Machine Learning-101

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Essential Tools for Machine Learning

Questions to Consider Before You Start…!

Every machine learning workflow begins with three questions:

- What kind of data are you working with?
- What insights do you want to get from it?
- How and where will those insights be applied?

Essential things for a ML tool

- Data processing capabilities
- Specialized machine learning
- Programmatic workflows
- Tools for scaling the machine learning workflow
- Automatic code generation tools for rapidly deploying your analytics
- To embedded targets

Machine Learning Tools & Languages

- MATLAB
- Python
- R
- Java-family/C-family
- Jupyter notebook
- Other concerns

Comparison

MATLAB???
Python???
R ???

- Data input, output, preprocessing and postprocessing - **Python**
- Pre-built algorithms – **R, Python**
- Novel algorithms - **R**
- Plotting - **Python, MATLAB, R**
- Exploration – **Python, MATLAB, R**
- Teaching - **MATLAB**
- Sharing and dissemination - **Python**
- Performance - **????**

Pros and Cons of Each Language for ML

• MATLAB

Advantage:

- Many wonderful libraries and the number one choice in signal processing, communication system, and control theory.
- Simulink: One of the best toolboxes in MATLAB is used extensively in control and dynamical system applications.
- Lots of available and robust packages for optimization, control, and numerical analysis.
- Nice toolbox for graphical work (Lets you plot beautiful looking graphs) and inherent support for matrix and vector manipulation.
- Easy to learn and has a user-friendly interface.

Disadvantage:

- Proprietary and not free or open-source, which makes it very hard for collaboration.
- Lack of good packages and libraries for machine learning, AI, time series analysis, and causal inference.
- Limited in terms of functionality: cannot be used for web development and app design.
- Not object-oriented language.
- Smaller user community compared to Python.

• Python

Advantage:

- Many wonderful libraries in machine learning, AI, web development, and optimization.
- Number one language for deep learning and machine learning in general.
- Open-source and free.
- A large community of users across GitHub, Stackoverflow, and …
- It can be used for other applications besides engineering, unlike MATLAB. For example, GUI (Graphical User Interface) development using Tkinter and PyQt.
- Object-oriented language.
- Easy to learn and user-friendly syntax.

Disadvantage:

- Lack of good packages for signal processing and communication (still behind for engineering applications).
- Steeper learning curve than MATLAB since it is an object-oriented programming(OOP) language and is harder to master.
- Requires more time and expertise to setup and install the working environment.

- **R**

Advantage:

- So many wonderful libraries in statistics and machine learning.
- Open-source and free.
- Number one language for time series analysis, causal inference, and PGM.
- A large community of researchers, especially in academia.
- Ability to create web applications, for example, through the Shiney app.

Disadvantage:

- Slower compared to Python and Matlab.
- More limited scope in terms of applications compared to Python. (Cannot be used for game development or cannot be as a backend for web developments)
- Not object-oriented language.
- Lack of good packages for signal processing and communication (still behind for engineering applications).
- Smaller user communities compared to Python.
- Harder and not user-friendly compared to Python and Matlab.

A foundation to build a machine learning knowledge and skills

- Regression
- Classification
- Clustering
- Dimensionality Reduction
- Ensemble Methods
- Neural Nets and Deep Learning
- Transfer Learning
- Reinforcement Learning
- Decision trees
- Others

https://github.com/attaullahshafiq10/ML-101

Examples & Resources….!

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Feedback form:

https://forms.gle/sMsuAYrcA3aBb7wA7