Responsible data dimensions

RESPONSIBLE AI DATA MANAGEMENT

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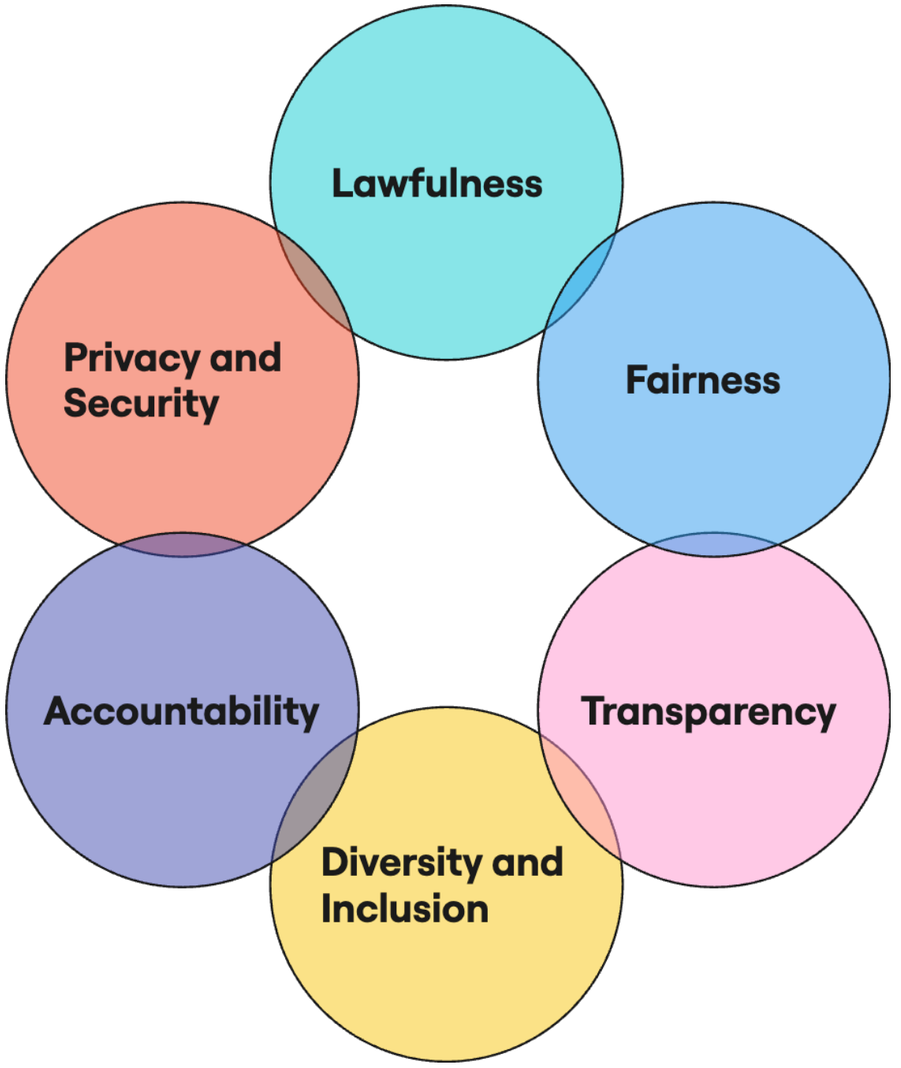
Lead ML Engineer

Responsible data management

- Ethical data management
- Evaluate models with technical metrics
- Responsible AI



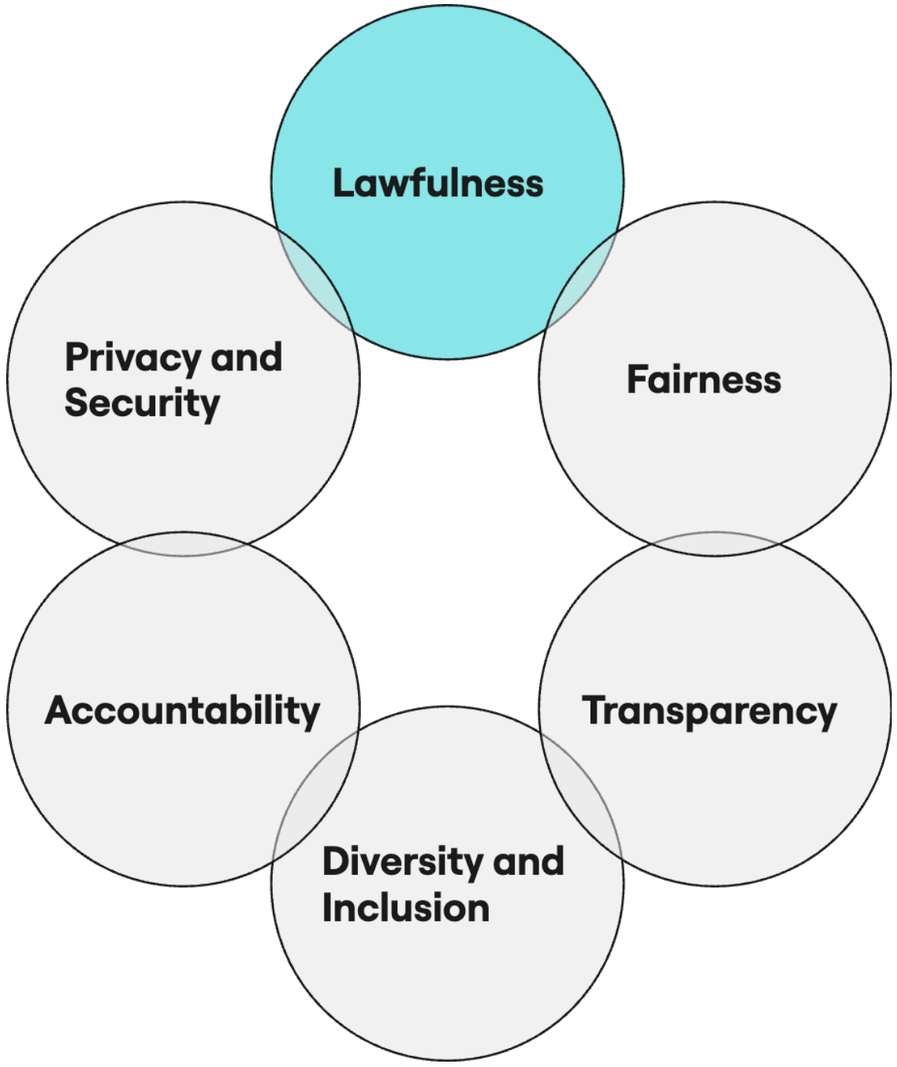
In this course

- Introduce responsible AI dimensions and metrics
- Apply concepts to the real world
- Overview of regulation and licensing
- Data governance and acquisition
- Validation and bias mitigation

Lawfulness

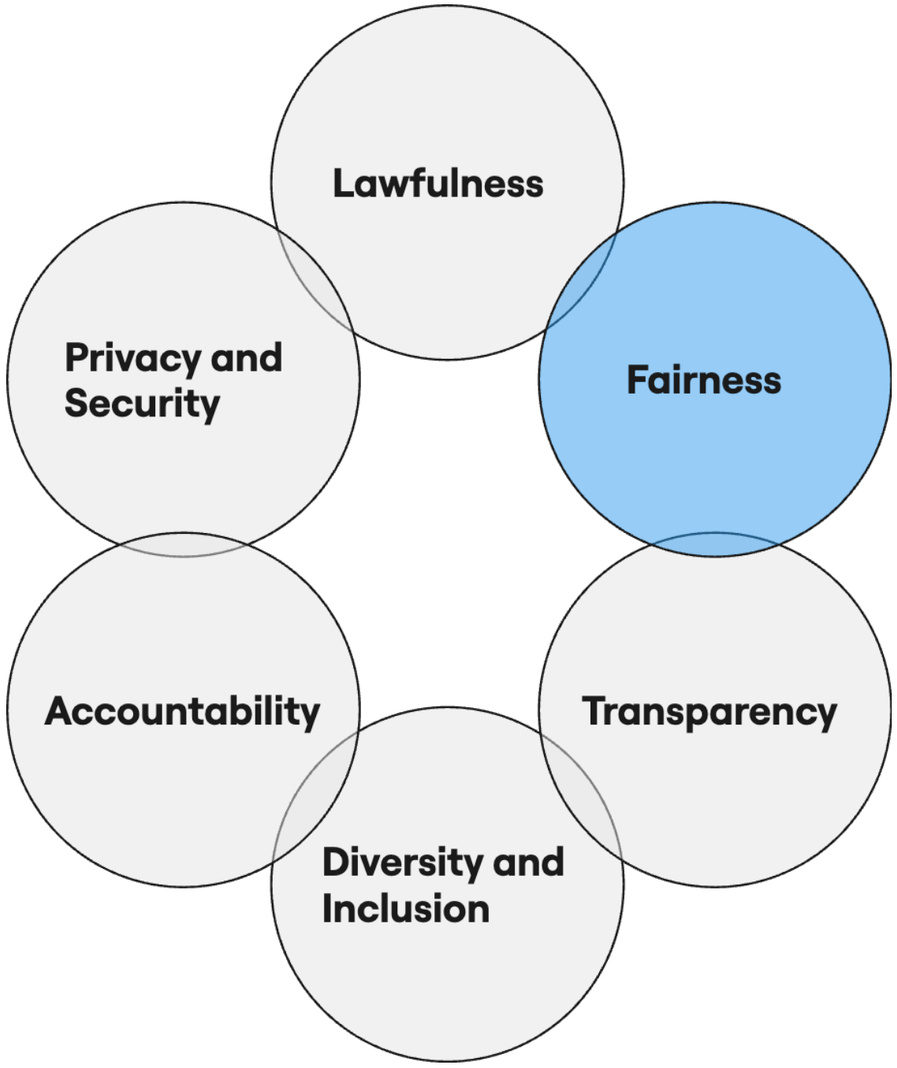
- Compliance with laws and regulations
- Ensures data is collected, processed, and used correctly
- Some laws and regulations include:
  - Data protection laws
  - Human rights laws
  - Ethical regulations towards stakeholders
  - Can differ depending on the governing body or country

Always confirm what applies!



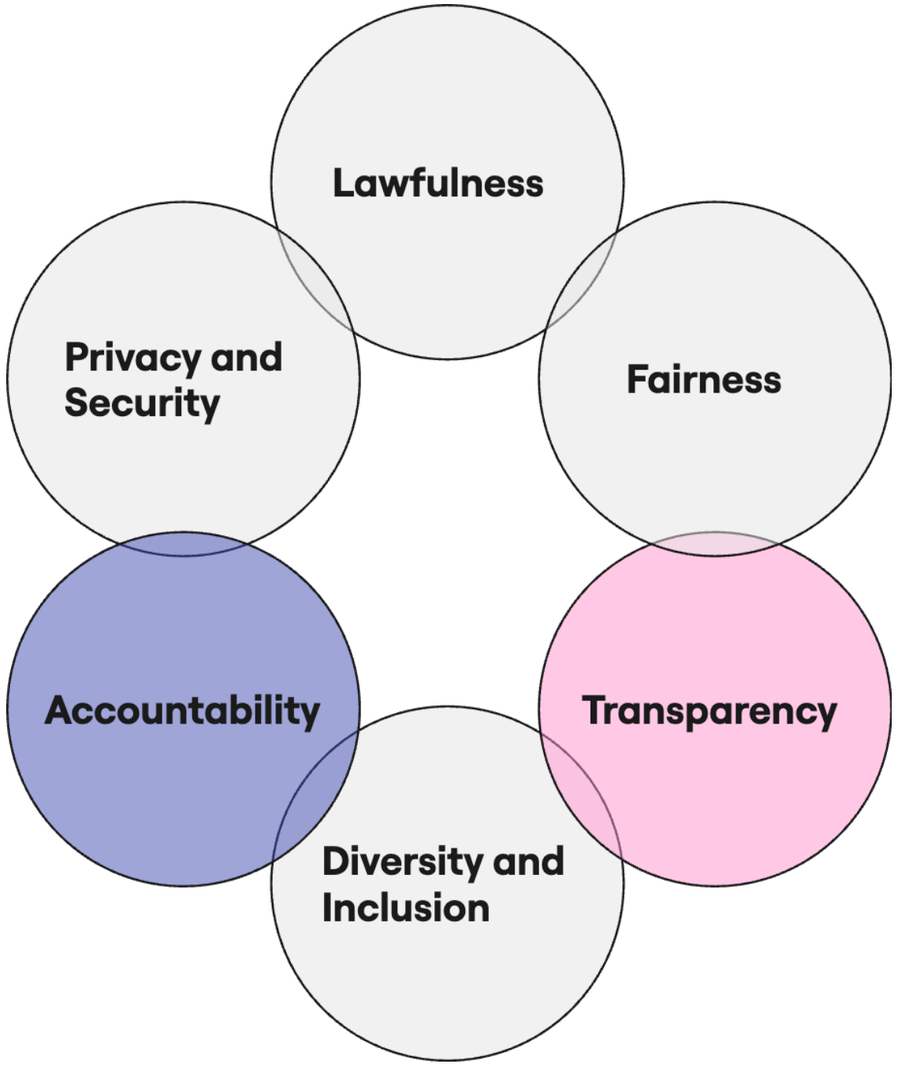
Fairness

- Algorithms and data practices do not create inequalities
- Treat everyone fairly, without discrimination



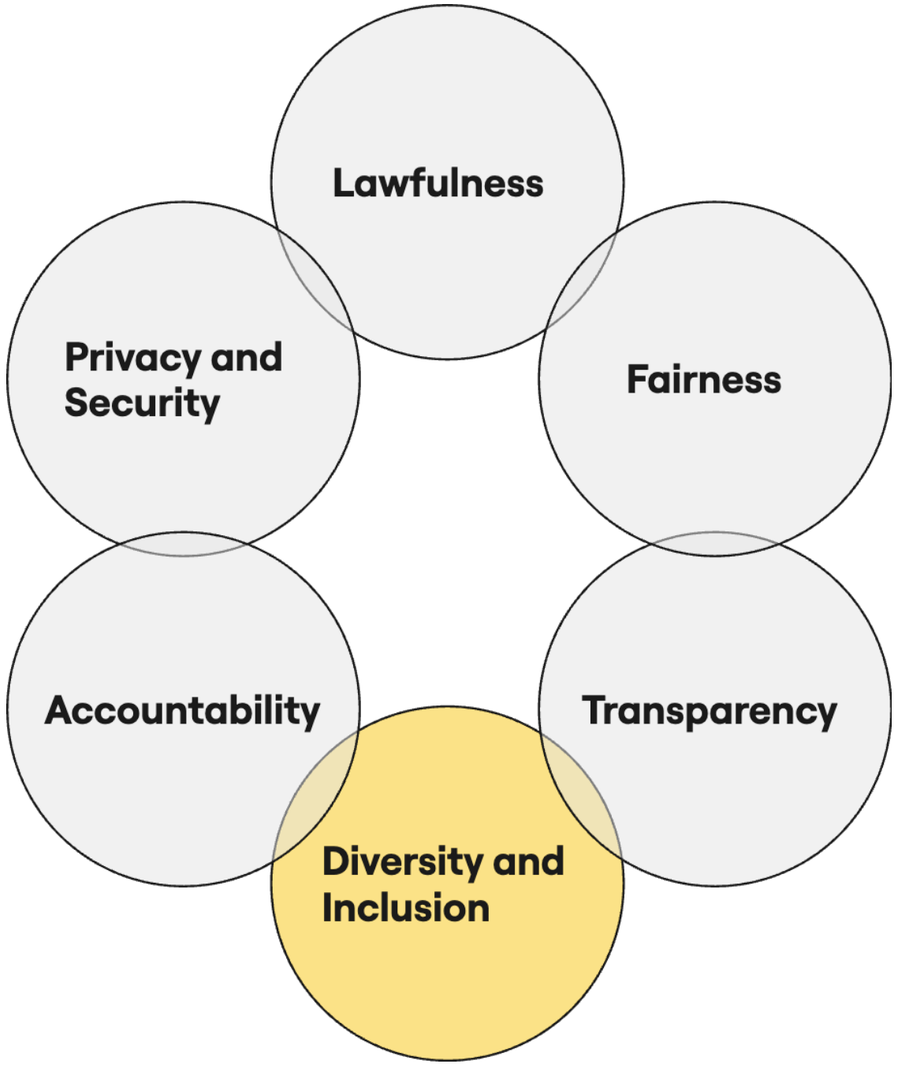
Transparency and accountability

- How the data is used
- How the model is developed
- How decisions are made
- Explain the AI
- Build stakeholders trust



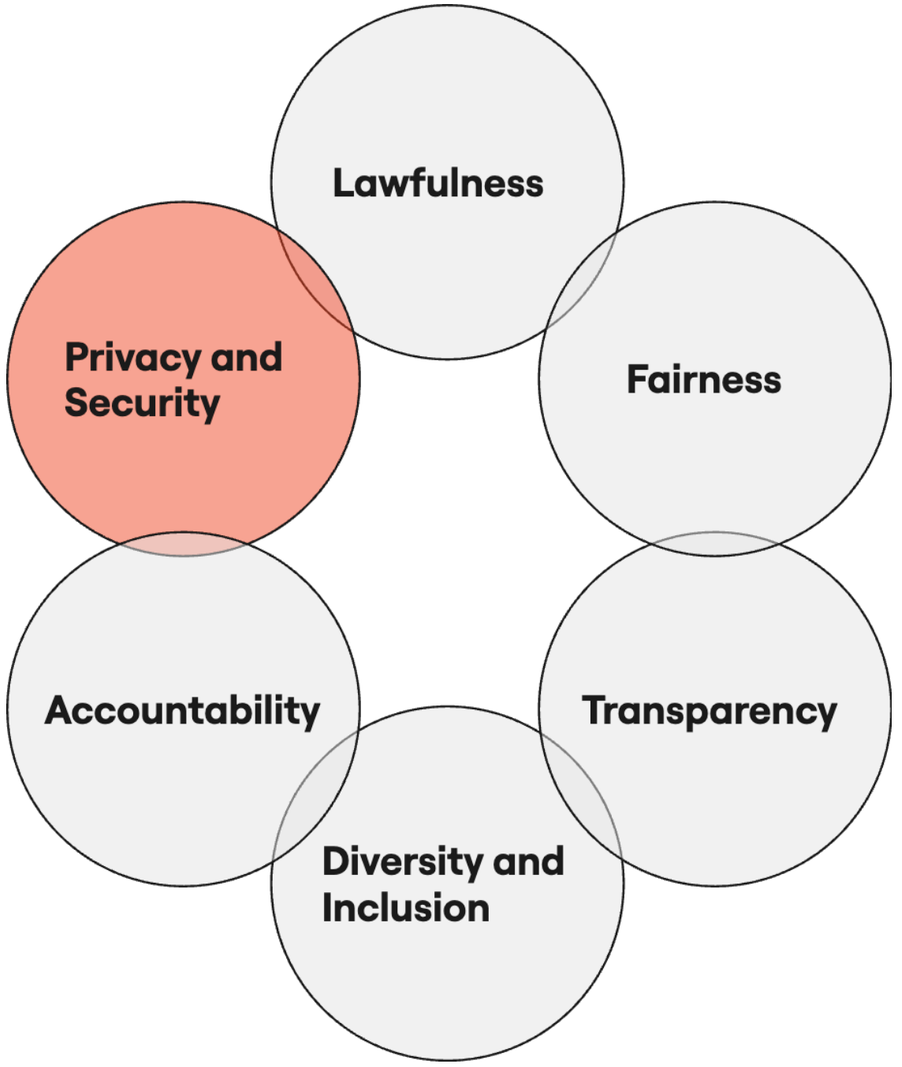
Diversity and inclusion

- Data diversity
- Diverse perspectives and experiences
- Key for bias mitigation



Privacy and security

- Safeguarding of personal and sensitive data
- Respecting and protecting individual rights
- Protect data and models from unauthorized access



Amazon AI hiring tool

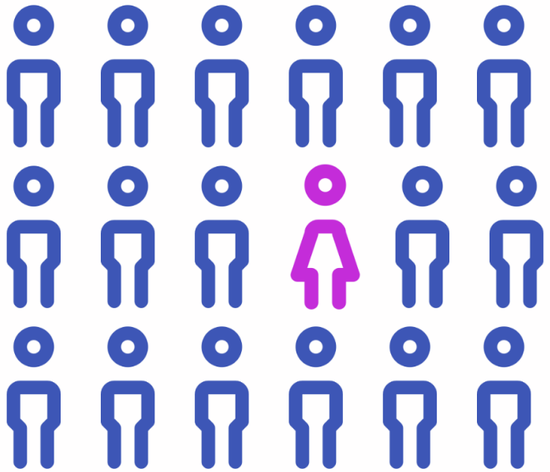
- Amazon: 2015-2017
- Automated talent acquisition
- Use AI to rate job applicants
- Led to scandal and abandoning of the initiative

[1] Reuters: https://www.reuters.com/article/idUSKCN1MK0AG/

Challenges of AI models

What went wrong?

- Not gender-neutral
- Imbalanced training data
- Used only technical metrics for AI evaluation



Let's practice!

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Responsible AI metrics

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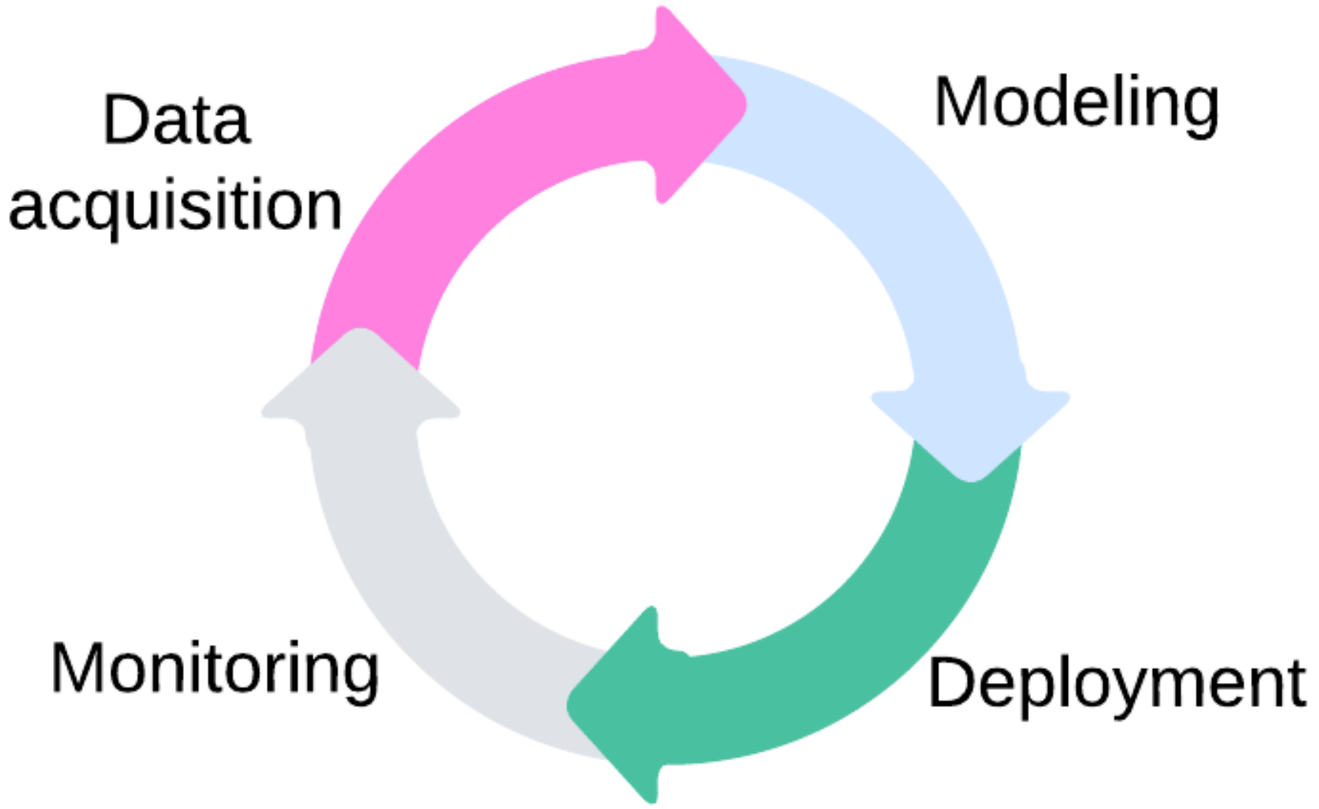
AI project lifecycle

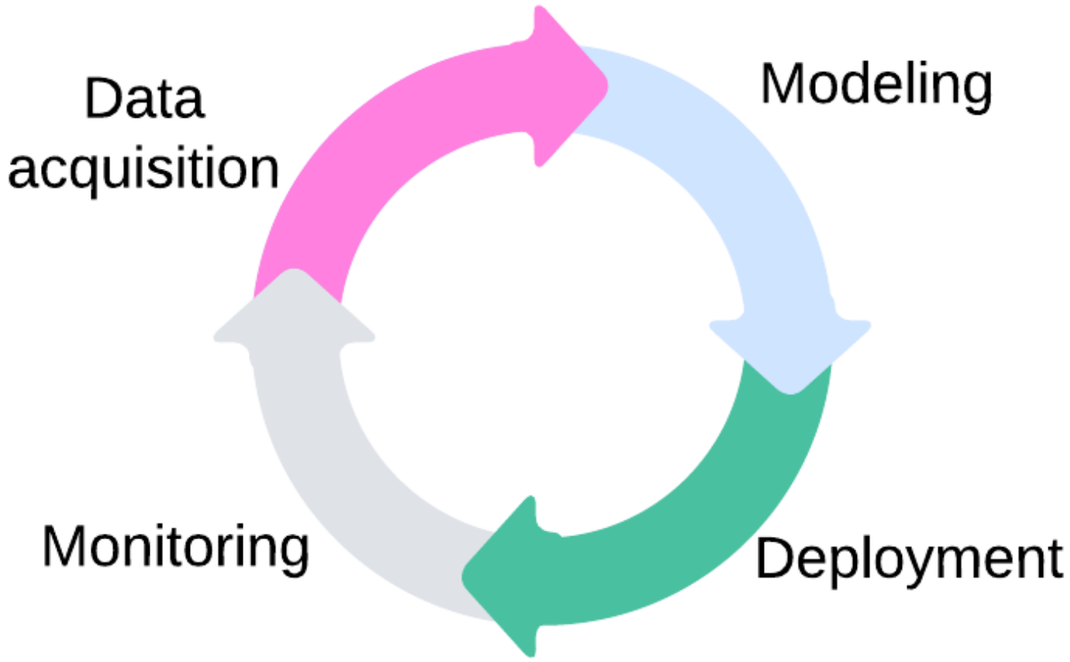


Responsible AI project

- Legally compliant
- Fair and diverse
- Practices are transparent, accountable, and secure

Model fairness:

- Fair, unbiased, and has equitable outcomes for everyone



Protected characteristics

- Groups likely to be treated unfairly and face discrimination
- Defined by protected characteristics:
  - Race
  - Ethnicity
  - Gender
  - Socioeconomic background

Data acquisition

- Equal outcomes
- Demographic disparity
- Laws and regulations

AI in facial recognition

- High accuracy

BUT

- Fail to capture specific ethnicities or genders

WHY...

Lack of:

- Data availability
- Diversity
- Representation

Equal outcomes and demographic disparity

Equal outcomes: benefits are equal across groups

Conditional demographic disparity: differences between groups

- Use descriptive statistics and distributions to assess data diversity
- Corrective measures: weighting and balancing
- Revisit after modeling
- Keep track of tests

Modeling

- Equal performance

For example, medical diagnoses:

- Some more common in protected groups

- Evaluate false negatives, false positives, and accuracy
- Explainability:
  - Local Interpretable Model-agnostic Explanation (LIME)
  - Shapley Additive Explanation (SHAP)

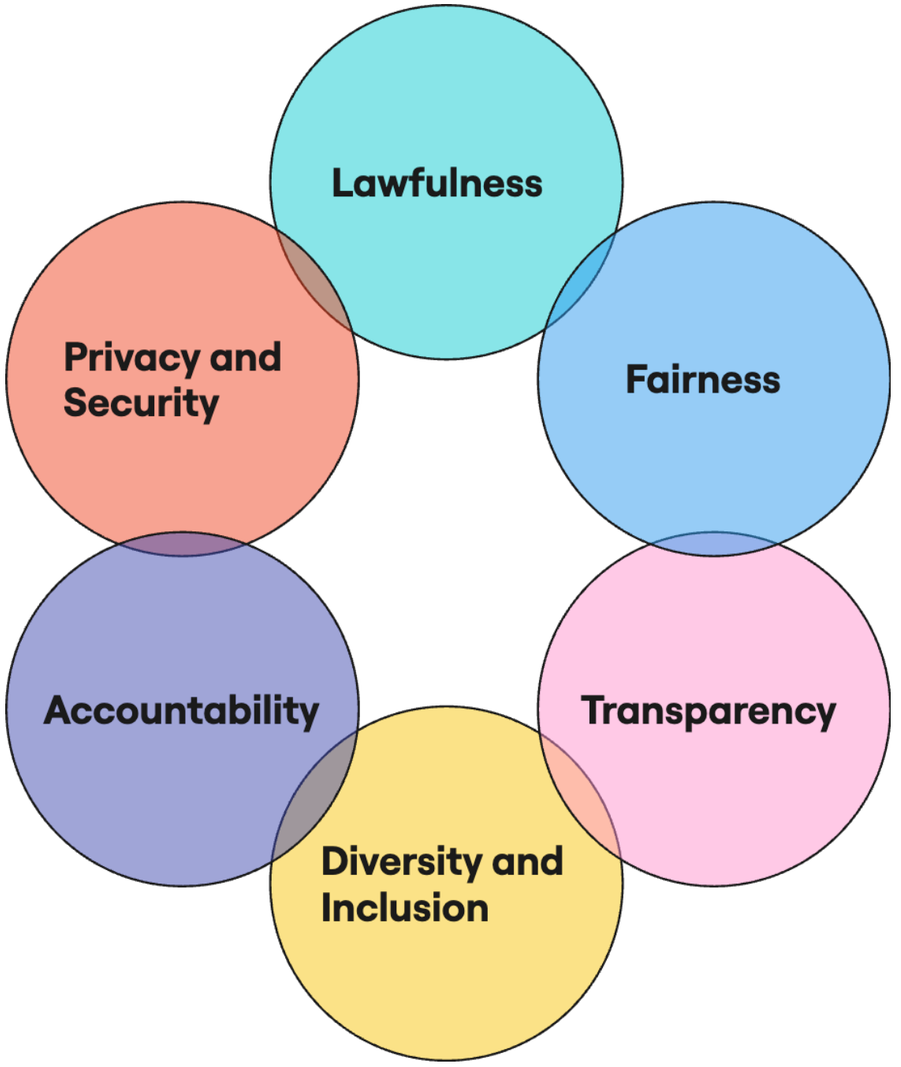
Deployment and monitoring

- Model drift:
  - Changes to model performances over time

- Monitor distributions
- Technical performance metrics
- Adjust model
- Keep track!

Applying metrics

- Understand the protected characteristics
- Many more metrics exist!
- **Always consult appropriate legal and domain experts**
- Conduct privacy and security checks



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Challenges of responsible AI

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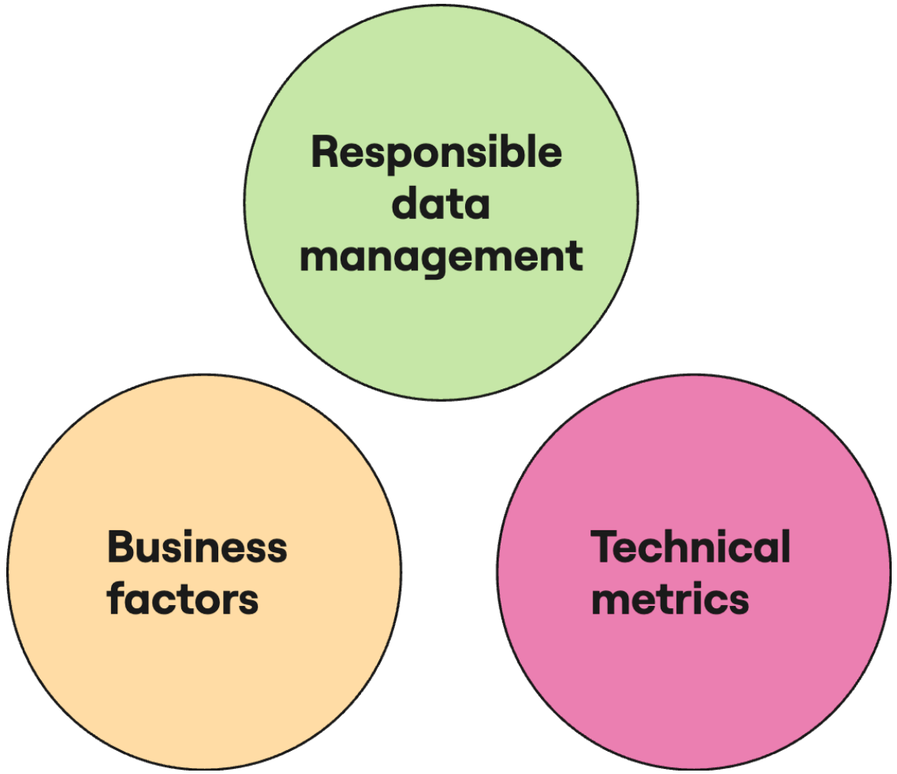
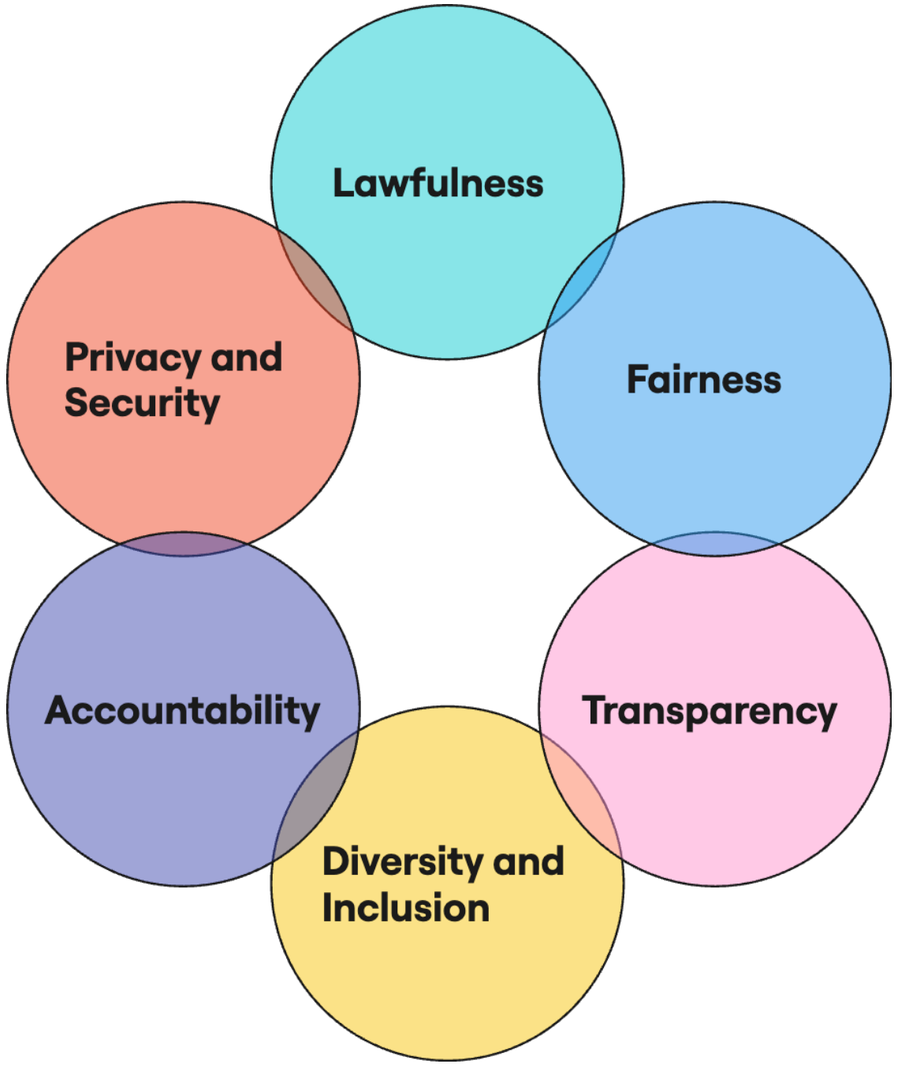
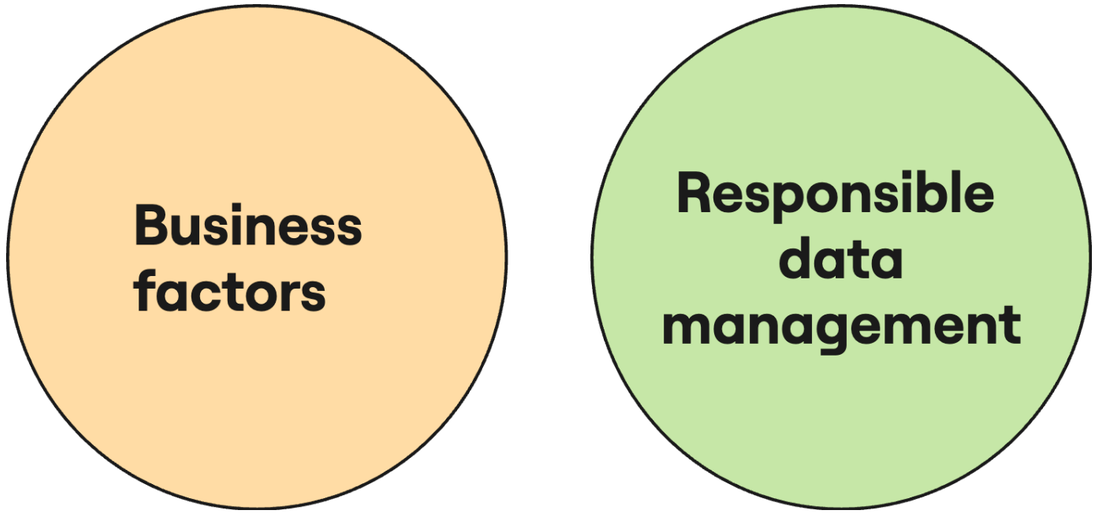
Responsible data management practices in the real world

- Complex
- Involves trade-offs
- Professional judgement

Common trade-offs



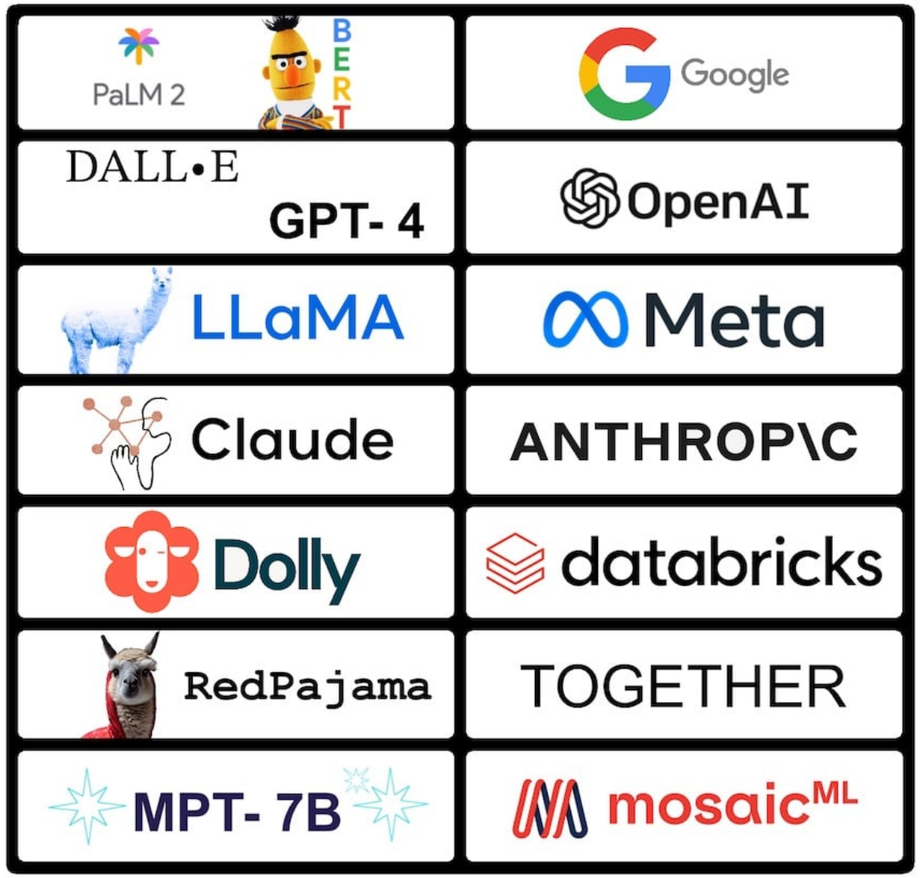




- Profit over fairness and privacy
- Revenue over testing and security

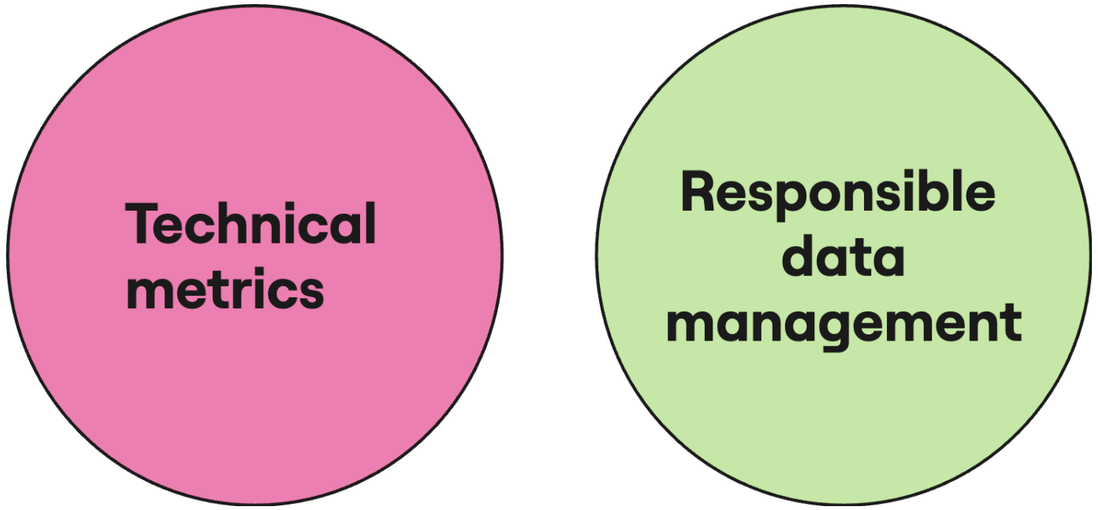
Pre-trained models

- Reduce costs
- Save time and resources
- No need for data collection and training
- Might have biased training data
- Lack transparency



Using pre-trained models

- Due diligence on model source
- Good reputation
- Credibility
- Review model documentation
- Additional tests for fairness and bias

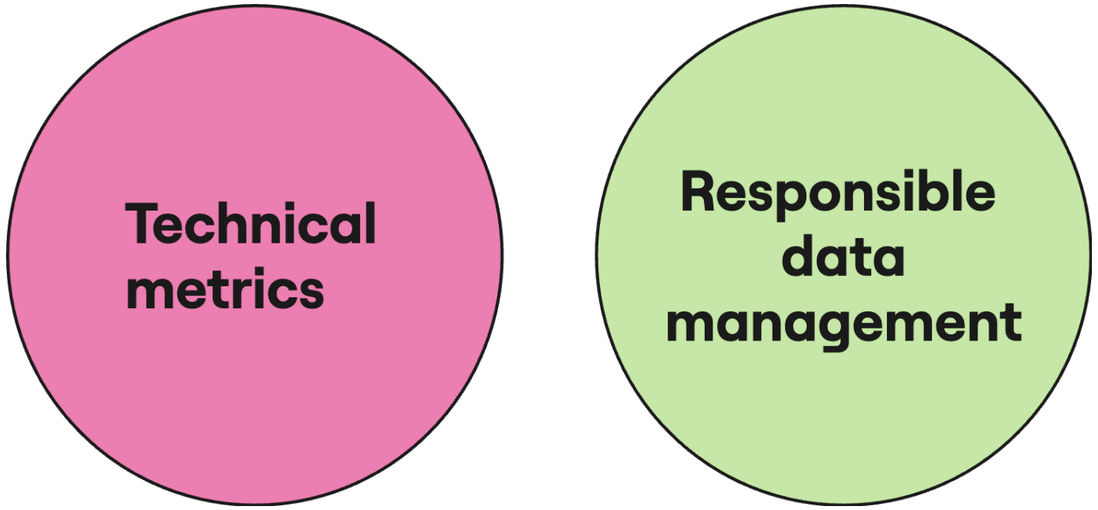


- Accuracy over fairness
- Even in balanced datasets

Accuracy trade-offs

- Lower accuracy for specific groups
- No account for data quality or quantity for underrepresented groups
- Privacy reduces accuracy

Robustness trade-offs



- Robustness versus bias
- Robustness versus fairness

Professional conduct and duties of care

- Code of ethics and conduct
- Guidance varies by country and organization
- Responsibility, non-harm, fairness
- User privacy and confidentiality
- Positive impact on society
- Maintain high standards
- Develop robust and secure systems
- Inclusive and non-discriminatory

[1] https://www.acm.org/code-of-ethics

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