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Book Review

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Title	:	**Fundamentals of Machine Learning using Python**
Author(s)	:	**Manaranjan Pradhan & U. Dinesh Kumar**
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Fundamentals of Machine Learning using Python by Manaranjan Pradhan and U. Dinesh Kumar is an overall Manual with a strong foundation in Machine learning using Python libraries with practical implementation of theories and real-life case studies. The book broadly covers topics like "Foundations of Machine Learning", "Introduction to Python", "Descriptive Analytics and Predictive Analytics" and its advanced concepts such as "Decision Tree Learning", "Random Forest", "Boosting", "Recommender Systems" and "Text Analytics". Each topic includes real-world examples and offers a step-by-step guide to exploring, building, evaluating and optimizing machine learning models. The authors have successfully combined theoretical foundations with hands-on coding exercises and have been able to present complex topics in an accessible way.

STRUCTURE AND CONTENT

The book is divided into 13 chapters, each crafted to flow carefully from the previous one. Chapter 1 introduces the basic flow of ML and goes ahead to give a description of the fundamental applications of ML within industries such as finance, health, and marketing. This provides a very good background to the readers entering this domain for the first time and provides a broader context on how significant ML is in solving real-world problems.

In further chapters, the basics of Python programming are explained in depth; it describes the core libraries, such as NumPy, Pandas, Matplotlib, and scikit-learn, required for basic data manipulation, visualization, and implementation of ML algorithms. The clarity in explanation and progressive step-by-step description allow readers, regardless of whether they have knowledge in programming or not, to easily work through what is presented.

The book proceeds with the explanation of linear regression, logistic regression, and decision trees as some of the most important supervised learning techniques. Each concept is first explained theoretically and then followed by a detailed Python implementation on real datasets. This dual approach cements understanding by showing how theoretical principles translate into practical applications.

The class that advanced topics including ensemble methods on support vector machines and neural networks is covered with. The authors discuss very elaborately critical issues of the process, specifically

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features selection and feature engineering, mentioning that these process steps may definitely bring a seriously sharp impetus to improvements of model performance. It covers other key techniques common within the general ML paradigm in unsupervised learning, covering such topics as clustering and the reduction of dimensionalities. These latter elements indeed contribute to presenting quite a reasonably even curricula of education in ML methodology.

PRACTICAL ORIENTATION

There can be no doubt that one of the most outstanding no-brainers in this respect is the feature of practical applicability: each chapter illustrates hands-on practice that encourages a reader to work out what has just been read. There are case studies dealing with real examples, such as Customer Retention Analysis and Stock price forecasting, including ML models into which they might be gainfully deployed. This will no doubt mean that through this practical direction, the learner will definitely experience immediate use after learning in practice.

It also covers model evaluation metrics such as precision, recall, F1-score, and ROC curves that let the readers critically look into the performance of their models, something very important in developing reliable ML systems.

SCIENTIFIC RIGOR AND DEPTH

From a scientific point of view, the book excels in introducing ML concepts in a rigorous and crystal-clear manner. The authors refrain from oversimplification and offer detailed explanations of algorithms and their mathematical background. For example, when discussing the SVMs, the book goes into an explanation of the idea of hyperplanes and how the kernel trick works for the case of non-linear separable data. The presence of such detailed discussions will help readers to get a better view of the internal structure of ML algorithms, thus fostering a deeper understanding.

While the treatment of neural networks is introductory, it lays a good foundation for further exploration. The coverage of activation functions, backpropagation, and gradient descent is well done and very fundamental to understand more complex deep learning architectures. Those who would like an in-depth explanation of deep learning will find this book a bit lacking and will have to look elsewhere in greater detail.

STRENGTHS

The strengths in this book are as follows, which make it a useful reference:

- **Accessibility:** The writing style is clear and approachable; intractable topics are made understandable. The use of diagrams and tables further facilitates comprehension.
- **Full Coverage:** The book varies from basic to advanced ML techniques and hence may be suitable for learners in different stages.
- **Practical Focus:** The reasons why Python would be used for the implementation of methodologies discussed throughout the book bring readers, along with all theoretical aspects, to a very practical stance.
- **Self-Contained Resource:** With the basics included, Python can be learned by people who have never programmed before, hence extending the scope of the book's audience.

LIMITATIONS

Despite its many strengths, the book does have some limitations:

- **Advanced Topic Depth:** While the book does introduce advanced topics such as neural networks, it does not go into great detail about them. Anyone interested in deep learning will find it necessary to look elsewhere for more information.
- **Library Focus:** The high usage of scikit-learn, though practical, does not give enough exposure to other ML libraries and frameworks such as TensorFlow or PyTorch, which are quite necessary in deep learning applications. Ethical Issues: There is no discussion of the ethical issues that may arise in the development of ML models; for example, bias and fairness. These, if included, would turn this book into a very important one with relevance to present-day ML practice, since the topics have been burgeoning interests of late.

CONCLUSION

Machine Learning Using Python by Manaranjan Pradhan and U. Dinesh Kumar is a perfectly balanced

introduction in the field of ML, combining theoretical knowledge with practical applications. It is very suitable for both beginners and practitioners. The style of the book is easy to understand, with comprehensive coverage which is practical in nature, thus enabling readers to build a very strong foundation in ML and Python programming. While it may have gone a little deeper regarding both more advanced topics and ethical considerations, it is not touching on the latter elements lessens neither the merit nor the potential utility that scholars will have with it. Educators will find it to be quite a reasonable textbook at an introductory level and for practitioners, this will be an excellent way of reviewing ML basics. In particular, this book is recommended for those at the beginning of their journey in ML both as a means of learning and as a reference.