**Q1: TensorFlow vs. PyTorch**

* **TensorFlow** (by Google) is known for deployment-ready capabilities, scalable production pipelines, and extensive tools like TensorBoard and TFX.
* **PyTorch** (by Meta) is loved for its **dynamic computation graph**, which feels more "Pythonic" and intuitive—especially during experimentation or research.

**When to choose:**

* Use **PyTorch** for **prototyping, academic research**, and when you want fast debugging.
* Use **TensorFlow** for **production-scale apps**, mobile/embedded deployment (via TensorFlow Lite), and model serving in enterprise environments.

**Q2: Use Cases for Jupyter Notebooks in AI**

1. **Data Exploration & Visualization**: Jupyter lets you interactively explore data, run code snippets, and visualize outputs inline using libraries like Matplotlib or Seaborn.
2. **Model Prototyping**: You can iteratively build, train, and tweak models while documenting the process with Markdown, which makes it ideal for showcasing workflows or teaching.

**Q3: spaCy vs. Basic Python String Ops**

* While Python's split(), find(), and regex can manipulate text, **spaCy offers pre-trained NLP pipelines** with tokenization, part-of-speech tagging, named entity recognition (NER), dependency parsing, and more.
* It's **faster and more accurate** for real-world language understanding, especially across large corpora. For example, identifying “Apple” as a company vs. fruit—Python string ops alone can’t do that without contextual models like spaCy’s.

**2. Comparative Analysis: Scikit-learn vs. TensorFlow**

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| **Aspect** | **Scikit-learn** | **TensorFlow** |
| **Target Applications** | Classical ML (e.g. SVM, Decision Trees, k-NN) | Deep Learning (CNNs, RNNs, GANs, Transformers) |
| **Ease of Use** | Very beginner-friendly; intuitive APIs | Steeper learning curve, especially for custom models |
| **Community Support** | Strong in academia & traditional ML communities | Massive global community, production-focused tools |