Chapter 1: Getting Started with Python Machine Learning

```python
In [55]: from ipywidgets import interactive

import ipywidgets as widgets

def play_with_dim(dim=1):
    f = np.poly1d(np.polyfit(x, y, dim))
    plot_web_traffic(x, y, [f])
    print("Error for d={}: \$f\$ \$\{(f.order, error(f, x, y))\}".format(dim=dim))

interactive_plot = interactive(play_with_dim, dim=(1,100))
output = interactive_plot.children[1]
output.layout.height = '500px'

dim = 15

Error for d=15: 113617150.429347
```
Chapter 2: Classifying with Real-world Examples
Chapter 3: Regression
Chapter 4: Classification I - Detecting Poor Answers

LinkCount

NumCodeLines

NumTextTokens
Bias-Variance for '5NN'

- Test error (dashed red line)
- Train error (solid blue line)

Error vs. Data set size.
Feature importance for LogReg C=0.01

- NumAllCaps
- NumExClams
- AvgSentLen
- NumCodeLines
- LinkCount
- AvgWordLen
- NumTextTokens
Confusion matrix, without normalization

<table>
<thead>
<tr>
<th></th>
<th>Poor</th>
<th>Good</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>1431</td>
<td>534</td>
</tr>
<tr>
<td>Good</td>
<td>874</td>
<td>1161</td>
</tr>
</tbody>
</table>
Chapter 5: Dimensionality Reduction
Entropy $H(X)$

$H(X)$ vs $P(X = \text{coin will show heads up})$
\[ N(I(X_1, X_2) = 0.290 \]
\[ N(I(X_1, X_2) = 0.252 \]
\[ N(I(X_1, X_2) = 0.137 \]
\[ N(I(X_1, X_2) = 0.079 \]
NI(X₁, X₂) = 0.287

NI(X₁, X₂) = 0.223

NI(X₁, X₂) = 0.107
Current features, initialized with all features x₁, x₂, ..., xₜ

Train model with y and check the importance of individual features

Importance of individual features

Feature set too big

Yes

Drop features that are unimportant

No

Resulting features x₂, x₁₀, x₁₄
Chapter 6: Clustering - Finding Related Posts

![Vectors](image_url)
Chapter 7: Recommendations

Customers Who Bought This Item Also Bought

- **Anna Karenina**
  - Leo Tolstoy
  - Paperback
  - $10.35
  - Rating: ★★★★★ (289)

- **The Brothers Karamazov**
  - Fyodor Dostoevsky
  - Paperback
  - $11.25
  - Rating: ★★★★★ (248)

- **The Idiot (Vintage Classics)**
  - Fyodor Dostoevsky
  - Paperback
  - $10.88
  - Rating: ★★★★★ (57)
Chapter 8: Artificial Neural Networks and Deep Learning

High-Level TensorFlow APIs
- Estimators

Mid-Level TensorFlow APIs
- Layers
- Datasets
- Metrics

Low-level TensorFlow APIs
- Python
- C++
- Java
- Go

 TensorFlow Distributed Execution Engine
Chapter 9: Classification II - Sentiment Analysis

Relationship between probabilities and their logarithm
P/R curve (AUC=0.90) / pos vs neg

P/R curve (AUC=0.67) / sent vs rest
Chapter 10: Topic Modeling
Chapter 11: Classification III - Music Genre Classification
Confusion matrix of a CNN based classifier (test)

The confusion matrix illustrates the performance of a classifier in identifying different music genres: classical, jazz, country, pop, rock, and metal. The matrix compares the true class labels with the predicted class labels. Each cell in the matrix represents the proportion of instances from the true class that were correctly or incorrectly classified into a predicted class. The color intensity indicates the accuracy, with darker shades representing higher accuracy rates.
Chapter 12: Computer Vision


Chapter 13: Reinforcement Learning
Chapter 14: Bigger Data

<table>
<thead>
<tr>
<th>Waiting</th>
<th>Ready</th>
<th>Finished</th>
<th>Running</th>
<th>Task name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>jugfile.print_final_result</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>jugfile.add</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>jugfile.double</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>----------</td>
<td>---------</td>
<td>----------------------</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Waiting</th>
<th>Ready</th>
<th>Finished</th>
<th>Running</th>
<th>Task name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>jugfile.print_final_result</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>jugfile.double</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>jugfile.add</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>----------</td>
<td>---------</td>
<td>----------------------</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>Total</td>
</tr>
</tbody>
</table>
AWS services

Recently visited services

All services

Compute
- EC2
- Lightsail
- Elastic Container Service
- Lambda
- Batch
- Elastic Beanstalk

Storage
- S3
- EFS
- Glacier
- Storage Gateway

Database
- RDS
- DynamoDB
- ElastiCache
- Amazon Redshift

Migration
- AWS Migration Hub
- Application Discovery Service
- Database Migration Service

Management Tools
- CloudWatch
- AWS Auto Scaling
- CloudFormation
- CloudTrail
- Config
- OpsWorks
- Service Catalog
- Systems Manager
- Trusted Advisor
- Managed Services

Mobile Services
- Mobile Hub
- AWS AppSync
- Device Farm
- Mobile Analytics

AR & VR
- Amazon Sumerian

Application Integration
- Step Functions
- Amazon SQS
- Simple Notification Service
- Simple Queue Service
- SWF

Customer Engagement
- Amazon Connect
- Pinpoint
- Simple Email Service

Machine Learning
- Amazon SageMaker
- Amazon Comprehend
- AWS DeepLens

Business Productivity
- Alexa for Business
- Amazon Chime
Add user

Set user details
You can add multiple users at once with the same access type and permissions. Learn more

User name: user_id

Add another user

Select AWS access type
Select how these users will access AWS. Access keys and autogenerated passwords are provided in the last step. Learn more

Access type:

- [ ] Programmatically access
  Enables an access key ID and secret access key for the AWS CLI, SDK, and other development tools.

- [ ] AWS Management Console access
  Enables a password that allows users to sign in to the AWS Management Console.

* Required

Create group
Create a group and select the policies to be attached to the group. Using groups is a best practice way to manage user permissions by job function, AWS service access, or your custom permissions. Learn more

Group name: ECG_PUML

Create policy

<table>
<thead>
<tr>
<th>Policy name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AmazonEC2ContainerService:EC2ReadOnlyAccess</td>
<td>AWS managed</td>
<td>Provides read-only access to Amazon EC2 Container Service.</td>
</tr>
<tr>
<td>AmazonEC2ContainerService:EC2FullAccess</td>
<td>AWS managed</td>
<td>Provides full access to Amazon EC2 Container Service.</td>
</tr>
<tr>
<td>AmazonEC2ContainerService:EC2ReportAccess</td>
<td>AWS managed</td>
<td>Provides full access to all Amazon EC2 reports via the AWS Management Console.</td>
</tr>
<tr>
<td>AmazonEC2ContainerService:EC2DeleteKey</td>
<td>AWS managed</td>
<td>Provides EC2 access to S3 bucket to download revision. This role is needed by the CodeDeploy agent on EC2 instances.</td>
</tr>
</tbody>
</table>

Filter: Policy type

<table>
<thead>
<tr>
<th>Policy name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Showing 17 results

Download .csv

<table>
<thead>
<tr>
<th>User</th>
<th>Access key ID</th>
<th>Secret access key</th>
</tr>
</thead>
<tbody>
<tr>
<td>user_id</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Access key ID: AKIAIM3ATLOT5E4SBika

Secret access key: ********* Show

Close
Resources

You are using the following Amazon EC2 resources in the US East (N. Virginia) region:

- 0 Running Instances
- 0 Dedicated Hosts
- 0 Volumes
- 1 Key Pairs
- 0 Placement Groups
- 0 Elastic IPs
- 0 Snapshots
- 0 Load Balancers
- 3 Security Groups

Learn more about the latest in AWS Compute from AWS re:Invent 2017 by viewing the EC2 Videos.

Create Instance

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

Launch Instance

Note: Your instances will launch in the US East (N. Virginia) region

Service Health

- **US East (N. Virginia):** This service is operating normally

Scheduled Events

- **US East (N. Virginia):** No events

Availability Zone Status:

- **us-east-1a:** Availability zone is operating normally
- **us-east-1b:** Availability zone is operating normally

Step 1. Choose an Amazon Machine Image (AMI)

An AMI is a template that contains the software configuration, operating system, application server, and applications required to launch your instance. You can select an AMI provided by AWS, our community, or the AWS Marketplace, or you can select one of your own AMIs.

Quick Start

- **Amazon Linux AMI 2016.09 (HVM), SSD Volume Type:** ami-043e6b9b
  - Select

- **Amazon Linux 2 LTS Candidate 3 (HVM), SSD Volume Type:** ami-056f8d80
  - Select

- **Oracle Linux Enterprise Server 12 SP3 (HVM), SSD Volume Type:** rami-0626a279
  - Select

- **Red Hat Enterprise Linux 7.2 (HVM), SSD Volume Type:** ami-0de7d6f9
  - Select

- **Red Hat Enterprise Linux 6.9 (HVM), SSD Volume Type:** ami-066f9e11
  - Select

- **Ubuntu Server 18.04 LTS (HVM), SSD Volume Type:** ami-0b096c23
  - Select

- **Ubuntu Server 18.04 LTS (HVM), SSD Volume Type:** ami-078e8e30
  - Select
### Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized for different use cases. Instances are virtual servers that can run Linux, Windows, or any OS you like. They are available with varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the app for your applications. Learn more about instance types and how they can meet your computing needs.

Currently selected: T2 Micro (variable ECUs, 1 vCPU, 1.7 GB RAM, Intel E5-2630, 1 GB memory, EBS only)

| T2 instance and VPC only: Your T2 instance will launch into your VPC. Learn more about T2 and VPC. |

<table>
<thead>
<tr>
<th>Family</th>
<th>Type</th>
<th>vCPUs</th>
<th>Memory (GB)</th>
<th>EBS-Optimized Available</th>
<th>Network Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>General purpose</td>
<td>32 EBS</td>
<td>1</td>
<td>0.5</td>
<td>EBS only</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>General purpose</td>
<td>32 vCPUs</td>
<td>1</td>
<td>0.5</td>
<td>EBS only</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>General purpose</td>
<td>2 Micro</td>
<td>1</td>
<td>0.5</td>
<td>EBS only</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>General purpose</td>
<td>1 vCPU</td>
<td>1</td>
<td>1</td>
<td>EBS only</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>General purpose</td>
<td>0.5 EBS</td>
<td>1</td>
<td>1</td>
<td>EBS only</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>General purpose</td>
<td>0.25 EBS</td>
<td>1</td>
<td>1</td>
<td>EBS only</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>General purpose</td>
<td>0.125 EBS</td>
<td>1</td>
<td>1</td>
<td>EBS only</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>General purpose</td>
<td>0.0625 EBS</td>
<td>1</td>
<td>1</td>
<td>EBS only</td>
<td>Low to Moderate</td>
</tr>
</tbody>
</table>

### Step 7: Review Instance Launch

Please review your instance launch details. You can go back to edit changes for each section. Click Launch to assign a key pair to your instance and complete the launch process.

#### AMI Details
- Amazon Linux AMI 2018.03.0 (HVM), SSD Volume Type
- instance 44-46486b

#### Instance Type
- ECUs: 10
- vCPUs: 1
- Memory (GB): 0.5
- Launch: 2018-06-25T16:10:42.993+02:00

#### Security Groups
- Security group name: launch-wizard-2
- Description: launch-wizard-2 created 2016-05-23T18:16:42.992+02:00

#### Security Group Details
- Protocol: 1
- Port: 80

#### Instance Details
- State: Running
- IP address: 34.201.58.154

#### Tags
- Key Name: asb-express
- Monitoring: None
- Launch: 2018-06-25T16:10:42.993+02:00

---

Select an existing key pair or create a new key pair

A key pair consists of a public key that AWS stores, and a private key file that you store. Together, they allow you to connect to your instance. For Windows AMIs, the private key file is required to obtain the password used to log in to your instance. For Linux AMIs, the private key file allows you to log in to your instance.

**Create a new key pair**

**Key pair name**: asb-express

**Download Key Pair**

You must download the private key file (".pem files") before you can connect. Store it in a secure and accessible location. You will not be able to download the file again after it's created.

---

Instance: 34.201.58.154

<table>
<thead>
<tr>
<th>Description</th>
<th>Status Checks</th>
<th>Monitoring</th>
<th>Tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instance ID</td>
<td>CentOS 7 (HVM)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Instance type</td>
<td>32 vCPUs</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Availability zone</td>
<td>us-east-1a</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Security group</td>
<td>launch-wizard-2</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Public DNS (IP): 34.201.58.154
IPv4 Public IP: 34.201.58.154
IPv6 Public IP: 
IPv4 Private IP: 
IPv6 Private IP: 
Secondary private IP: 

---
$ ssh -i aws_explore.pem ec2-user@34.201.68.154

Last login: Wed May 23 16:14:17 2018 from 94.252.95.61

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
|   | ( ) Amazon Linux AMI
|___|___|___|

6 package(s) needed for security, out of 7 available
Run "sudo yum update" to apply all updates.
[ec2-user@ip-172-30-0-118 ~]$
You are using the following Amazon VPC resources:

<table>
<thead>
<tr>
<th>Resources</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>VPCs</td>
<td>N. Virginia 1</td>
</tr>
<tr>
<td>Subnets</td>
<td>N. Virginia 4</td>
</tr>
<tr>
<td>Route Tables</td>
<td>N. Virginia 1</td>
</tr>
<tr>
<td>Internet Gateways</td>
<td>N. Virginia 1</td>
</tr>
<tr>
<td>Security Groups</td>
<td>N. Virginia 6</td>
</tr>
<tr>
<td>Nat Gateways</td>
<td>N. Virginia 0</td>
</tr>
<tr>
<td>VPC Peering Connections</td>
<td>N. Virginia 0</td>
</tr>
<tr>
<td>Network ACLs</td>
<td>N. Virginia 1</td>
</tr>
</tbody>
</table>