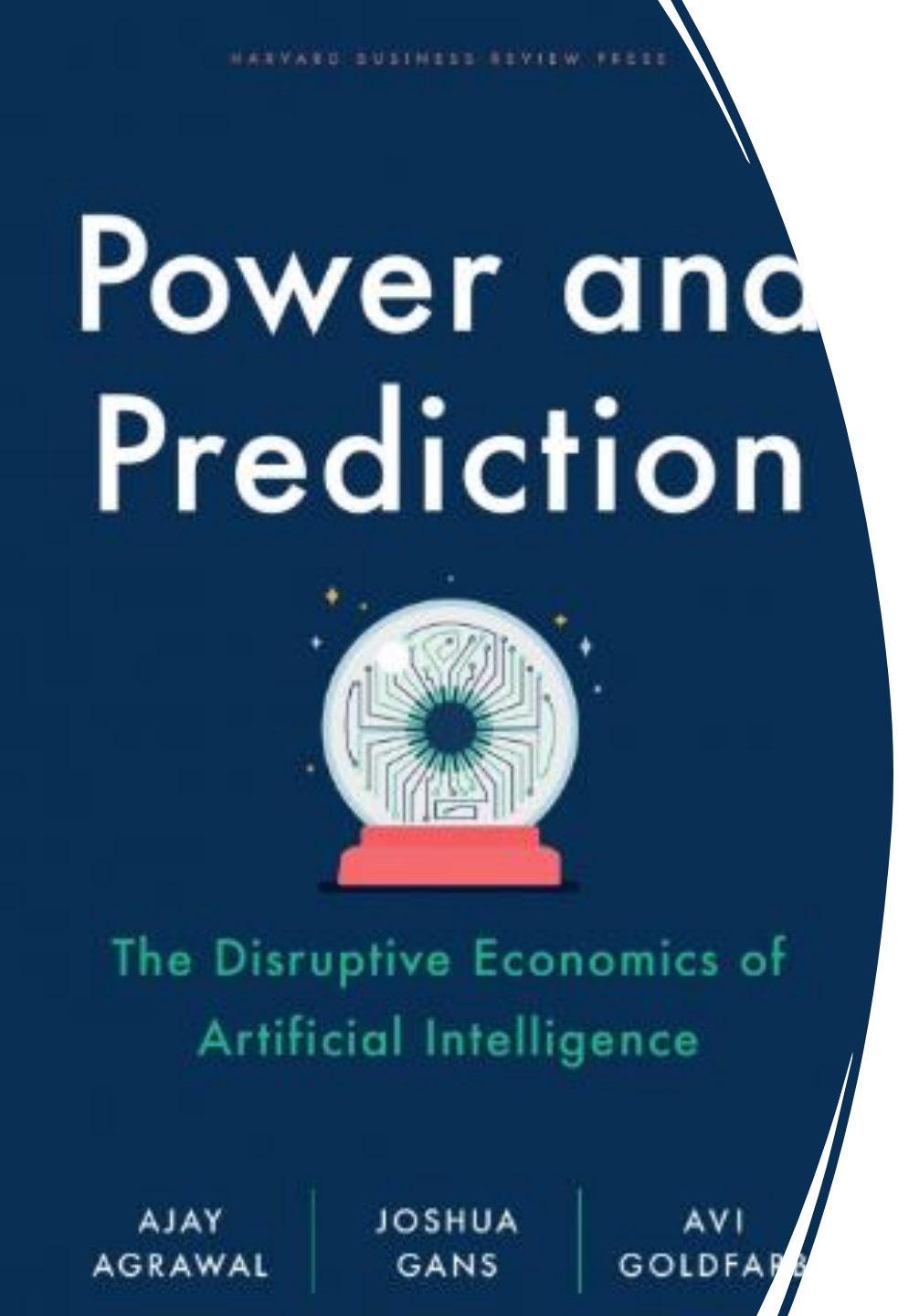
Power and prediction

Seminary 3

Contents

1. Where are we?
2. Applications
3. Challenges
4. Ethics
5. Milestones



Where are we?

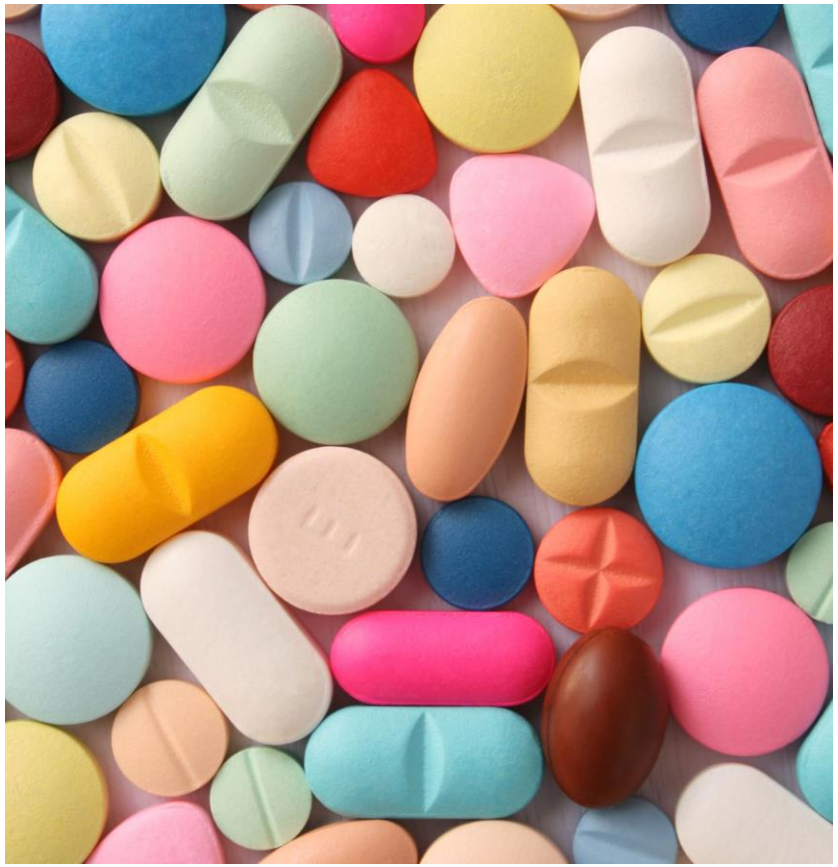
- "Power and Prediction" by Ajay Agrawal, Joshua Gans, and Avi Goldfarb
- In the Between Times
- Point solutions vs system solution
  - Electricity from 1880 to 1920
  - Computers from 1960 to 1980
  - AI, 2012 – DL can recognize images better

Where to apply?

- Today AI is not artificial general intelligence
- … it is a prediction technology
- Predictions help to make decision
- Decisions are made by humans
  - Shifting power
- Examples:
  - Insurance costs
  - Advertising
  - Patients' triage/diagnostics
  - Human resources

Applications

- **Healthcare**
- personalized medicine
- drug discovery
- telemedicine
- integration of wearable devices
- improve mental health care
- **Customer service**
- virtual assistants
- sentiment analysis allows to better understand customer
- customized product recommendations



Applications

- **Finance**
- fraud detection
- algorithmic trading
- credit scoring
- risk assessment

- **Manufacturing**
- quality control
- predictive maintenance
- supply chain optimization

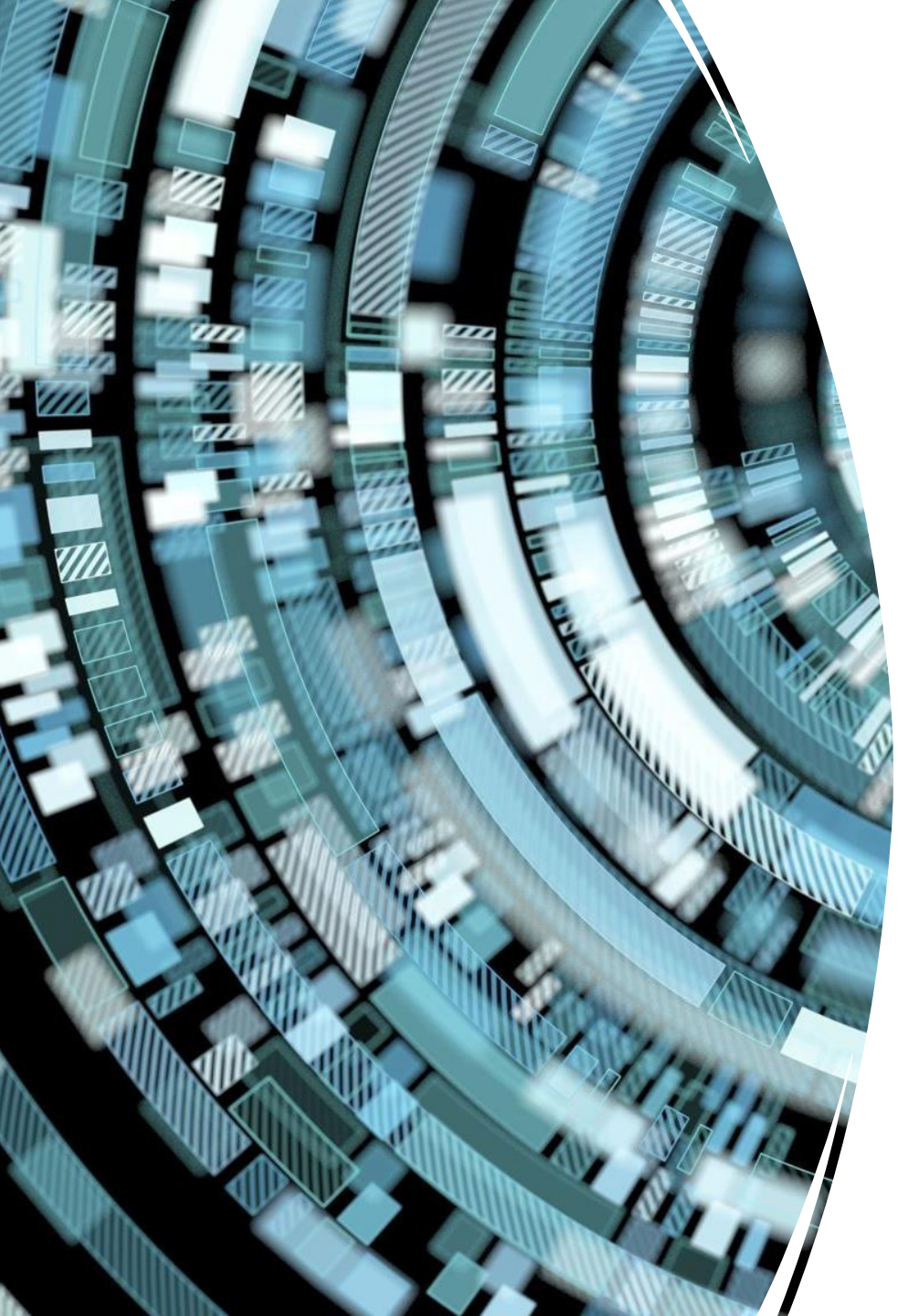
Applications

- **Transportation**
  - self-driving cars
  - intelligent traffic management
  - optimization saves time and fuel
  - drone delivery
- **Agriculture**
  - monitor crops
  - keep pests at bay
  - optimize irrigation
  - improve fertilization

Applications

- Entertainment
- AI-generated content
- personalized and engaging entertainment
- virtual concerts

- Human Resources
- workforce planning
- recruitment processes
- monitor employee performance
- inclusive hiring processes



Challenges

- Data quality and availability
- Computing power
- Integration with existing systems
- Deep-learning algorithms are opaque
- Security flaws
- Lack of expertise
- Costs
- Ethical and legal considerations
  - (data privacy and biases)

Ethics-Concerns

- AI may have embedded bias
- Climate degradation
- Human rights
  - Surveillance
  - News feed algorithm (wave of violence faced by Rohingya Muslims in Myanmar)
- Inequalities
  - Women, minority groups, marginalized people.
  - Bank loans
  - Hiring process

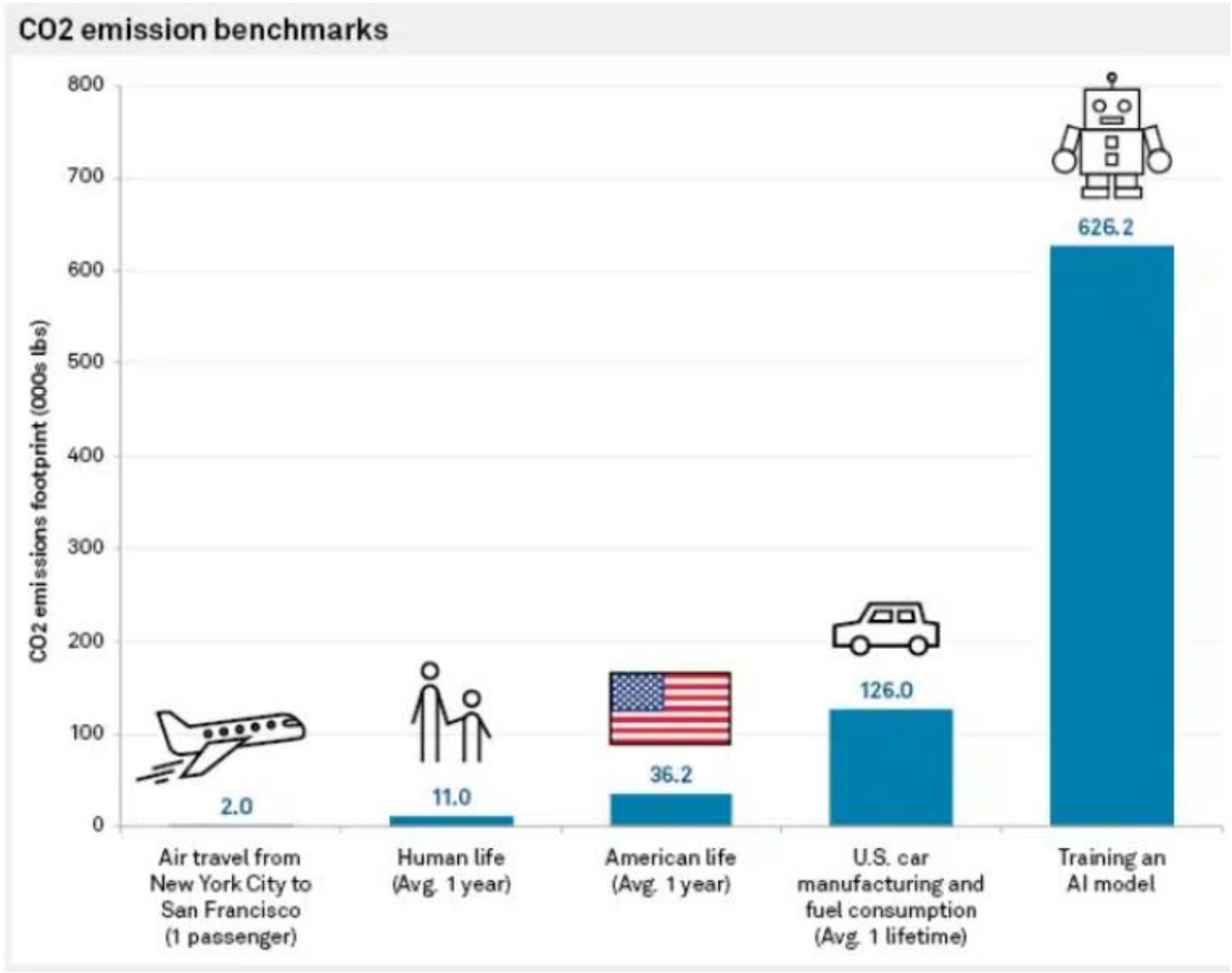


Image: spglobal.com.

Ethics- UNESCO core principles

1. Risk assessment should be used to prevent harms
2. Unwanted harms (safety risks) as well as vulnerabilities to attack (security risks) should be avoided
3. Privacy must be protected
4. International law & national sovereignty must be respected in the use of data
5. AI systems should be auditable and traceable.
6. Ethical deployment of AI systems depends on their transparency & explainability
7. AI systems do not displace ultimate human responsibility and accountability
8. AI technologies should be assessed against their impacts on 'sustainability',
9. Public understanding of AI and data should be promoted
10. AI actors should promote social justice, fairness, and non-discrimination

Train an AI model

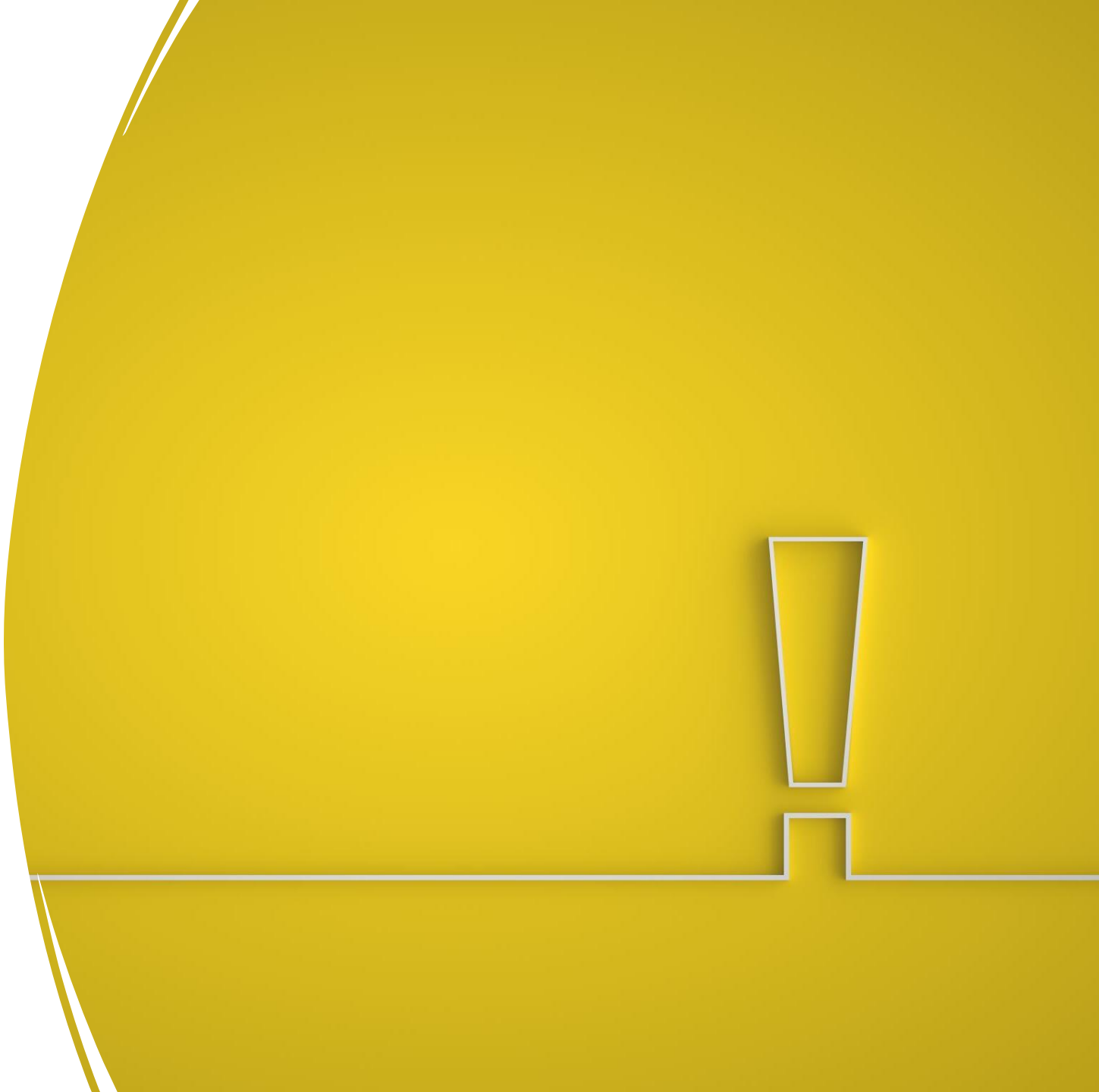
Steps:

- Requirements
- Data collection
- Data cleaning
- Model training
- Validation
- ~~Deploy~~
- ~~Integrate in app~~

Seminary Code: https://github.com/ileniTudor/trainSaveEvaluateModel

1. Requirements

- Input/output
- What data do I need (privacy issues)
- Metrics
- How is the problem solved now?
  - Is it accurate?
- Non-functional requirements?
  - Power, latency?
- Cost?



Data collection

- https://paperswithcode.com/datasets
- https://www.kaggle.com/datasets

2. Data cleaning

- Handle missing data
  - Dropping rows
  - Fill with mean value of the column
  - Fill with a random value
  - Multiple imputation prediction (KNN, ANN)
- Remove unnecessary columns
  - Variables that only have a single value
  - Variables with very few unique values
  - Duplicate observations
- Transform any categorical features to numbers/vectors
- Scale numerical features

Train Validation ~~Deploy~~

- Training
- Validation
- ~~Deploy~~
  - ~~cloud~~
  - ~~local~~
  - ~~edge~~

Milestones

- **One page** essay how you (will) use AI in your project
  - Define your goals (2p)
  - Choose a programming language and framework (2p)
  - Collecting/cleaning data (2p)
  - Training the algorithm (1p)
  - Validation dataset and testing (2p)

References

1. https://srinstitute.utoronto.ca/news/power-and-prediction-avi-goldfarb-on-the-disruptive-economics-of-ai
2. https://www.forbes.com/sites/bernardmarr/2023/05/10/15-amazing-real-world-applications-of-ai-everyone-should-know-about/
3. https://ideausher.com/blog/how-to-build-an-ai-application/
4. https://www.unesco.org/en/artificial-intelligence/recommendation-ethics
5. https://www.linkedin.com/pulse/challenges-implementing-ai-case-muller/
6. https://www.datacamp.com/tutorial/techniques-to-handle-missing-data-values