Knobbe Martens

Protecting Artificial Intelligence/Machine Learning Inventions in the United States

Knobbe Japan Practice Series

November 19, 2021

Mauricio Uribe
mauricio.uribe@knobbe.com

Kenny Masaki
kenny.masaki@knobbe.com

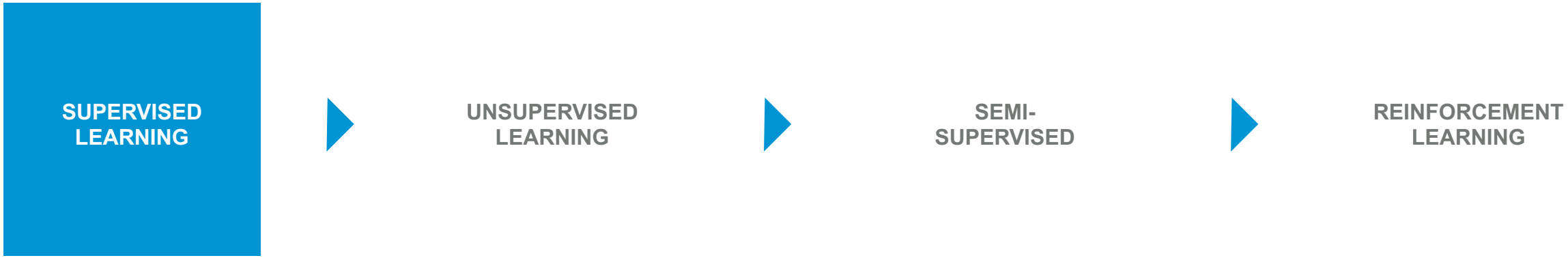
Machine Learning/Artificial Intelligence

- Minimal Requirements for an Algorithm to be ML
  - Representation (表現) – Classifiers or basic language that a computer can understand
  - Evaluation (評価)– Inputting data and generating output (score)
  - Optimization (最適化)– Developing a strategy to get from inputs to outputs

Learning Models

1. Supervised Learning
   教師あり学習
2. Unsupervised Learning
   教師なし学習
3. Semi-Supervised Learning
   半教師あり学習
4. Reinforcement Learning
   強化学習

Introduction to Machine Learning – Different Machine Learning Models

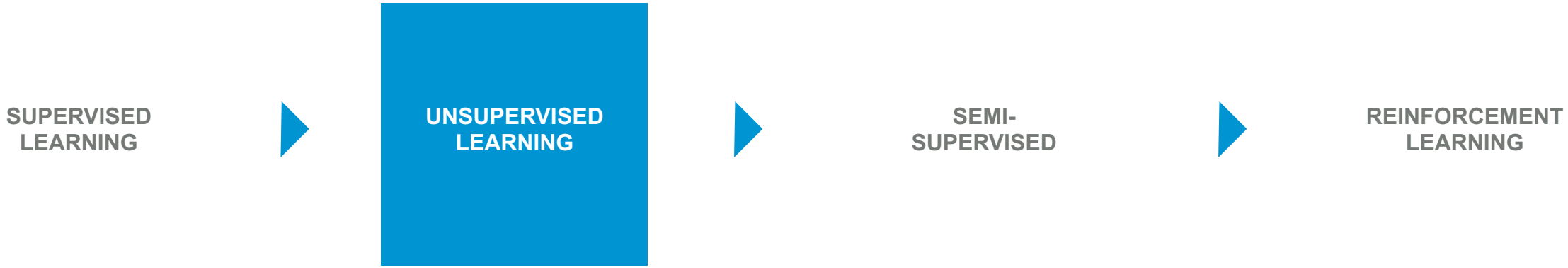


教師あり学習

General Characteristics

- Basic Concept: Machine learning is programmed with expected outputs (e.g., labeled training set) to generated learned algorithm
- Quality of performance of the learned algorithm is dependent on the training set

Introduction to Machine Learning – Different Machine Learning Models



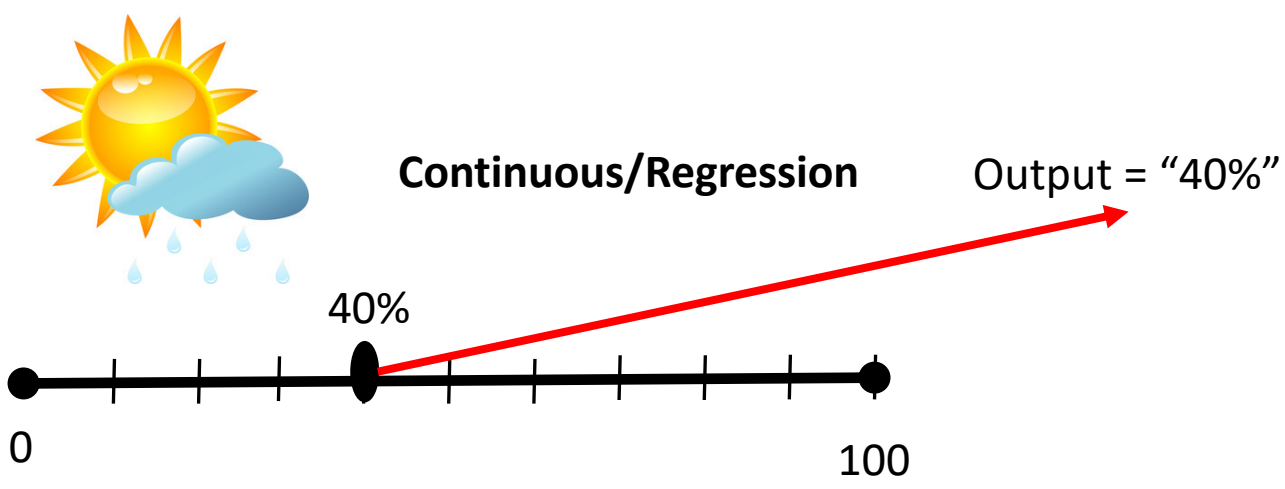
教師なし学習

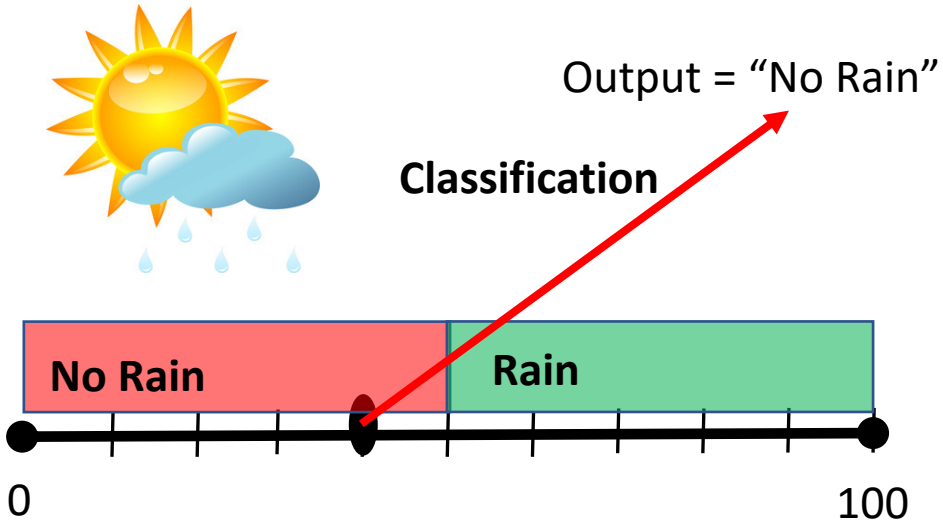
General Characteristics

- Basic Concept: Machine learning is programmed without labeled data (e.g., unlabeled data without human influence) to generate output
- Real-time analysis without pre-existing data using only logic operations
- No training provided to the machine learning algorithm

Machine Learning Outputs – Regression vs. Classification（回帰と分類）

- **Classification**: A model (function) which helps in separating the data into multiple categorical classes.
  - Data is categorized under different labels according to parameters
  - Labels are predicted for the data.
- **Regression/Continuous**: A model (function) distinguishing the data into continuous real values instead of categorical classes.
  - Function attempts to approximate value with the minimum error deviation.
  - No labels





Exemplary Algorithm Types

	Unsupervised Learning Algorithms	Supervised Learning Algorithms

Classification Output	• Association Rule Analysis
	  • Apriori
	  • Equivalence Class Transformation
	  • FP-Growth
	• Hidden Markov Model
		• Classification
		  • K-Nearest Neighbors
		  • Decision/Boosted Trees
		  • Logic Regression/Naive-Bayes
		  • Neural Networks
		  • Support Vector Machine (SVM)

Continuous Output	• Clustering and Dimensionality
	  • K-Means
	  • Singular Value Decomposition
	  • Principle Component Analysis
		• Regression
		  • Linear Regression
		  • Polynomial Regression
		• Decision Trees
		• Random Forests

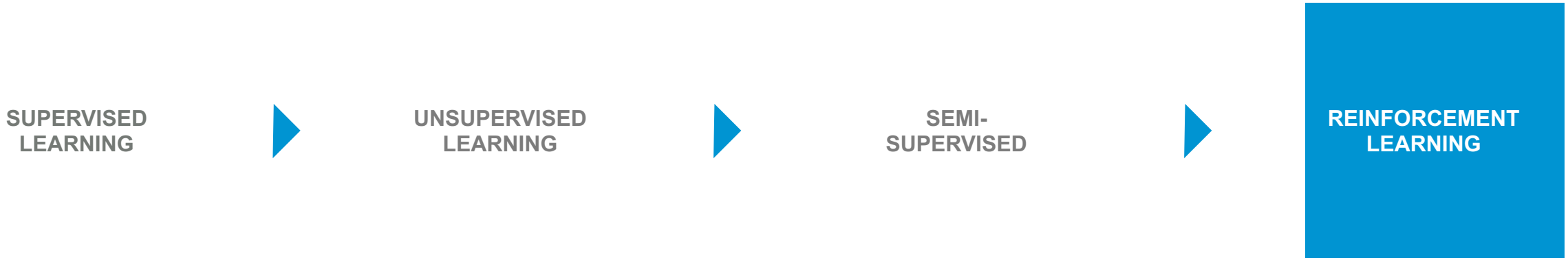
Introduction to Machine Learning – Different Machine Learning Models

半教師あり学習

General Characteristics

- Combination of labeled and unlabeled data sets
- Mitigates cost of labeling data for larger data sets
- Mitigates some human bias for the unlabeled data

Introduction to Machine Learning – Different Machine Learning Models



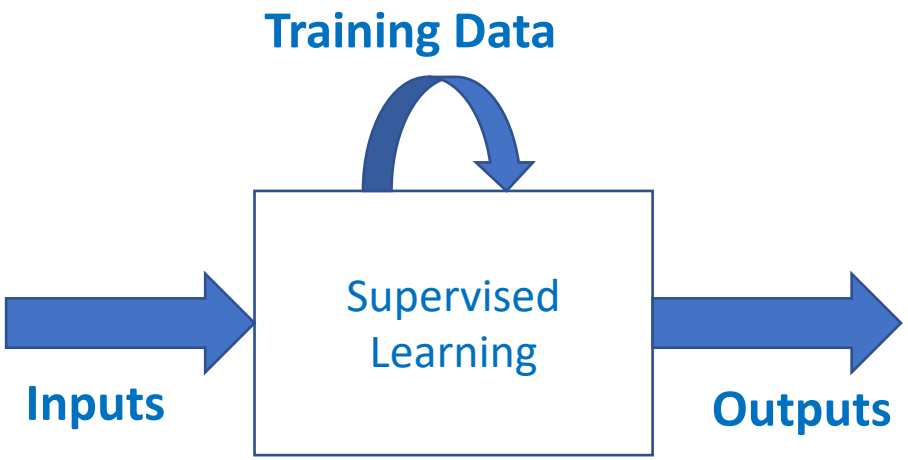
強化学習

General Characteristics

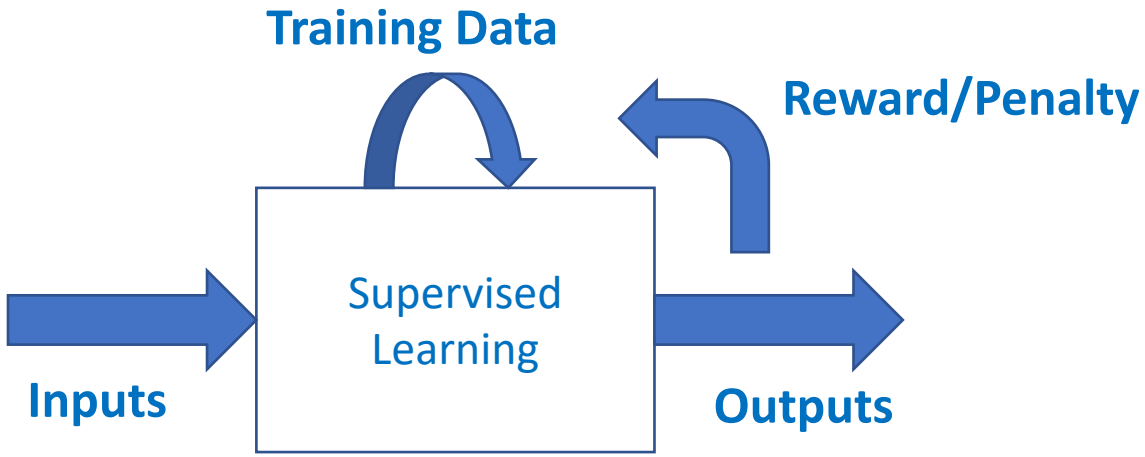
- Introduction of reward function to allow algorithm to adapt
- Includes the utilization of randomization of values based on reward function

Comparison of Supervised Learning to Reinforcement Learning

Supervised Learning Algorithms



Reinforcement Learning Algorithms



Protecting ML Technologies

Data Set Generation and Inputs

- Contract/Copyright
- Data Privacy
- Potential Patentable Subject Matter

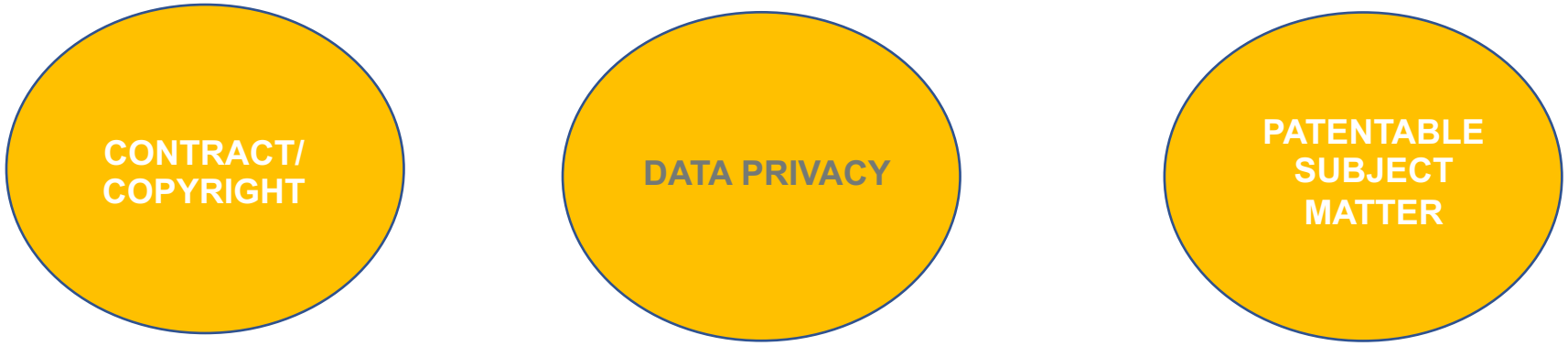
ML Processing

- Contract/Copyright
- Data Privacy
- Potential Patentable Subject Matter

ML Results and Post Processing

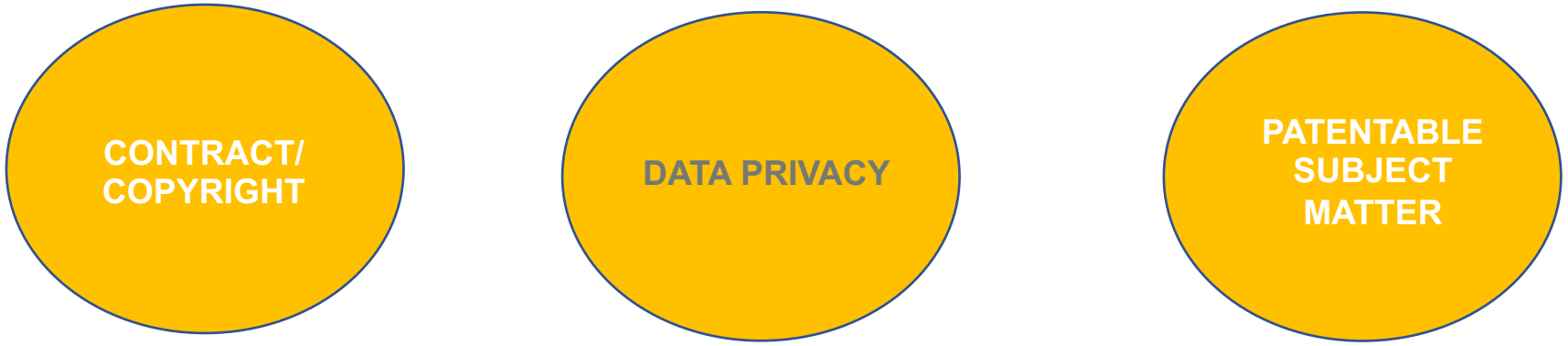
- Contract/Copyright
- Data Privacy
- Potential Patentable Subject Matter

Protecting ML Technologies - Data Set Generation and Inputs



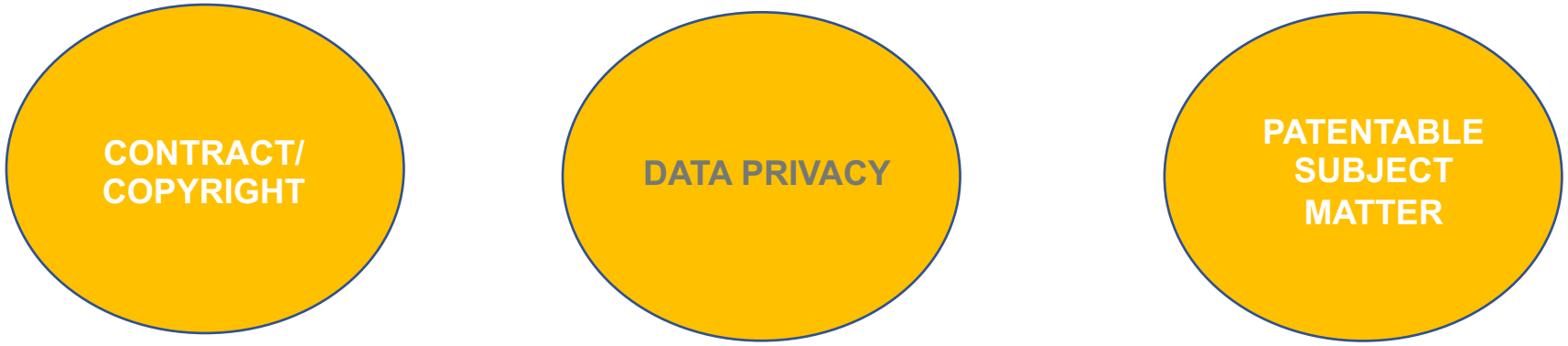
- Contract/Copyright
  - Securing data rights from users or third-parties
- Data Privacy
  - Providing necessary information
  - Maintaining data appropriately
- Potential Patentable Subject Matter
  - Collecting or Forming Data Set
  - Supplementing Data Set

Protecting ML Technologies - ML Processing



- Contract/Copyright
  - Third-party ML processing services
- Data Privacy
  - Providing data to third-party services
  - Maintaining data appropriately
- Potential Patentable Subject Matter
  - Modifications/Improvements to AI algorithms

Protecting ML Technologies - ML Results and Post Processing



- Contract/Copyright
  - Limitations/restrictions of the generated result
- Data Privacy
  - Maintaining processed data appropriately
- Potential Patentable Subject Matter
  - Post-processing feedback
  - Use of ML processed data

Protecting ML Technologies

Data Set Generation and Inputs

- Contract/Copyright
  - Securing data rights from users or third-parties
- Data Privacy
  - Providing necessary information
  - Maintaining data appropriately
- Potential Patentable Subject Matter
  - Collecting or Forming Data Set
  - Supplementing Data Set

ML Processing

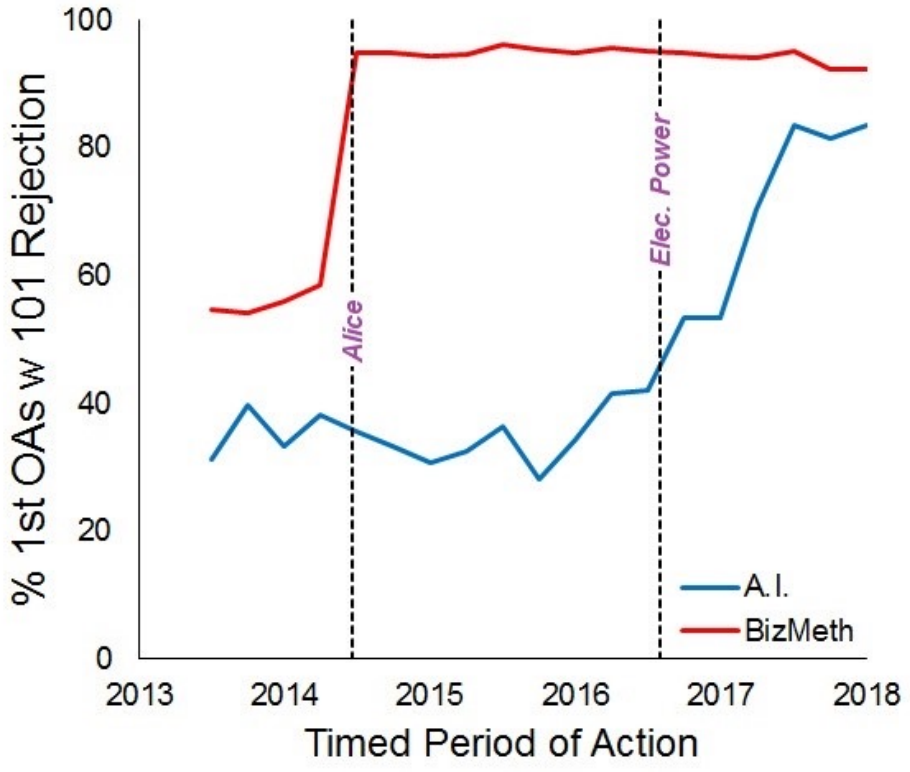
- Contract/Copyright
  - Third-party ML processing services
- Data Privacy
  - Providing data to third-party services
  - Maintaining data appropriately
- Potential Patentable Subject Matter
  - Modifications/Improvements to AI algorithms

ML Results and Post Processing

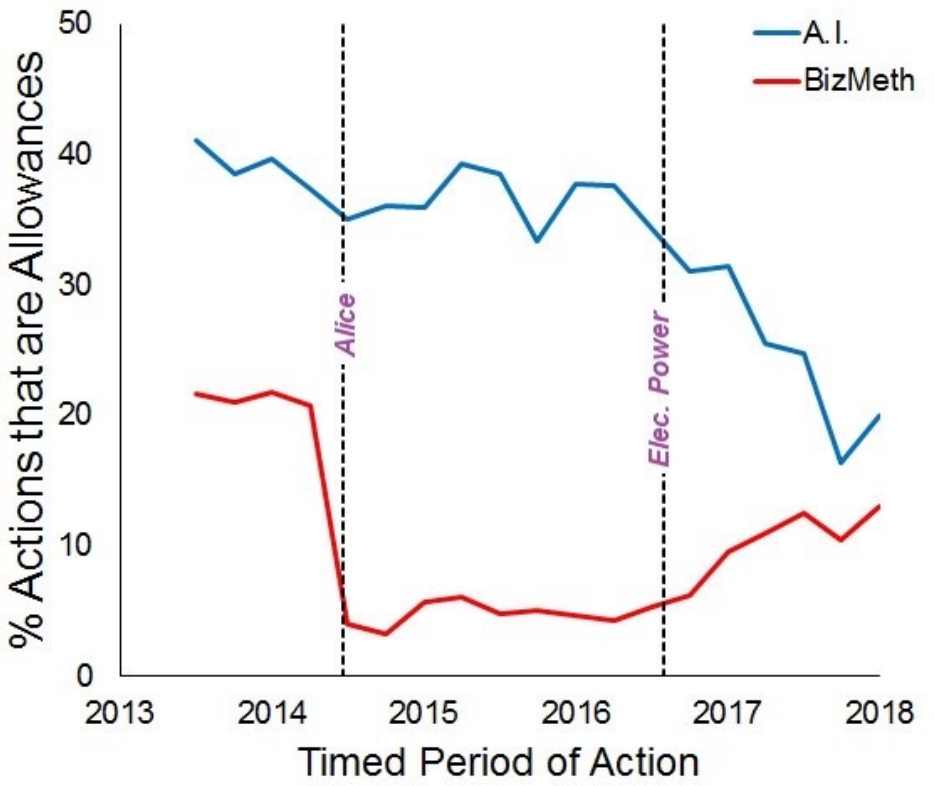
- Contract/Copyright
  - Limitations/restrictions of the generated result
- Data Privacy
  - Maintaining processed data appropriately
- Potential Patentable Subject Matter
  - Post-processing feedback
  - Use of ML processed data

Issued U.S. Patents (Class 706): 13,537

Comparison of Section 101 Rejections "Business Method" vs. ML



Allowance Percentage "Business Method" vs. ML



Source: *Artificial Intelligence Technologies Facing Heavy Scrutiny at the USPTO*, IP Watchdog, November 28, 2018.

Example 39 - Method for Training a Neural Network for Facial Detection
USPTOが例示する、特許適格性を有する例

A computer-implemented method of training a neural network for facial detection comprising:

collecting a set of digital facial images from a database;

applying one or more transformations to each digital facial image including mirroring, rotating, smoothing, or contrast reduction to create a modified set of digital facial images;

creating a first training set comprising the collected set of digital facial images, the modified set of digital facial images, and a set of digital non-facial images;

training the neural network in a first stage using the first training set;

creating a second training set for a second stage of training comprising the first training set and digital non-facial images that are incorrectly detected as facial images after the first stage of training; and

training the neural network in a second stage using the second training set.

Best Practices -特許戦略-

- **U.S. Best Practices**

1. Include description of the technical substance underlying the AI technology. Simply relying on black box description of “artificial intelligence” or “machine learning” will likely not be sufficient.
   AI技術の基礎となる技術内容を説明を含めること。単に、“artificial intelligence” や “machine learning” をブラックボックス的に使う事では十分ではない。

2. Avoid personification of “modules” or “processors”
   “modules” or “processors”の擬人化を避ける。

3. Include detailed step-by-step algorithms and concrete examples of how the AI/machine learning can be applied.
   詳細なステップごとのアルゴリズムと、どのようにAI/機械学習が適用されるかの具体的な例を含める。

Best Practices -特許戦略-

- **Overlapping Best Practices Between the U.S. and Europe**

1. Much of the above advice for U.S. patent applications also applies in Europe.
   US特許出願に関するアドバイスの多くの部分は、欧州における出願にも当てはまる。

2. Identifying technical problems in the specification coupled with the specific, technical solutions—and claiming those solutions—remain viable approaches for AI inventions in both the U.S. and Europe.
   明細書上、技術的な問題を、技術的な解決策と組み合わせて特定し、それらの解決策を請求項とすることは、米国と欧州の両方において、AIの発明に対する実行可能なアプローチである。

3. Describing improvements to how a computer performs machine learning or executes AI (e.g., by running faster, using less memory, etc.) helps both in the U.S. and Europe.
   コンピューターが機械学習を実行する方法やAIを実行する方法を改善すること（たとえば、高速で実行したり、メモリの使用量を減らすなど）は、米国と欧州の両方で役に立つ。

4. Reciting specific use cases may be specifically helpful in Europe
   特定の使用例を引用することは、特に欧州においては、役に立つ。

Knobbe Martens

Thank you!