

CAP 781

MACHINE LEARNING

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Course Outcome

CO1 :: understand the key concepts and principles of machine learning, including supervised and unsupervised learning techniques, feature extraction, and model evaluation.

CO2 :: analyze machine learning algorithms and models, understanding their strengths, limitations, and applications in various domains

CO3 :: evaluate the performance of machine learning models using appropriate evaluation metrics

CO4 :: develop machine learning solutions for real-world problems, designing and developing effective algorithms and models



Text Books and References

1. TEXT BOOK:

1. Applied Machine Learning by M. Gopal

2. REFERENCES:

1. Machine Learning by Ethem Alpaydın
2. Principles of Soft Computing by S. N. Sivanandam And S. N. Deepa
3. Machine Learning by Tom Mitchell

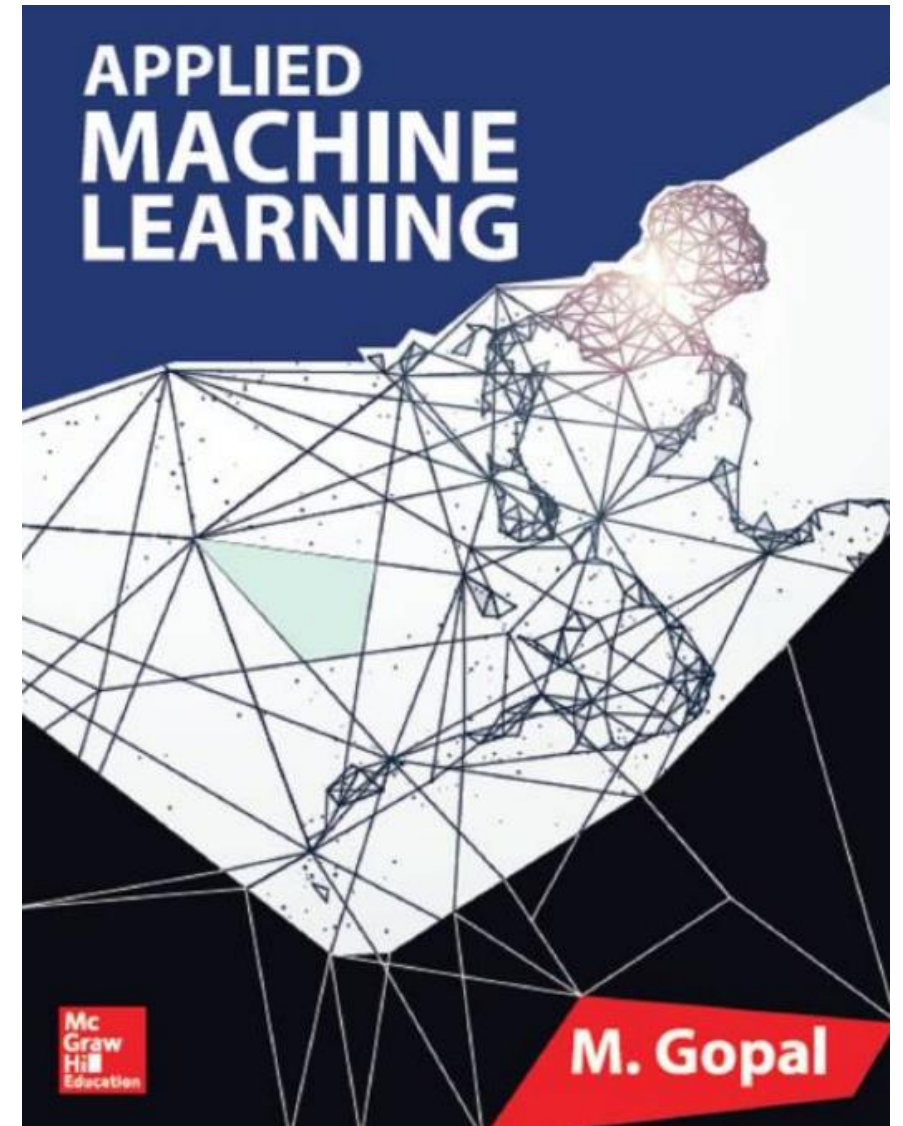


Text Book: Applied Machine Learning

Author: M. Gopal

Download:

<https://chaitanyaserver.com/wp-content/uploads/2024/02/Applied-Machine-Learning-by-M-Gopal.pdf>

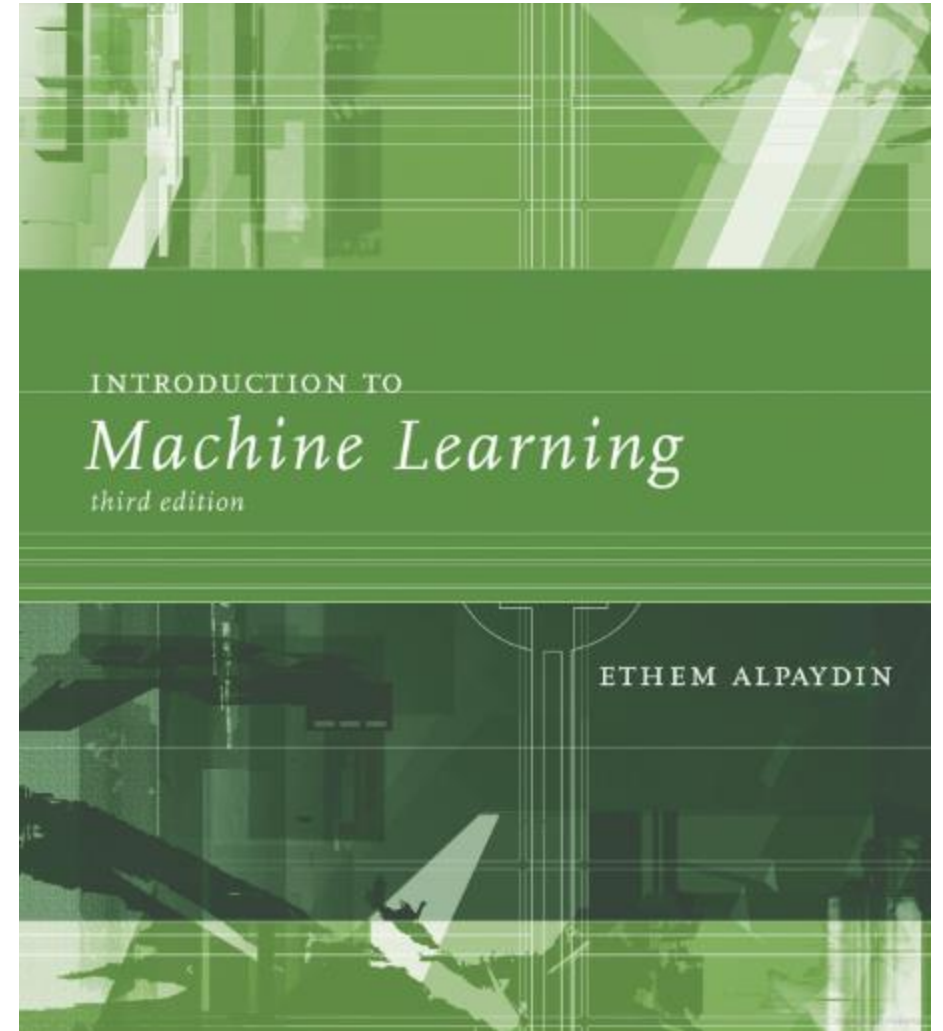


Reference Book: Machine Learning

Author: Ethem Alpaydın

Download:

https://kkpatel7.wordpress.com/wp-content/uploads/2015/04/alppaydin_machinelearning_2010.pdf

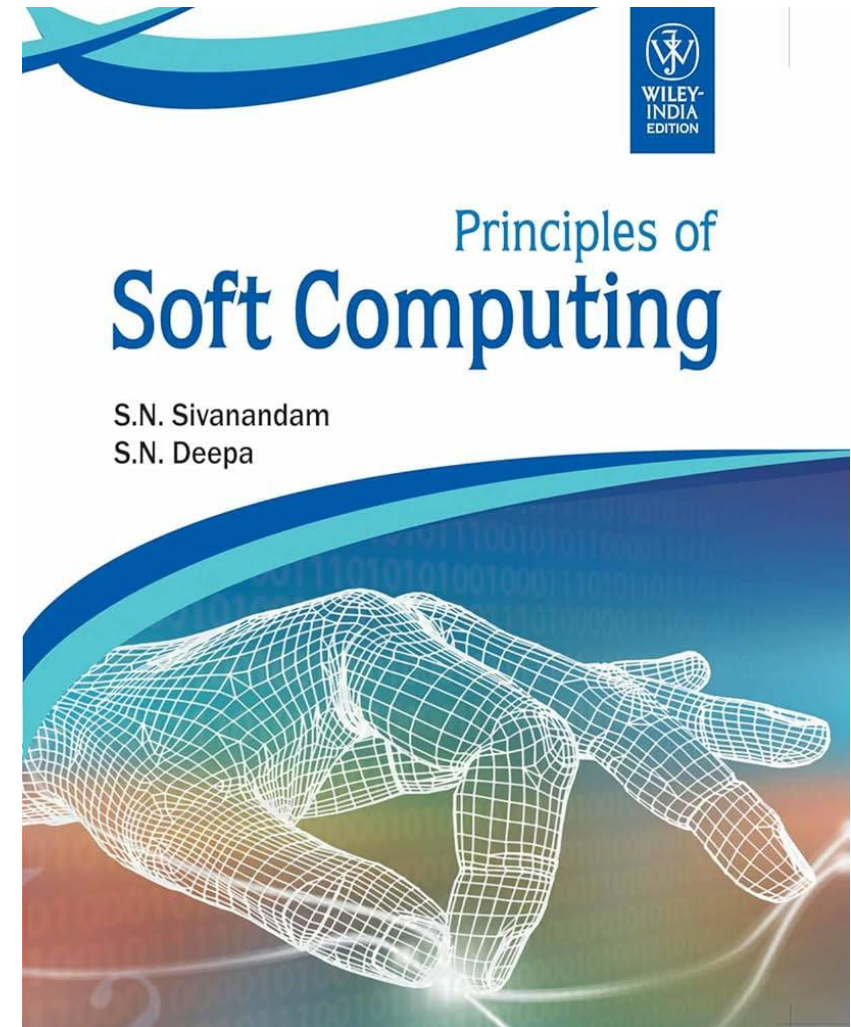


Reference Book: Principles of Soft Computing

Author: S. N. Sivanandam
And S. N. Deepa

Download:

<https://pg.its.edu.in/sites/default/files/MCAKCA032-PRINCIPALES%20OF%20SOFT%20COMPUTING-SN%20SIVNANDAM%20AND%20DEEPA%20SN.pdf>

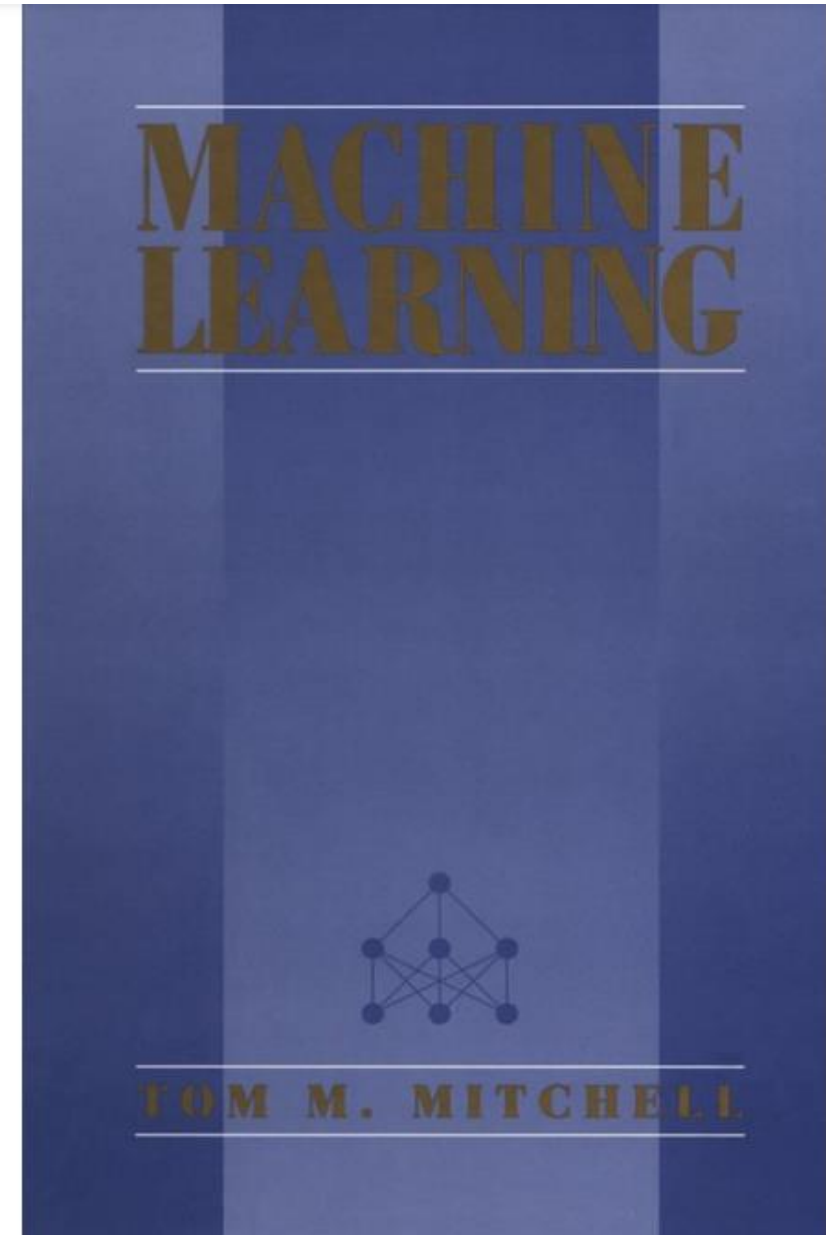


Reference Book: Machine Learning

Author: Tom Mitchell

Download:

<https://www.cs.cmu.edu/~tom/files/MachineLearningTomMitchell.pdf>



Relevant Websites

| S. No | Web Address | Salient Features |
|-------|---|--|
| 1 | https://pythonprogramming.net/k-nearest-neighbors-intro-machine-learning-tutorial/ | Introduction to Classification, Working of KNN model |
| 2 | https://pythonprogramming.net/support-vector-machine-fundamentals-machine-learning-tutorial/ | SVM Model |
| 3 | https://pythonprogramming.net/neural-networks-machine-learning-tutorial/ | Introduction to Artificial Neural Networks |
| 4 | https://pythonprogramming.net/reading-csv-files-python-3/ | Reading a CSV file in python |
| 5 | https://nptel.ac.in/courses/106105152 | Online Machine Learning Video Lectures |

Syllabus / Course Outline



UNIT I:
Introduction to
Machine Learning



UNIT II:
Supervised
Learning



UNIT III:
Unsupervised
Learning



UNIT IV: Image
Processing



UNIT V: Neural
Networks and Deep
Learning



UNIT VI:
Advanced Topics in
Machine Learning

UNIT I: Introduction to Machine Learning

- History of Machine Learning,
- Programs vs learning algorithms,
- Basic definitions,
- Supervised Learning,
- Unsupervised Learning,
- Reinforcement Learning,
- Issues in machine learning,
- Different Applications of Machine learning.

UNIT II: Supervised Learning

- Regression,
- Linear Regression,
- Polynomial Regression,
- Classification,
- Logistic Regression,
- k-Nearest Neighbors (k-NN),
- Support Vector Machines (SVM),
- Decision Trees and Random Forests,
- Ensemble Methods,
- Bagging, Boosting,
- Model Evaluation Techniques,
- Cross Validation,
- Hyperparameter Tuning,
- Introduction to Scikit-learn,
- Hands-on with Real-world Datasets

UNIT III: Unsupervised Learning

- Clustering, k-Means,
- Hierarchical Clustering,
- Dimensionality Reduction,
- Principal Component Analysis (PCA),
- Anomaly Detection,
- Autoencoders and Feature Learning,
- Case Studies and Applications of Unsupervised Learning

UNIT IV: Image Processing

- Introduction to Digital Image Processing,
- Image Enhancement Techniques,
- Histogram Equalization,
- Contrast Stretching, Filtering,
- Image Segmentation,
- Thresholding,
- Region Based Segmentation,
- Feature Extraction from Images,
- Edge Detection,
- Corner Detection,
- Blob Detection,
- Case Studies and Applications of Image Processing in Computer Vision

UNIT V: Neural Networks and Deep Learning

- Introduction to Neural Networks,
- Perceptron and Multilayer Perceptron (MLPs),
- Activation Functions: Sigmoid, ReLU, and others,
- Convolutional Neural Networks (CNNs) for Image Recognition,
- Recurrent Neural Networks (RNNs) for Sequence Data,
- Transfer Learning and Pre-trained Models

UNIT VI:

Advanced Topics in Machine Learning

- Reinforcement Learning,
- Q-Learning,
- Deep Q Networks (DQNs),
- Model Compression and Optimization,
- Recent Advances in Machine Learning,
- Future Trends and Challenges in Machine Learning

Practical

| Practical No | Practical |
|--------------|---|
| Practical 1 | Importing and Exporting Data in python, Data wrangling, Exploratory Data Analysis |
| Practical 2 | |
| Practical 3 | |
| Practical 4 | Implementation and performance analysis of Linear Regression, Multi Regression, Non Linear Regression |
| Practical 5 | |
| Practical 6 | |
| Practical 7 | Implementation and performance analysis of KNN, SVM and Logistic Regression |
| Practical 8 | |

Practical

| Practical No | Practical |
|--------------|--|
| Practical 9 | Implementation and performance analysis of k-Means and Hierarchal Clustering |
| Practical 10 | |
| Practical 11 | Implement and compare any two ensemble-based machine learning approaches on different datasets |
| Practical 12 | Design of an Artificial Neural Network for given dataset |
| Practical 13 | |
| Practical 14 | Implement and compare the performances of any three-machine learning based classification models on different datasets |

Tools and Language

- Python 3.10
- Docker 27.3
- PyCharm Professional
- GitHub
- Jupyter Notebook / Lab



Grading policy

- Attendance – 5%
 - CA - (02)– 25%
 - Mid Term – 20%
 - End Term Practical – 25%
 - End Term Test – 25%
-
- CA Category : A0202 (Total 2 / Best of 2)

GitHub Classroom

- All assignments and study materials will be available in the GitHub repository.
- To access the repository, you must have a GitHub account.
- An invitation will be sent to the email linked to your GitHub account.
- Simply accept the invitation to gain access to:
 - All lecture materials
 - All lab materials