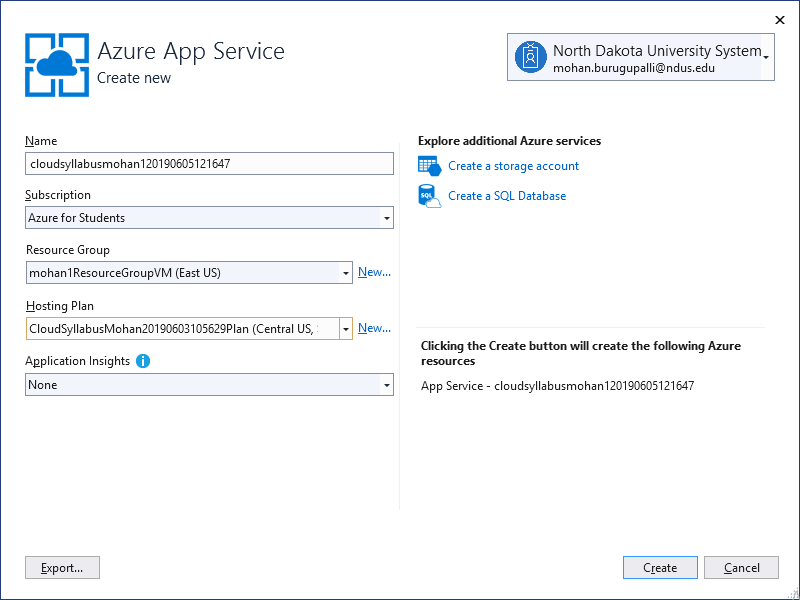
Now the website shows as below



### **Deploy the website to Azure**

In the visual studio, select the project which we want to publish to Azure, right click and select publish.

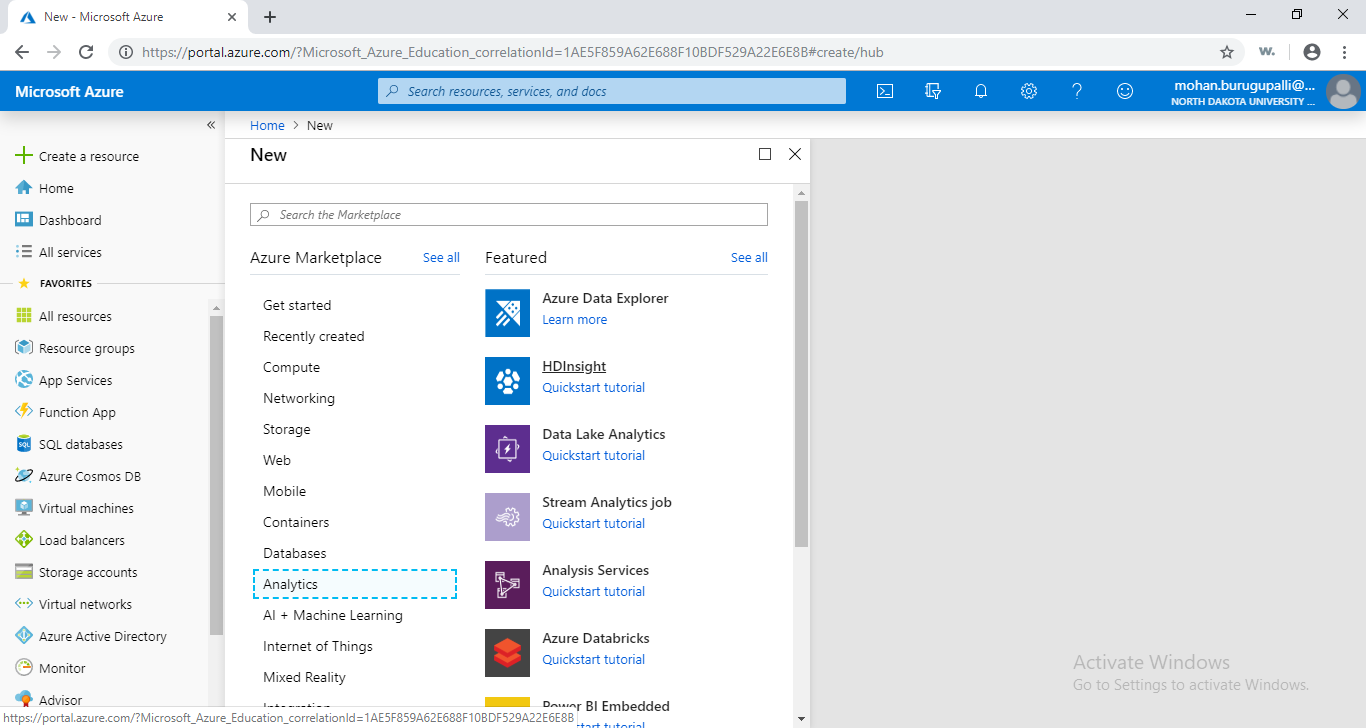


Create new and check the resource group and other details. Create. 

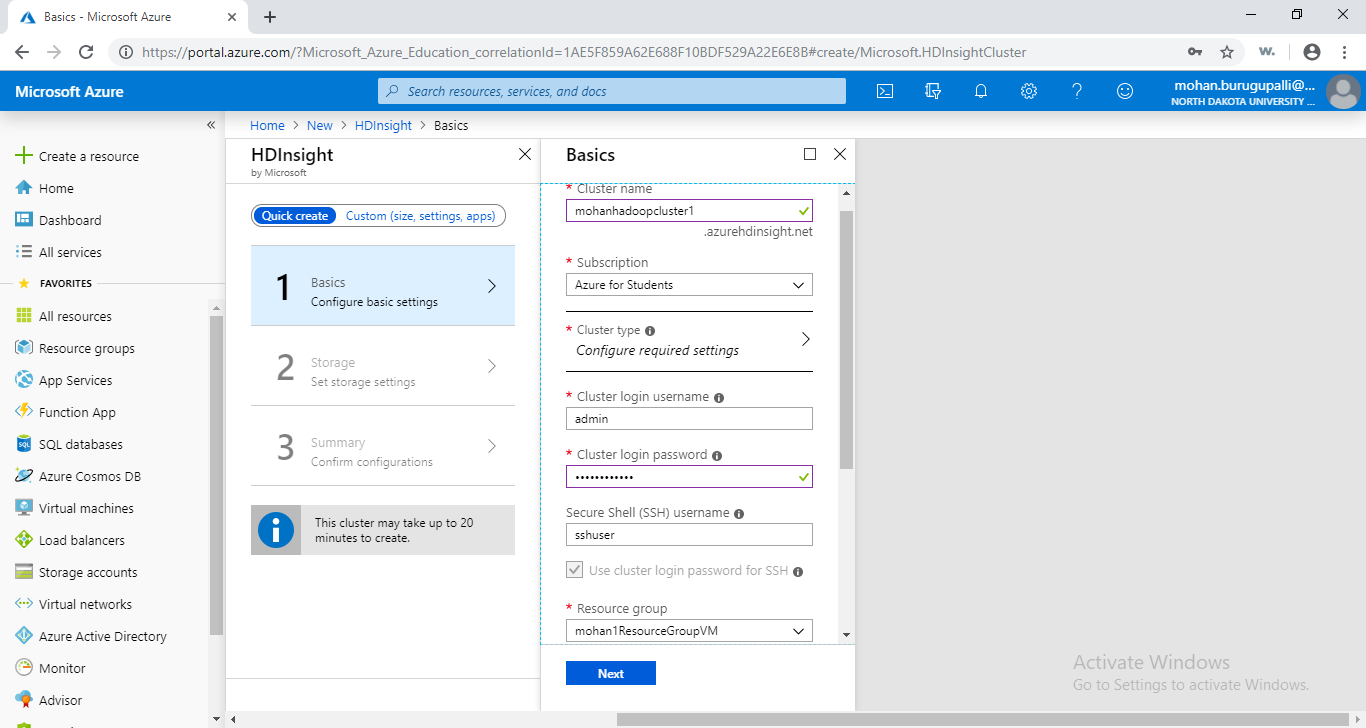
## **Task 3: Setup an Apache Hadoop Cluster and run a MapReduce Job**

### **Create an Apache Hadoop Cluster**

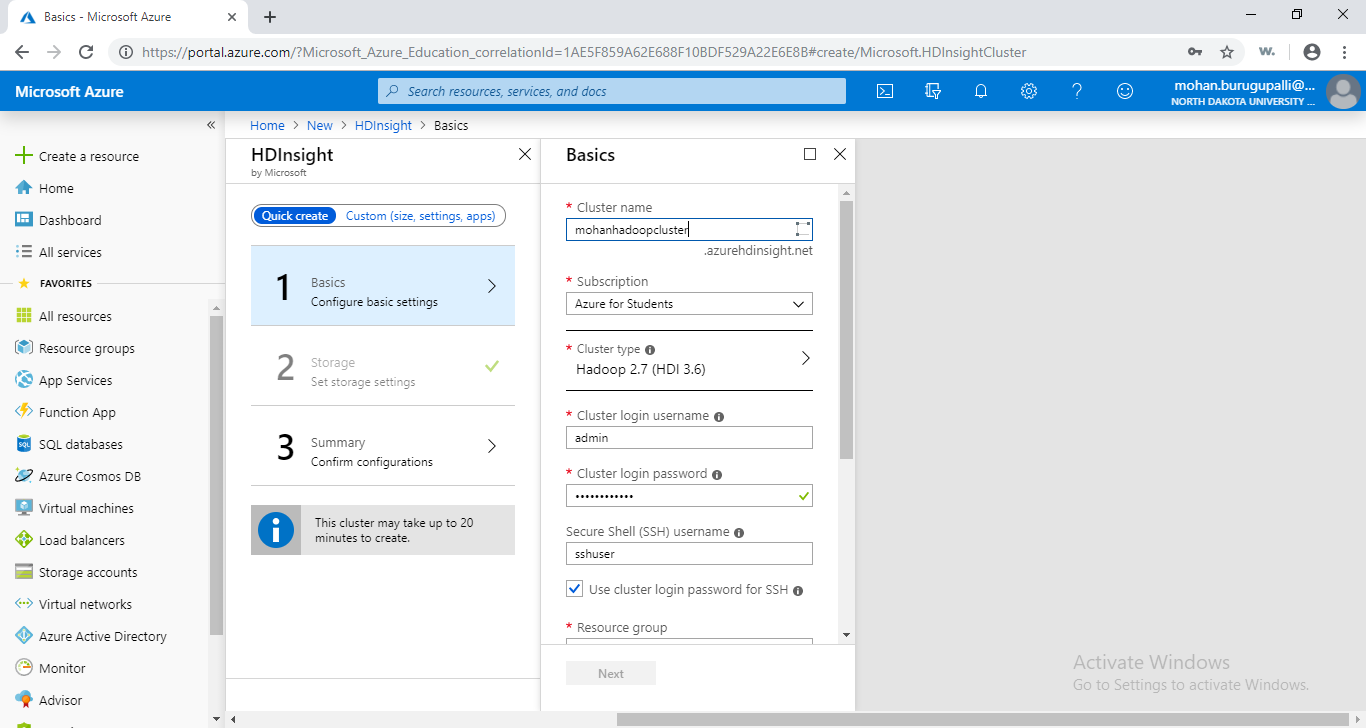
In the Azure portal click on create new resource > Analytics >HDInsight



Provide the basic details such as cluster name, username, password etc..

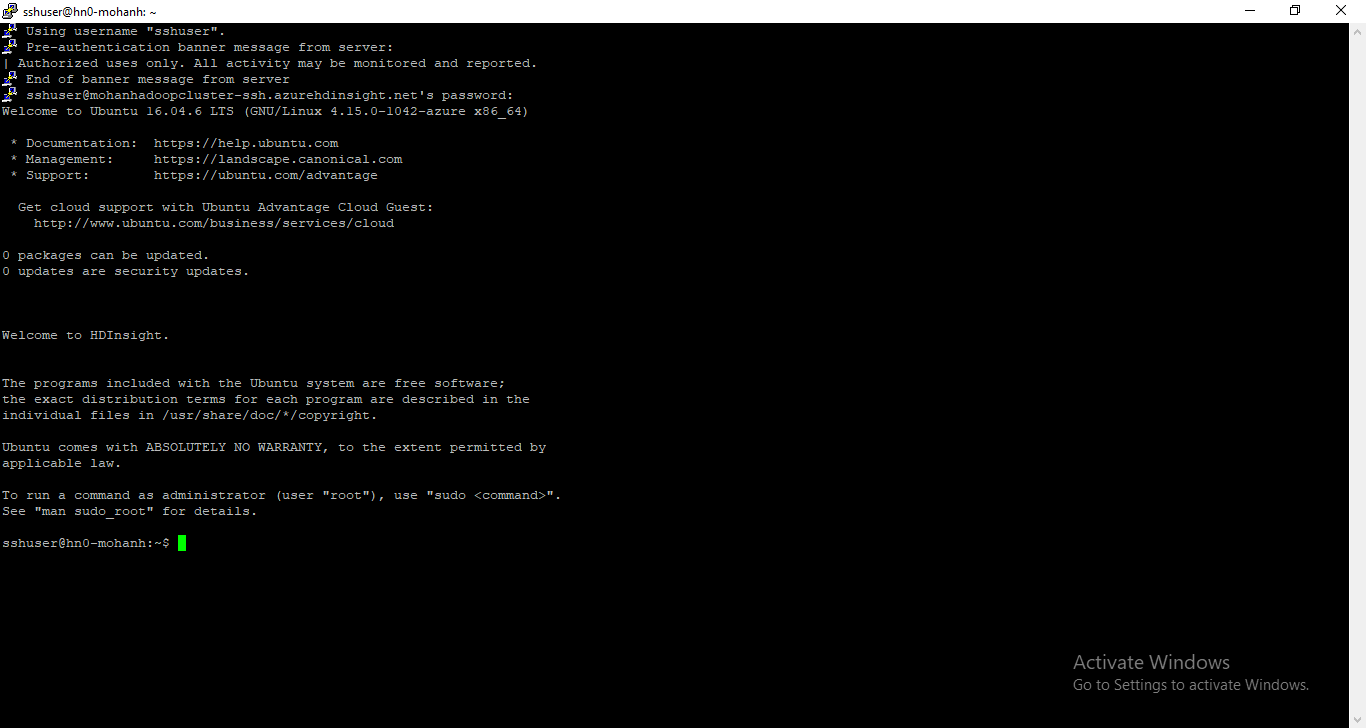


In the configuration required settings, give cluster type as Hadoop>Select>Next

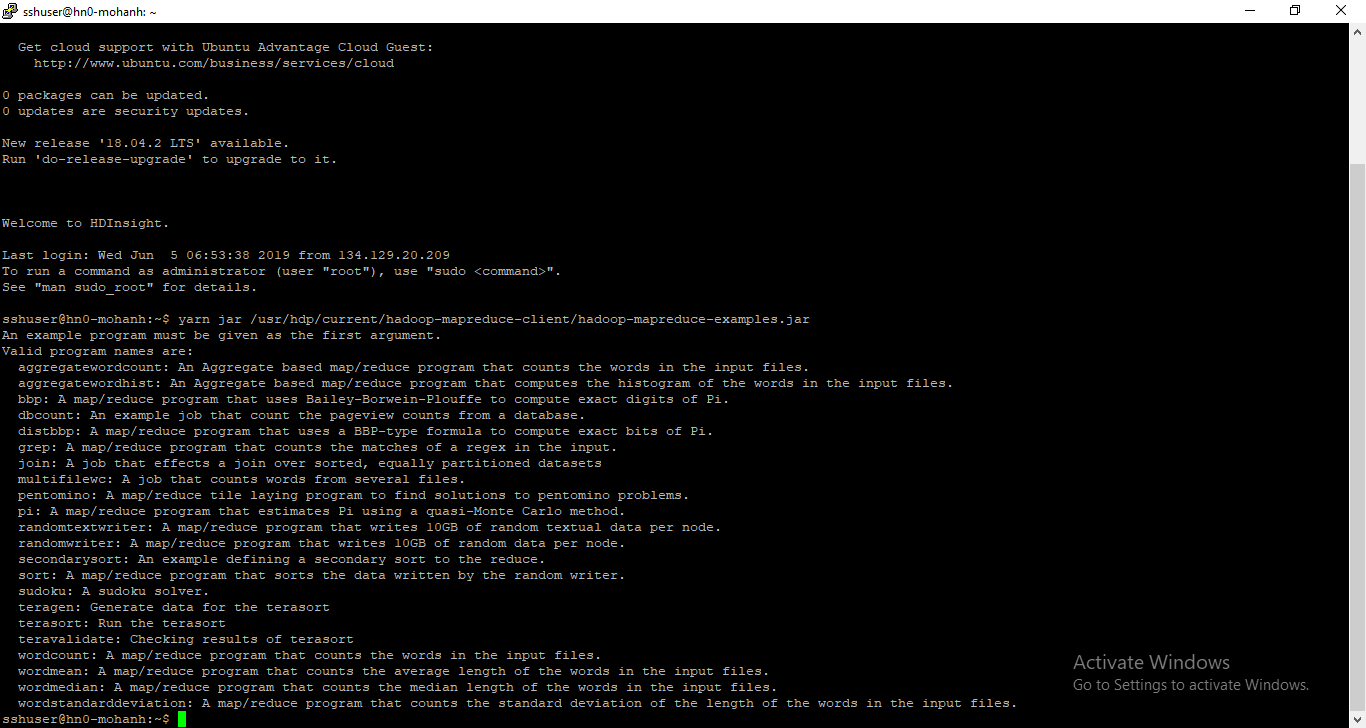


### **Run word count example**

Have connected to HDInsight using putty as below.



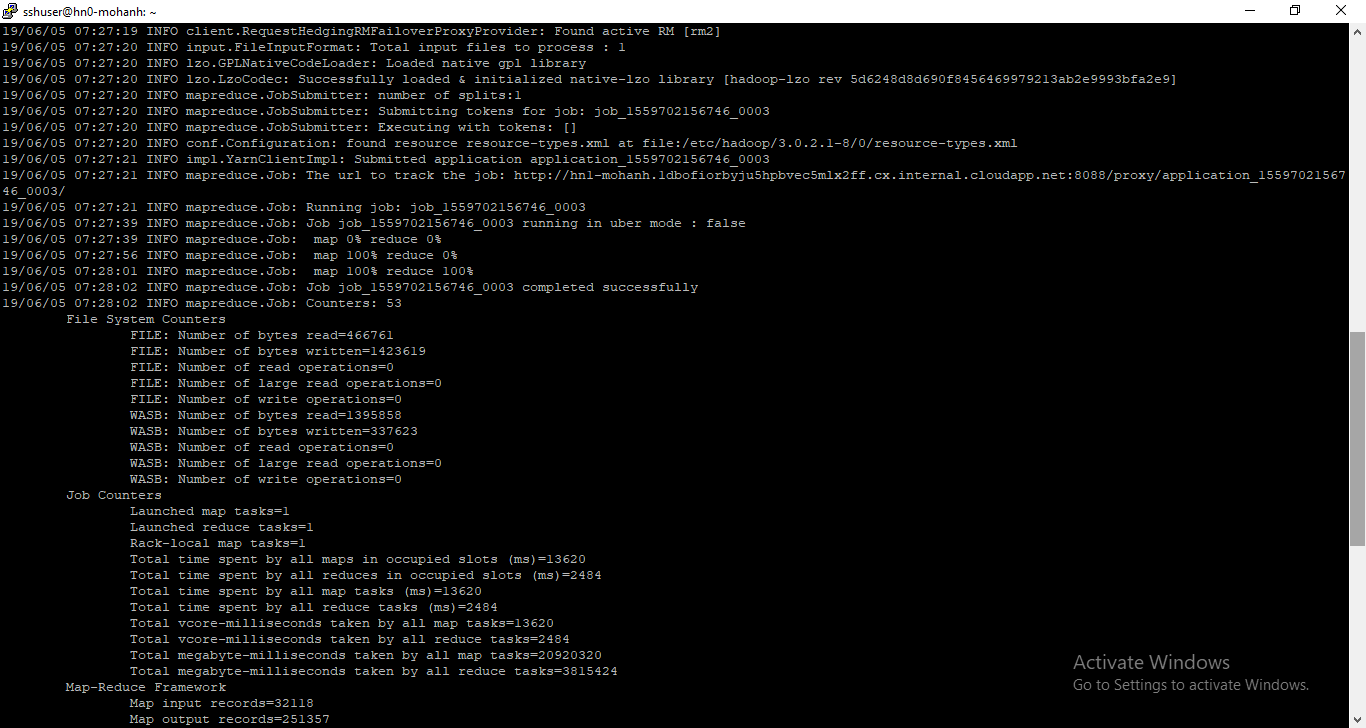
Listing the samples as below.



Checking the specific samples that contain wordcount



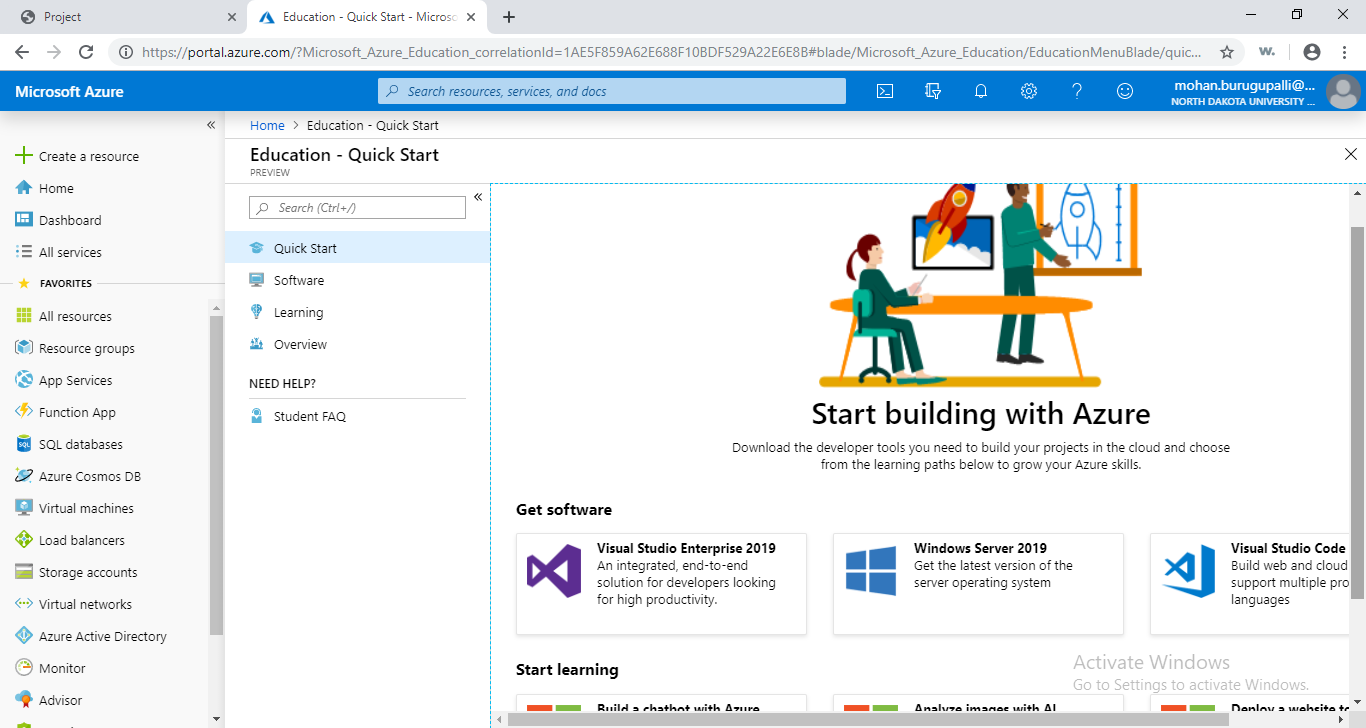
Input is taken from davinci.txt and the output is saved to davinciwordcount as shown below



# **Results**

## **Task 0: Create Azure Account**

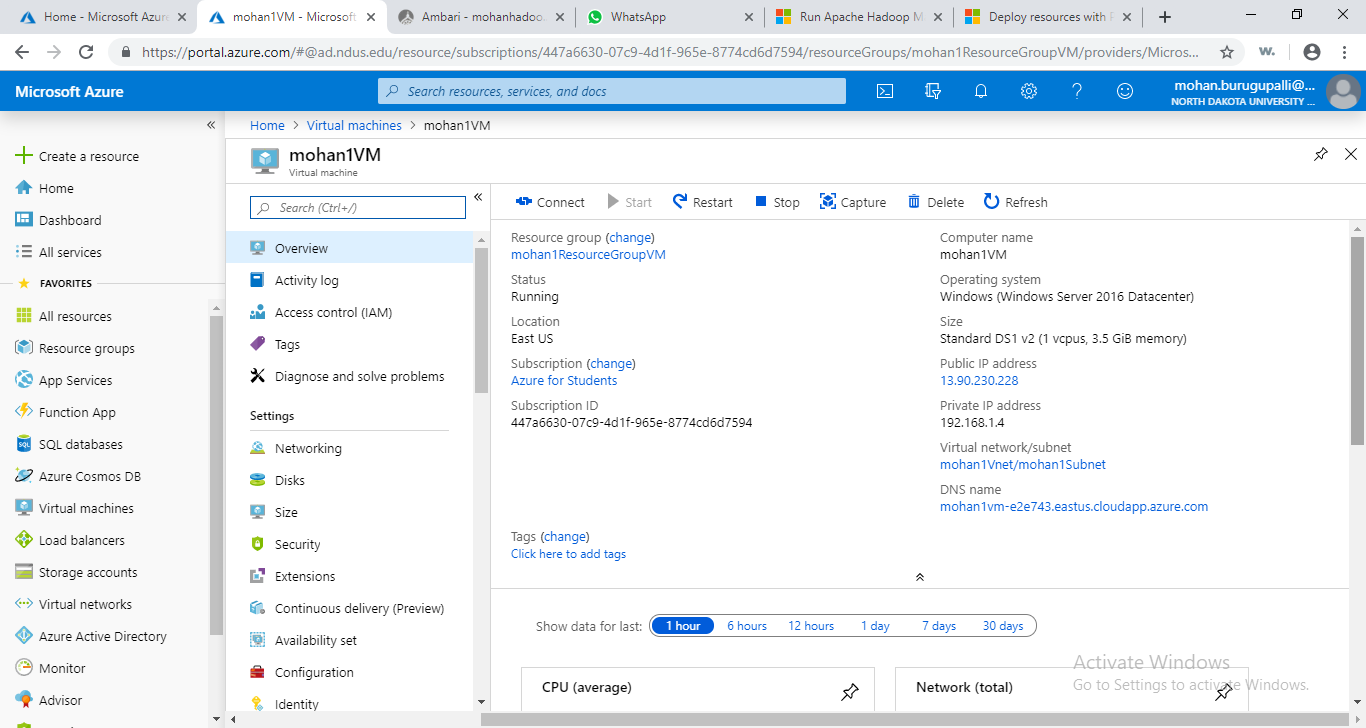
Below screenshot is the home page after creating the azure account



## **Task 1: Create a Virtual Machine**

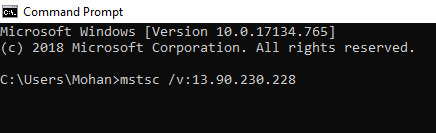
### **Check the created VM on the Azure portal**

Check for the virtual machine created using power shell in the Azure portal. We can see that under Home > Virtual machines > mohan1VM(given VM name)

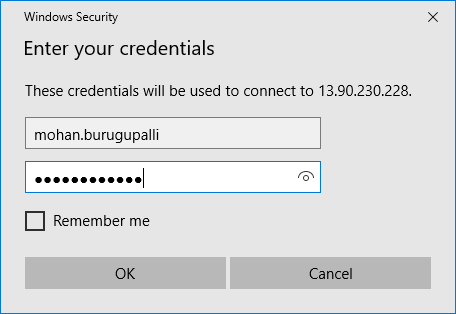


### **Connect to the VM created**

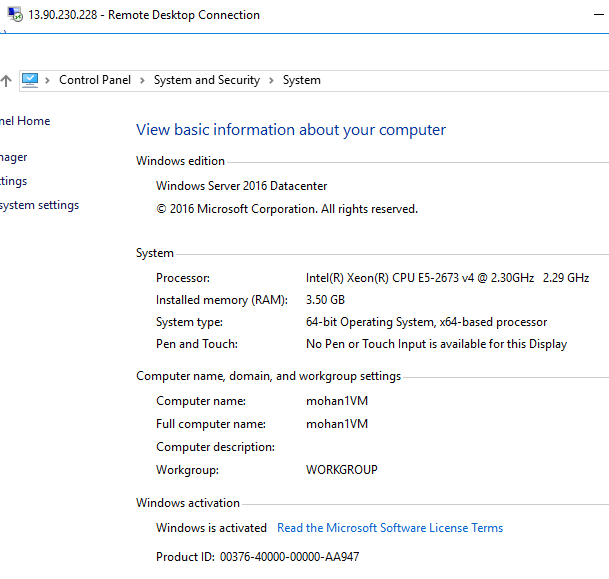
From the above image, we can see the Public IP address of the virtual machine. i.e 13.90.230.228. Using this ip address let us connect to the created VM’s virtual desktop. Open command prompt in our local system and use the command ‘mstsc /v:<ip address of the vm>’ that connects to the virtual desktop.



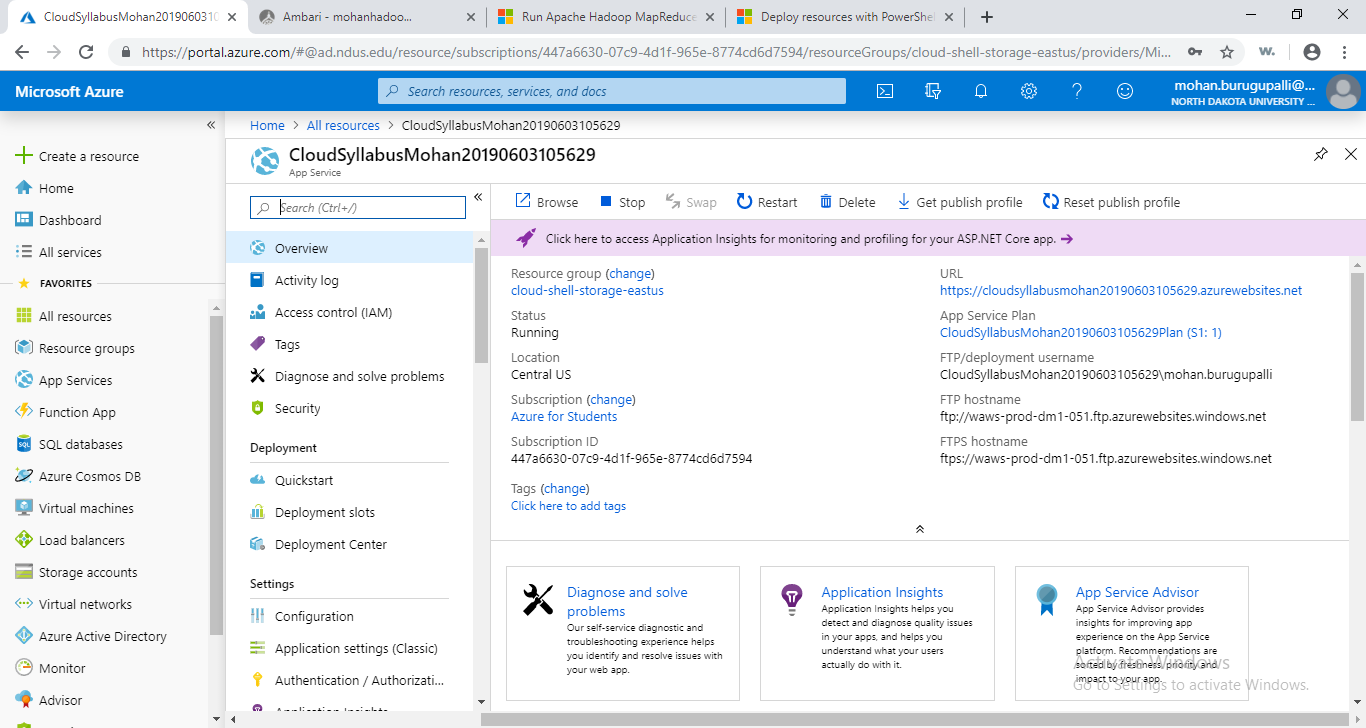
That opens a sign in page for the virtual machine. We have set up credentials for access and need to enter those here.



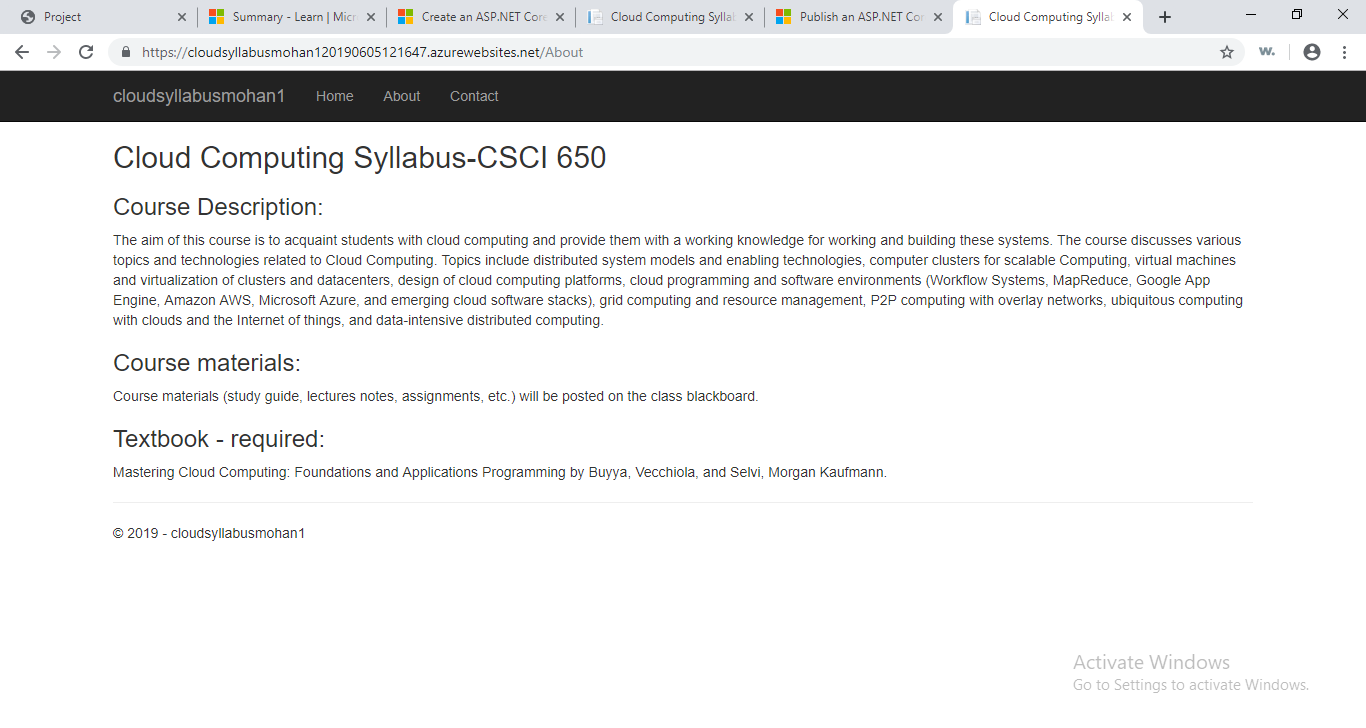
Below is our virtual machine, its desktop view and system properties.

## **Task 2: Create and deploy a website**



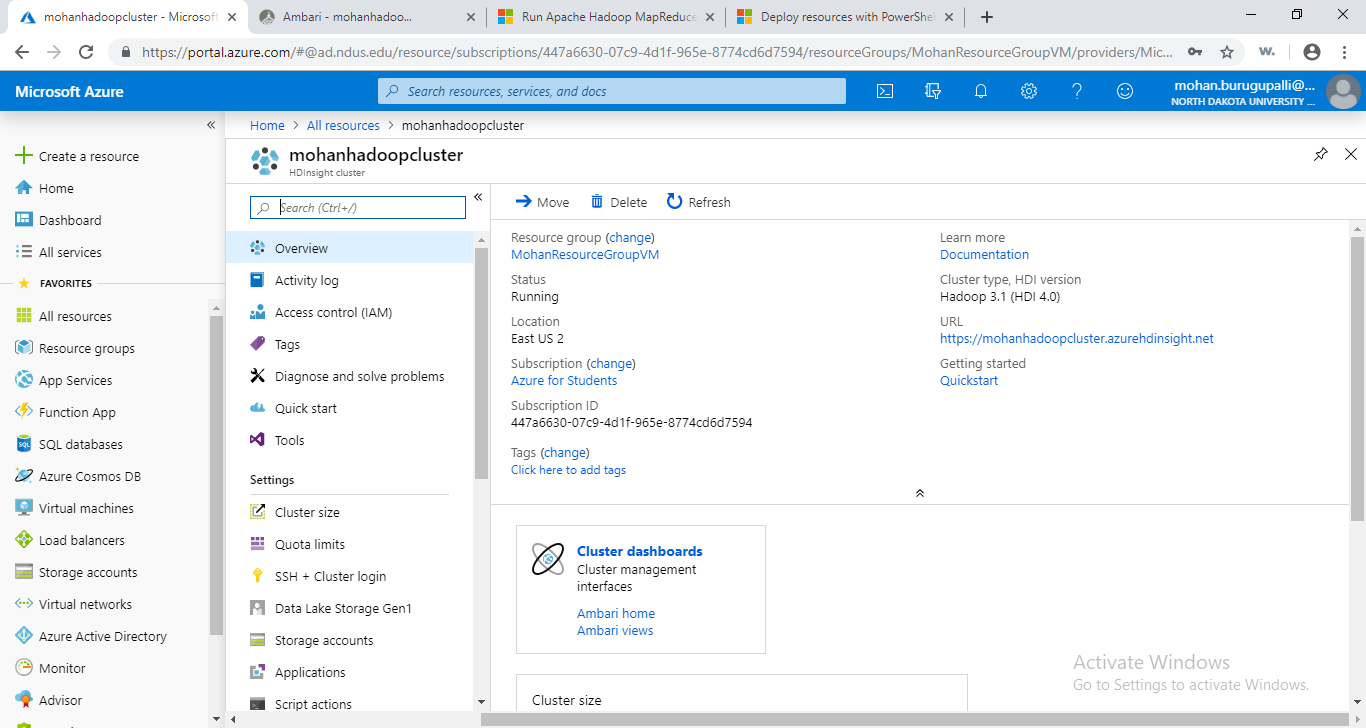
The website that conatins Cloud computing syllabus is published to Azure server as below to the url - <https://cloudsyllabusmohan120190605121647.azurewebsites.net/About>



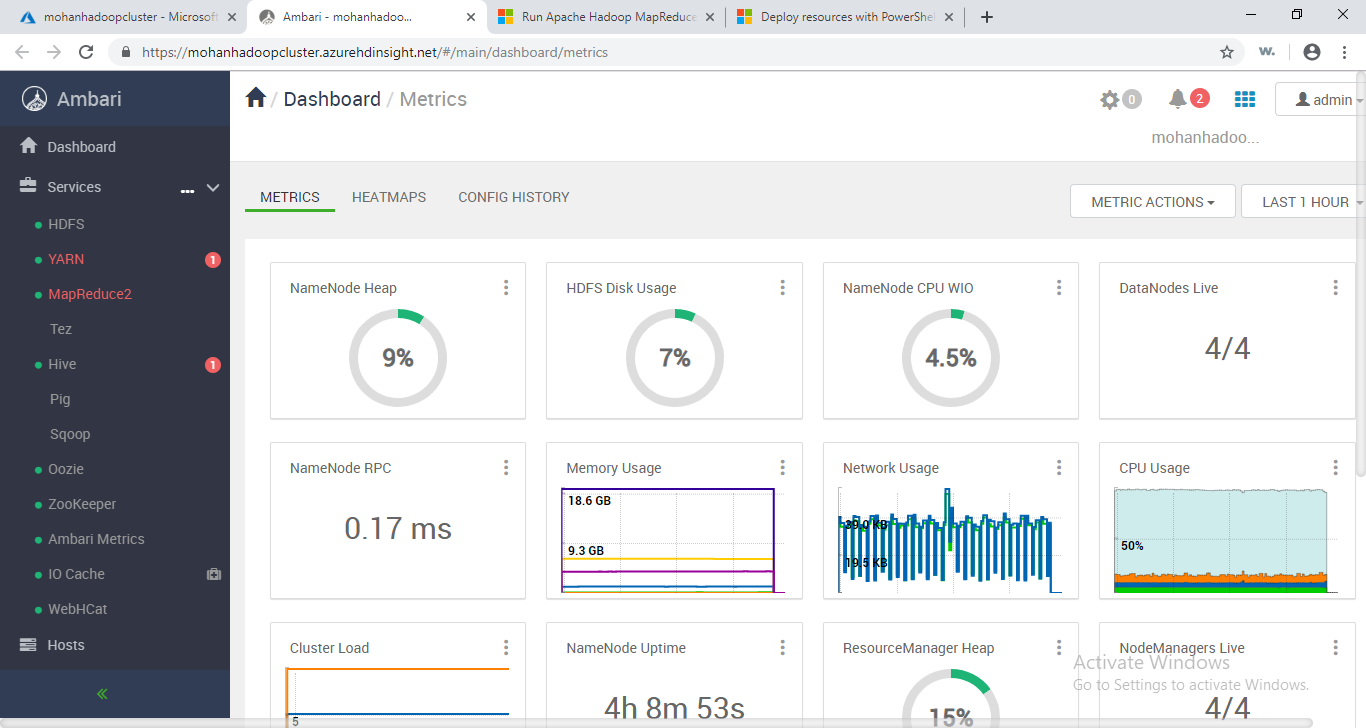
## **Task 3: Setup an Apache Hadoop Cluster and run a MapReduce Job**

### **Setup of Apache Hadoop Cluster**

The below cluster is created after we click next and create after summary. It took nearly 25 mins to create the cluster.

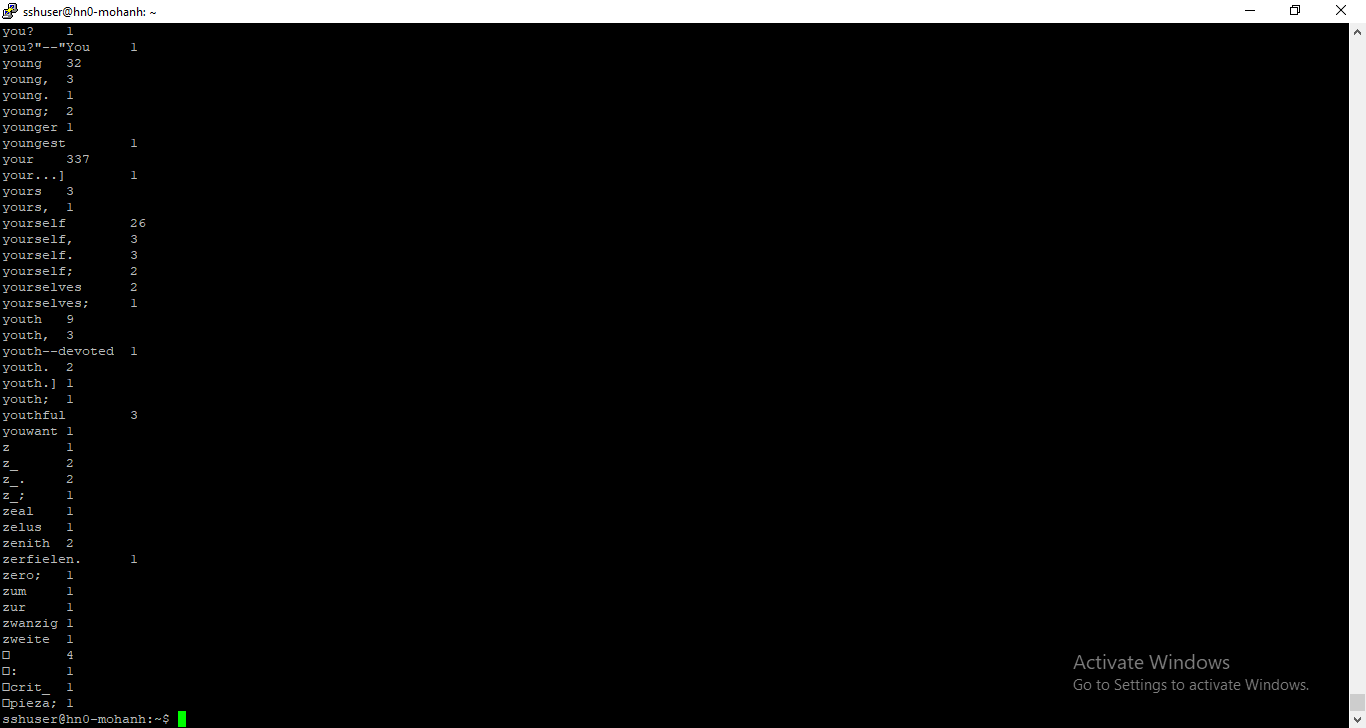


Click on the URL to see the below screen



### **Run a Map Reduce Job**

The job is finished and the output can be seen as below with the command ‘hdfs dfs -cat /example/data/davinciwordcount/\*’



# **Conclusion**

From the project work I understood and got to know the Azure concepts of the following

* Creating Azure account
* Different methods of creating a virtual machine
* Creating a website and deploy it to Azure
* Setup an Apache Hadoop cluster on HDInsight
* Run MapReduce job on Hadoop cluster.

# **Future Work**

Build the knowledge gained from this project work to develop complex applications.

# **References**

[1] <https://s3.us-east-1.amazonaws.com/blackboard.learn.xythos.prod/57fced8e8d3c5/14213336?response-content-disposition=inline%3B%20filename%2A%3DUTF-8%27%27Project%25281%2529.pdf&response-content-type=application%2Fpdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Date=20190605T014610Z&X-Amz-SignedHeaders=host&X-Amz-Expires=21600&X-Amz-Credential=AKIAIL7WQYDOOHAZJGWQ%2F20190605%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-Signature=1e00733ce562b440ab5e250898d93c35f6c80fb0c20b6874eb063bef7bc4d00b>

[2] <https://docs.microsoft.com/en-us/azure/virtual-machines/windows/>

[3] <https://docs.microsoft.com/en-us/azure/virtual-machines/windows/tutorial-manage-vm>

[4] <https://docs.microsoft.com/en-us/learn/paths/deploy-a-website-with-azure-app-service/>

[5] <https://docs.microsoft.com/en-us/visualstudio/ide/quickstart-aspnet-core?view=vs-2019>

[6] <https://docs.microsoft.com/en-us/azure/hdinsight/hadoop/apache-hadoop-linux-create-cluster-get-started-portal>

[7] <https://docs.microsoft.com/en-us/azure/hdinsight/hadoop/apache-hadoop-run-samples-linux>