Overview of Machine Learning Systems

CHALLENGES AND CONSIDERATIONS IN APPLYING MACHINE LEARNING

STUDENT: PAULO EDUARDO DA SILVA JUNIOR

Summary

1. When to Use Machine Learning?

2. Machine Learning Use Cases.

3. Research vs. Production in ML.

4. ML Systems vs. Traditional Software.

5. Conclusion.

When to Use Machine Learning?

1. Identifying complex, predictable patterns in data.

2. Advantage in predictive tasks such as recommendations and fraud detection.

3. Assessing need, ethics, and cost-benefit.

4. Machine learning is an approach to
    ◦ Learn;
    ◦ Complex patterns from;
    ◦ Existing data and use these patterns to make;
    ◦ Predictions on;
    ◦ Unseen data.

Machine Learning Use Cases

Industries:

◦ Enterprise: Customer insights, process automation, anomaly detection.

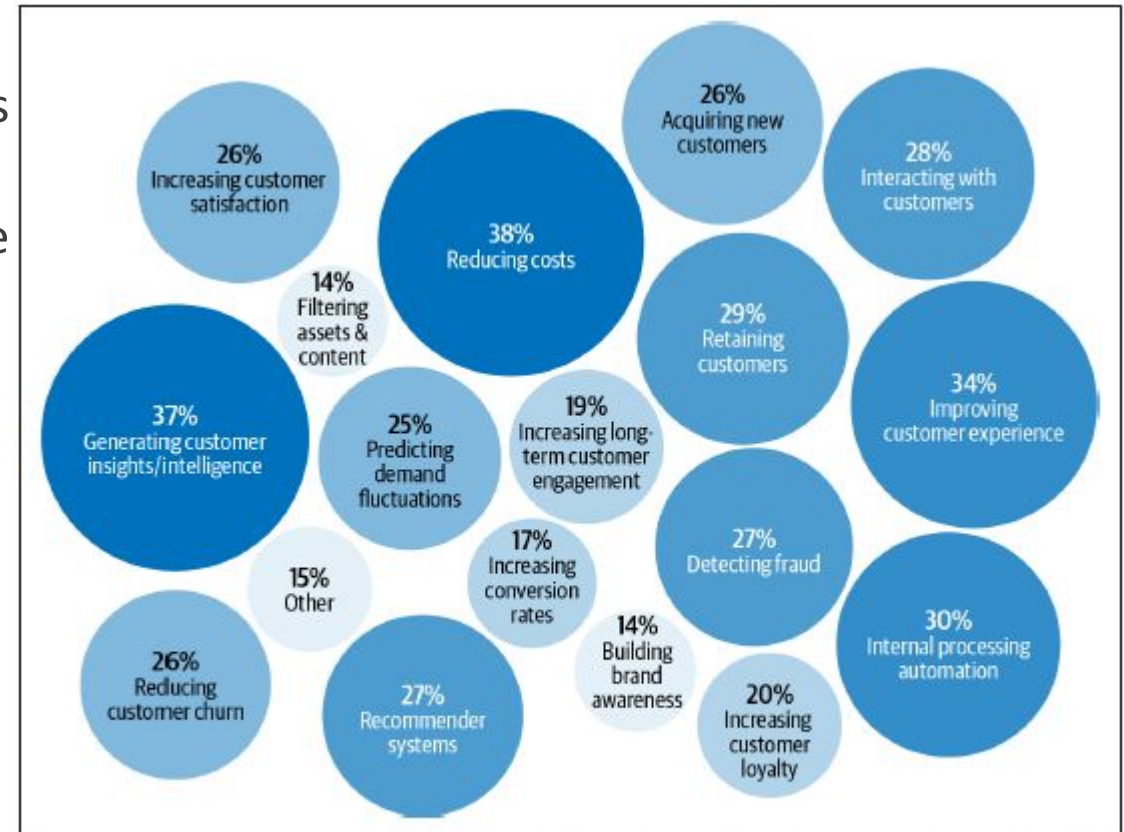◦ End-user: Personal assistants, machine translation, image recognition.

Figure 1-3. 2020 state of enterprise machine learning. Source: Adapted from an image by Algorithmia

Research vs. Production in ML

Points:
- Challenges in dynamic data and latency.
- Need for interpretability and fairness.
- Stakeholder demands: engineering, product management, and sales.

Table 1-1. Key differences between ML in research and ML in production

	Research	Production
Requirements	State-of-the-art model performance on benchmark datasets	Different stakeholders have different requirements
Computational priority	Fast training, high throughput	Fast inference, low latency
Data	Static[a]	Constantly shifting
Fairness	Often not a focus	Must be considered
Interpretability	Often not a focus	Must be considered

ML Systems vs. Traditional Software

Comparison:
- ◦ ML: Dependence on data and models.
- ◦ Traditional Software: Main dependence on code.
- ◦ Challenges of adaptation, monitoring and maintenance in ML.
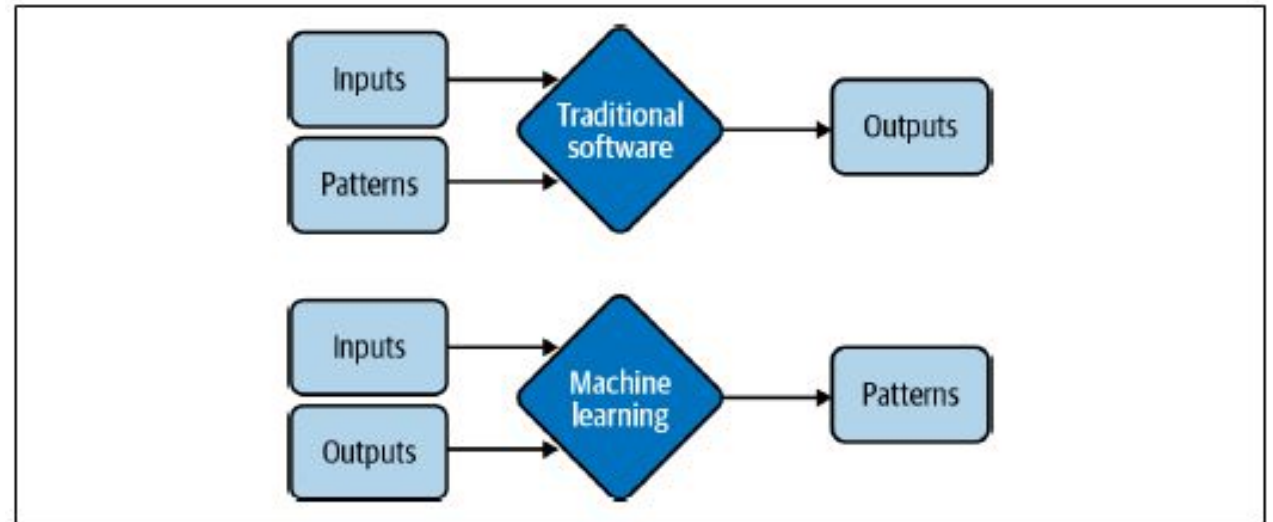
Figure 1-2. Instead of requiring hand-specified patterns to calculate outputs, ML solutions learn patterns from inputs and outputs

Conclusion

Summary:
- ◦ The complexity of ML systems demands more than algorithms.
- ◦ Infrastructure, monitoring, and maintenance are essential.
- ◦ Future chapters will detail components for a complete ML system.