

Class: T.Y.BBA (C.A.) (Semester - V)

Paper Code: **BCA3501**

Title of Paper: **Android Application Programming**

Credit: 3

No. of Lectures: 48

**A] Learning Objective:**

To understand the Android Operating System and develop applications using Google's Android open-source platform

**B] Learning Outcome:**

Student should be able to develop Android Applications.

<b>Unit No</b>	<b>Topic</b>	<b>No. of lectures</b>
1	<b>Introduction to Android</b> 1.1. Overview 1.2. History 1.3. Features of Android 1.4. Architecture of Android 1.4.1 Overview of Stack 1.4.2 Linux Kernel 1.4.3 Native Libraries 1.4.4 Android Runtime 1.4.5 Application Framework 1.4.6 Applications 1.5. SDK Overview 1.5.1 Platforms 1.5.2 Tools – (JDK, SDK, Eclipse/Android Studio, ADT, AVD, Android Emulator) 1.5.2 Versions 1.6. Creating your first Android Application	04
2	<b>Activities, Fragments and Intents</b> 2.1. Introduction to Activities 2.2. Activity Lifecycle 2.3. Introduction to Intents 2.4. Linking Activities using Intents 2.5. Calling built-in applications using Intents 2.6. Introduction to Fragments 2.7. Adding Fragments Dynamically 2.8. Lifecycle of Fragment 2.9. Interaction between Fragments	05
3	<b>Android User Interface</b> 3.1. Understanding the components of a screen 3.1.1 Views and ViewGroups 3.1.2 LinearLayout 3.1.3 AbsoluteLayout 3.1.4 TableLayout 3.1.5 RelativeLayout 3.1.6 FrameLayout 3.1.7 ScrollLayout 3.1.8 ScrollView	08

	<ul style="list-style-type: none"> <li>3.2. Adapting to Display Orientation <ul style="list-style-type: none"> <li>3.2.1 Anchoring Views</li> <li>3.2.2 Resizing and Repositioning</li> </ul> </li> <li>3.3. Managing Changes to Screen Orientation <ul style="list-style-type: none"> <li>3.3.1 Persisting State Information during Changes in Configuration</li> <li>3.3.2 Detecting Orientation Changes</li> <li>3.3.3 Controlling the Orientation of the Activity</li> </ul> </li> <li>3.4. Utilizing Action Bar <ul style="list-style-type: none"> <li>3.4.1 Adding Action Items to the Action Bar</li> <li>3.4.2 Customizing the Action Items and Application Icon</li> </ul> </li> </ul>	
4	<p><b>Designing Your User Interface with Views</b></p> <ul style="list-style-type: none"> <li>4.1. Using Basic Views <ul style="list-style-type: none"> <li>4.1.1 TextView</li> <li>4.1.2 Button, ImageButton, EditText, CheckBox</li> <li>4.1.3 ToggleButton, RadioButton, and RadioGroup Views</li> <li>4.1.4 ProgressBar View</li> <li>4.1.5 AutoCompleteTextView View</li> </ul> </li> <li>4.2. Using Picker Views <ul style="list-style-type: none"> <li>4.2.1 TimePicker View</li> <li>4.2.2 DatePicker View</li> </ul> </li> <li>4.3. Using List Views to Display Long Lists <ul style="list-style-type: none"> <li>4.3.1 ListView</li> <li>4.3.2 Using the Spinner View</li> </ul> </li> <li>4.4. Understanding Specialized Fragments <ul style="list-style-type: none"> <li>4.4.1 Using a ListFragment</li> <li>4.4.2 Using a DialogFragment</li> <li>4.4.3 Using a PreferenceFragment</li> </ul> </li> </ul>	10
5	<p><b>Displaying Pictures and Menus</b></p> <ul style="list-style-type: none"> <li>5.1. Using Image Views to Display Pictures <ul style="list-style-type: none"> <li>5.1.1 Gallery and ImageView views</li> <li>5.1.2 Image Switcher</li> <li>5.1.3 Grid View</li> </ul> </li> <li>5.2. Using Menus with Views <ul style="list-style-type: none"> <li>5.2.1 Creating the helper methods</li> <li>5.2.2 Options Menu</li> <li>5.2.3 Context Menu</li> </ul> </li> </ul>	06
6	<p><b>Databases – SQLite</b></p> <ul style="list-style-type: none"> <li>6.1. Introduction to SQLite</li> <li>6.2. SQLiteOpenHelper and SQLiteDatabase</li> <li>6.3. Creating , opening and closing database</li> <li>6.4. Working with cursors, Insert, Update, Delete</li> <li>6.5. Building and executing queries</li> </ul>	04
7	<p><b>Messaging and E-mail</b></p> <ul style="list-style-type: none"> <li>7.1. SMS Messaging <ul style="list-style-type: none"> <li>7.1.1 Sending SMS Messages Programmatically</li> <li>7.1.2 Getting Feedback after Sending a Message</li> <li>7.1.3 Sending SMS Messages Using Intent</li> <li>7.1.4 Receiving SMS Messages</li> <li>7.1.5 Caveats and Warnings</li> </ul> </li> </ul>	03

	7.2. Sending E-mail	
8	<b>Location-Based Services and Google Map</b> 8.1. Display Google Maps 8.1.1 Creating the project 8.1.2 Obtaining the Maps API Key 8.1.3 Displaying the Map 8.1.4 Displaying the Zoom Control 8.1.5 Changing Views 8.1.6 Navigating to a specific location 8.1.7 Adding Markers 8.1.8 Getting the location that was touched 8.1.9 Geocoding and Reverse Geocoding 8.2. Getting Location Data 8.3. Monitoring a Location	08
	<b>Total No. of Lectures</b>	<b>48</b>

### Reference Books

1. Beginning Android4 Application Development, By Wei-Meng Lee WILEY India Edition WROX Publication
2. Professional Android 4 Application Development, By Reto Meier WROX Publication
3. The official site for Android developers - <https://developer.android.co>

Class: T.Y.BBA (C.A.) (Semester - V)

Paper Code: **BCA3502**

Title of Paper: **Dot Net Programming**

Credit: 3

No. of Lectures: 48

**A] Learning Objectives:**

1. To introduce visual programming and event driven programming practically.
2. To enhance applications development skill of the student.

**B] Learning Outcome:**

Student should be able to

1. Develop Desktop Application.
2. Develop Web Application.

Unit No.	Topic	No. of Lectures
1	<b>Introduction to .Net Framework</b> 1.1 IDE (Integrated Development Environment) 1.2 Event Driven Programming 1.3 .NET Framework 1.4 Architecture of .Net 1.5 Execution Process of .Net Application 1.6 Features of .Net 1.7 Advantages of .Net 1.8 Develop simple .Net Application	06
2	<b>Introduction to VB.Net</b> 2.1 Basics of VB.Net 2.1.1 Operators 2.1.2 Data Types 2.2 Control Structures 2.2.1 Decision making statements 2.2.2 Loops - For, while, do while etc. 2.3 Exit Statements 2.4 Build Console Applications 2.4.1 Methods - Read(), Readline(), Write(), Writeline() etc. 2.5 Build Windows Applications 2.5.1 Controls - Form, TextBox, Button, Label, CheckBox, Listbox, ComboBox, RadioButton, DateTimePicker, MonthCalender, Timer, Progressbar, Scrollbar, PictureBox, ImageBox, ImageList, TreeView, ListView, Toolbar, StatusBar, Datagridview 2.5.2 Menus and PopUp Menu 2.5.3 Predefined Dialog controls 2.5.4 DialogBox - InputBox(), MessageBox(), MsgBox()	10

3	<p><b>Object Oriented Programming in VB .Net</b></p> <p>3.1 Class and Object</p> <p>3.2 Properties, methods and events.</p> <p>3.3 Constructors and Destructors</p> <p>3.4 Method overloading</p> <p>3.5 Inheritance</p> <p>3.5.1 MyBase , MyClass keywords.</p> <p>3.6 Access modifiers: Public, Private, Protected, Friend.</p> <p>3.7 Method Overriding.</p> <p>3.8 Interfaces.</p> <p>3.9 Polymorphism.</p> <p>3.10 Exception Handling</p>	06
4	<p><b>Architecture Of ADO.Net</b></p> <p>4.1 Database : Connection, Command, DataAdapter ,DataSet, DataReader, DataTable</p> <p>4.2 Connection to database with Server Explorer</p> <p>4.3 Multiple Table Connection</p> <p>4.4 Data binding with controls like TextBox, ListBox, DataGrid.</p> <p>4.5 Navigating data source</p> <p>4.6 DataGridView, DataFormwizard, Data validation</p>	10
5.	<p><b>Crystal Report</b></p> <p>5.1 Connection to Database, Table, Queries, Building Report, Modifying Report, Formatting Fields and Object</p> <p>5.2 Header, Footer, Working with formula fields, Parameter fields, Special fields</p> <p>5.3 Working with Multiple Tables.</p>	08
6.	<p><b>ASP.Net Web Forms</b></p> <p>6.1 Introducing ASP.NET web forms: The Role of HTTP, The Role of HTML, The Role of Client Side Scripting, Posting Back to the Web Server,</p> <p>6.2 Interacting with the Incoming HTTP Request, Interacting with the Outgoing HTTP Response,</p> <p>6.3 The Life Cycle of an ASP.NET Web Page, ASP.NET Web Controls, 6.4 Master Pages, and Themes: Understanding the Nature of Web</p>	08

	Controls, Building the ASP.NET Cars Web Site, The Role of the Validation Controls, Working with Themes	
	<b>Total No. of Lectures</b>	<b>48</b>

**Reference Books:**

1. Programming Microsoft Visual Basic.NET – Francesco Balena
2. The Complete Reference -Visual Basic .NET – Jeffrey R. Shapiro
3. Murach’s VB.NET database programming with ADO.NET -Anne Prince and Doug Lowe
4. The Visual Basic.NET COACH
5. Visual Basic .NET 2003 in 21 Days. – Steven Holzner, SAMS Publications.
6. Mastering Crystal Report - BPB Publication
7. Crystal Report – The Complete Reference:- Tata McGraw Hill

Class: T.Y.BBA (C.A.) (Semester - V)

Paper Code: **BCA3503**

Title of Paper: **Cloud Computing**

Credit: 3

No. of. Lectures: 48

**A] Learning Objectives:**

1. To understand evolution of cloud computing.
2. To learn and apply the concept of virtualization.
3. To analyze different cloud computing architectures and methods.
4. To evaluate the role of SOA and distributed computing.
5. To learn to create applications using parallel and distributed programming concepts.

**B] Learning Outcome:**

Students will be able to

1. Understand how cloud computing has evolved.
2. Apply virtualization techniques.
3. Analyze the different architectures followed in cloud computing
4. Evaluate the use of SOA and Distributed computing.
5. Develop applications using parallel & distributed programming.

Unit No.	Topic	No. of Lectures
1	<b>Introduction to Cloud</b> 1.1 Scalable Computing over the Internet 1.2 Technologies for Network based Systems 1.3 System Models for Distributed and Cloud Computing 1.4 Software Environments for Distributed Systems and Cloud 1.5 Performance, Security and Energy Efficiency 1.6 Clustering for Massive Parallelism 1.7 Computer Clusters and MPP Architecture 1.8 Design principles of Computer Clusters.	09
2	<b>Virtualization</b> 2.1 Implementation Levels of Virtualization 2.2 Virtualization Structures 2.3 Tools and Mechanisms 2.4 Virtualization of CPU, Memory, I/O Devices 2.5 Virtual Clusters and Resource Management 2.6 Virtualization for Data-Center Automation.	09
3	<b>Cloud Architecture</b> 3.1 Cloud Computing and Service models 3.2 Data center design and interconnection networks 3.3 Architectural Design of Compute and Storage Clouds 3.4 Public Cloud Platforms 3.5 Inter Cloud resource management 3.6 Cloud Security and Trust Management.	10
4	<b>SOA for Distributed Computing</b> 4.1 Services and SOA 4.2 Message Oriented Middleware 4.3 Portals and Science Gateways	10

	4.4 UDDI and Service Registries 4.5 Publish-Subscribe ,Metadata ,Semantic Web and Grid 4.6 Basic Workflow – Workflow Standards ,Architecture ,Specification , Workflow Execution Engine.	
5	<b>Programming Model</b> 5.1 Parallel and Distributed Programming Paradigms 5.2 MapReduce , Twister and Iterative MapReduce 5.3 Hadoop Library from Apache 5.4 Mapping Applications 5.5 Programming Support 5.6 Google App Engine, Amazon AWS 5.7 Microsoft Azure – Eucalyptus – Nimbus - Open Nebula, OpenStack. 5.8 CloudSim – Architecture , Cloudlets ,VM creation ,Broker ,VM allocation ,Hosts ,DataCenter.	10
<b>Total No. of Lectures</b>		<b>48</b>

**Reference Book:**

1. Ronald L. Krutz, Russell Dean Vines, “Cloud Security – A comprehensive Guide to Secure Cloud Computing”, Wiley – India, 2010.
2. John W. Rittinghouse and James F. Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010.
3. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud”, O’Reilly, 2009.
4. Rajkumar Buyya, Christian Vecchiola, S. Tamarai Selvi, “Mastering Cloud Computing”, TMH, 2013.
5. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
6. William von Hagen, “Professional Xen Virtualization”, Wrox Publications, 2008.
7. Frank P. Coyle, “XML, Web Services and the Data Revolution”, Pearson Education, 2007.



Class: T.Y.BBA (C.A.) (Semester - V)  
**Paper Code: BCA3503**

Title of Paper: **Internet of Things**

Credit: 3

No. of. Lectures: 48

**A] Learning Objectives:**

1. To understand Smart Objects and IoT Architectures
2. To learn about various IoT-related protocols
3. To build simple IoT Systems using Arduino and Raspberry Pi.
4. To understand data analytics and cloud in the context of IoT
5. To develop IoT infrastructure for popular applications

**B] Learning Outcome:**

Student should be able to

1. Identify the Components that forms part of IoT Architecture.
2. Determine the most appropriate IoT Devices and Sensors based on Case Studies.
3. Setup the connections between the Devices and Sensors.
4. Evaluate the appropriate protocol for communication between IoT.
5. Analyze the communication protocols for IoT.

Unit No	Name of Topic	No. of Lectures
<b>1</b>	<b>Fundamentals of IoT</b> Evolution of Internet of Things 1.1 Enabling Technologies 1.2 IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models 1.3 Simplified IoT Architecture and Core IoT Functional Stack 1.4 Fog, Edge and Cloud in IoT 1.5 Functional blocks of an IoT ecosystem 1.6 Sensors, Actuators, Smart Objects and Connecting Smart Objects 1.7 Security concerns and challenges	09
<b>2</b>	<b>IOT Protocols</b> 2.1 IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN 2.2 Network Layer: IP versions, Constrained Nodes and Constrained Networks 2.3 Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks 2.4 Application Transport Methods: Supervisory Control and Data Acquisition 2.5 Application Layer Protocols: CoAP and MQTT	09

<b>3</b>	<b>Design &amp; Development</b> 3.1 Design Methodology 3.2 Embedded computing logic 3.3 Micro-controller, System on Chips 3.4 IOT system building blocks 3.5 Arduino 3.6 Board details, IDE programming 3.7 Raspberry Pi 3.8 Interfaces and Raspberry Pi with Python Programming.	09
<b>4</b>	<b>Data Analytics And Supporting Services</b> 4.1 Structured Vs Unstructured Data 4.2 Data in Motion Vs Data in Rest 4.3 Role of Machine Learning 4.4 No SQL Databases 4.5 Hadoop Ecosystem 4.6 Apache Kafka, Apache Spark 4.7 Edge Streaming Analytics and Network Analytics 4.8 Xively Cloud for IoT, Python Web Application Framework 4.9 Django 4.10 AWS for IOT 4.11 System Management with NETCONF 4.12 YANG	09
<b>5</b>	<b>Case Studies/ Industrial Applications</b> 5.1 Cisco IOT system 5.2 IBM Watson IOT platform 5.3 Manufacturing 5.4 Converged Plantwide Ethernet Model (CPwE) 5.5 Power Utility Industry 5.6 GridBlocks Reference Model 5.7 Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control	12
<b>Total No. of Lectures</b>		<b>48</b>

**Reference Books:**

1. Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach, Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things – Key applications and Protocols, Wiley, 2012 (for Unit 2).
3. Jan Höller, Vlasios Tsiatsis, Catherine Mulligan, Stamatias, Karnouskos, Stefan Avesand. David Boyle, “From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence”, Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O’Reilly Media, 2011.
6. Dieter Uckelmann, Mark Harrison, Florian Michahelles, Architecting the Internet of Things, Springer publications.
7. Marco Schwartz, Internet of Things with Arduino Cookbook, Packt Publications.
8. Internet of Things and Data Analytics, Wiley Publications.

Class: T.Y.BBA (C.A.) (Semester - V)

Paper Code: **BCA3504**

Title of Paper: **Digital Marketing**

Credit: 3

No. of Lectures: 48

**A) Learning Objectives:**

1. To give knowledge about using digital marketing in and as business.
2. To make SWOT analysis, SEO optimization and use of various digital marketing tools.
3. To create a measurable and goal oriented website or marketing plan.

**B) Learning Outcome:**

Student should be able to

1. Explain why we get a huge list of webpages as a result of a search.
2. Examine why a certain webpage is ranked higher compared to others.
3. Organize how we can ethically boost the ranking of our webpage.
4. Describe some of the latest technologies used in Digital Marketing.

<b>Unit No.</b>	<b>Topic</b>	<b>No. of Lectures</b>
1	<b>Introduction</b> 1.1 Understanding Internet Marketing 1.2 Search Engine Optimization 1.3 Search Engine Marketing 1.4 Email Marketing 1.5 Digital Display Marketing	04
2	<b>Introduction to New Age Media (Digital) Marketing</b> 2.1 What is Digital Marketing 2.2 Digital vs. Real Marketing 2.3 Digital Marketing Channels 2.4 Types of Digital Marketing(Overview)-Internet Marketing ,Social Media Marketing, Mobile Marketing	04
3	<b>Creating Initial Digital Marketing Plan</b> 3.1 Content management 3.2 SWOT analysis: Strengths, Weaknesses, Opportunities, and Threats 3.3 Target group analysis EXERCISE: Define a target group	04
4	<b>Marketing using Web Sites</b> 4.1 Web design 4.2 Optimization of Web sites 4.3 MS Expression Web EXERCISE: Creating web sites, MS Expression	04
5	<b>Search Engine Optimization</b> 5.1 SEO Optimization 5.2 Writing the SEO content EXERCISE: Writing the SEO Content	04
6	<b>Customer Relationship Management</b> 6.1 Introduction to CRM 6.2 CRM platform	04

	6.3 CRM models EXERCISE: CRM strategy	
7	<b>Social Media Marketing</b> 7.1 Understanding Social Media Marketing 7.2 Social Networking (Facebook, LinkedIn, Twitter, etc.) Social Media (Blogging, Video Sharing - Youtube, Photosharing – Instagram, Podcasts) 7.3 Web analytics - levels 7.4 Modes of Social Media Marketing 7.4.1 Creating a Facebook page Visual identity of a Facebook page , Types of publications, Facebook Ads , Creating Facebook Ads , Ads Visibility 7.4.2 Business opportunities and Instagram options Optimization of Instagram profiles , Integrating Instagram with a Web Site and other social networks ,Keeping up with posts 7.4.3 Business tools on LinkedIn Creating campaigns on LinkedIn , Analyzing visitation on LinkedIn 7.4.4 Creating business accounts on YouTube YouTube ,Advertising , YouTube Analytics 7.4.5 E-mail marketing E-mail marketing plan , E-mail marketing campaign analysis , Keeping up with conversions 7.5 Digital Marketing tools: Google Ads, Facebook Ads, Google Analytic, Zapier, Google Keyword Planner EXERCISE: Social Media Marketing plan. EXERCISE: Making a Facebook page and Google Ads	20
8	<b>Digital Marketing Budgeting</b> 8.1 Resource planning 8.2 Cost estimating 8.3 Cost budgeting 8.4 Cost control	04
<b>Total No. of Lectures</b>		<b>48</b>

**Reference Books:**

- 1) Digital Marketing for Dummies By Ryan Deiss and Russ Hennesberry
- 2) Advertising and Promotion: An Integrated Marketing Communications Perspective, George Belch, San Diego University Michael Belch, San Diego University
- 3) Advertising Management: Rajeev Batra, John G. Myers, David A. Aaker
- 4) Belch: Advertising & Promotions (TMH) 5) The Social Media Bible: Tactics, Tools, & Strategies for Business Success by Lon Safko 6) Web Analytics 2.0 – AvinashKaushik

Class: T.Y.BBA (C.A.) (Semester - V)  
**Paper Code: BCA3504**

Title of Paper: **Machine Learning**

Credit: 3

No. of. Lectures: 48

**A] Learning Objectives:**

1. To study the basics of machine learning.
2. To learn linear models.
3. To understand distance-based clustering techniques.
4. To know about tree and rule-based models.
5. To understand ensemble learning.

**B] Learning Outcome:**

Students should be able to

1. Understand the concepts of machine learning
2. Apply the linear modelling techniques to solve a problem
3. Understand distance-based clustering techniques
4. Design tree and rule-based models
5. Apply ensemble learning techniques

Unit No.	Topic	No. of Lectures
1	<b>Introduction to Machine Learning</b> 1.1 Task: problems solved with machine learning, Looking for structure, performance evaluation - 1.2 <b>Models</b> : Geometric models, Probabilistic models, Logical models, Grouping and grading 1.3 Features 1.4 Binary Classification: Classification, Scoring and ranking, Class probability estimation 1.5 Handling more than two classes 1.6 Regression-Movie genre identification and rating system	9
2	<b>Linear Models</b> 2.1 Concepts: Supervised, Unsupervised and Descriptive learning 2.2 Hypothesis space 2.3 Linear classification 2.3.1 Univariate linear regression 2.3.2 Multivariate linear regression 2.3.3 Logistic regression 2.4 Perceptron 2.5 Multilayer neural networks 2.6 Learning neural networks structures 2.7 Support vector machines 2.8 Credit card approval system	9

<b>3</b>	<b>Distance Based Models</b> 3.1 Distance and measure 3.2 Neighbours and examples 3.3 Nearest neighbour classification 3.4 Distance based clustering: K-means algorithm, clustering around medoids 3.5 clustering using kernels 3.5.1 Silhouettes 3.5.2 Hierarchical clustering 3.5.3 Document clustering	10
<b>4</b>	<b>Tree &amp; Rule Models</b> 4.1 Decision trees 4.2 Ranking and probability estimation trees 4.3 Regression trees 4.4 Clustering trees 4.5 Ordered rule lists 4.6 Unordered rule lists 4.7 Descriptive rule 4.8 First- order rule 4.9 Spam filtering	10
<b>5</b>	<b>Model Ensembles</b> 5.1 Features 5.1.1 Kinds of feature 5.1.2 Feature transformation 5.1.3 Feature Construction and Selection 5.2 Ensemble learning: Bagging and random forests 5.3 Boosting: Boosted rule learning 5.4 Mapping the ensemble landscape : Bias, variance, margin, other ensemble methods 5.5 Meta learning-Diabetes diagnosis system.	10
<b>Total No. of Lectures</b>		<b>48</b>

**Reference Book:**

1. Brink Henrik, Richards Joseph W & Fetherolf Mark, "Real-World Machine Learning", 2nd Edition, Drea mtech Press, 2017
2. Manaranjan Pradhan and Dinesh Kumar U., "Machine Learning using Python", Wiley India Pvt. Ltd., 2019.
3. K.P. Murphy, "Machine Learning: A probabilistic perspective", MIT Press, 2012.
4. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007. M. Mohri, A. Rostamizadeh, and A. Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.