Machine Learning

Exam and AI Hype

Aleksandr Petiushko

ML Research

September 9th, 2023

Content

Content

Content

1. Exam information
2. Exam problems
3. AI/ML/DL “buzzwords” / hype

Exam information

- Exam format: **hand-written on paper**
- Exam duration: **1.5 hrs** (mandatory) + 1 hr (if needed, but no lunch/dinner then)
- Materials allowed to be used: **hand-written notes** + **calculator**
- **No one** is allowed to use either the **phone**, **laptop** or **printed materials**
- Exam parts:
  1. ML Pipeline Design: 60%
  2. Short questions about the course content: 20%
  3. Simple ML-related calculations: 20%

Time for questions

Exam problems

ML Pipeline Design

Describe your own task comprising *both* Classification and Regression problems. State clearly its objective(s). How to collect the training/testing data? How to prepare (pre-process) the collected data? What are input features and outputs of the designed system, their types and ranges? Think of potential ML models to use and loss functions to train. Provide the evaluation procedure and success metrics to select the best model.

Short questions about the course content

1. Definitions of Empirical and Structural Risks. Provide simple examples
2. What metrics to use when observing class imbalance? Why? Provide simple examples

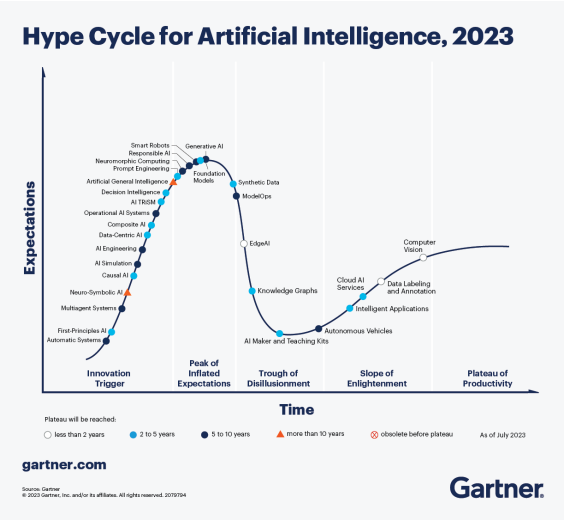
Simple ML-related calculations

1. Calculate TP, FP, FN, TN, TPR, FPR, FNR, TNR, Empirical Risk, Precision, Recall if GT=(+1,+1,+1,+1,+1,-1,-1,-1) and prediction=(-1,+1,-1,-1,+1,-1,+1,-1)
2. Weights: $(0, 1, 2)$. Find the regularization parts for LASSO and Ridge Regressions.

AI “buzzwords” requests

- LLM (GPT / BERT) (application, prompts, mechanisms of training and limited data regime, logical reasoning)
- NLP vs GPT vs Chatbots, Algorithm vs Code, Supervised learning $>$ Semi-supervised learning $>$ Unsupervised
- Generative AI (distributions)
- Embodied AI / Self Driving: what key AI development will be required behind the success of embodied AI (insufficient data of the right form)
- OpenAI, AI Regulations, and Compliance (every app inherits the initial bias, emergent properties)
- AI Art Generator (Stable Diffusion)
- Transfer Learning: Understanding how and when to use transfer learning can save time and computational resources.
- Transformer Architecture
- AI in logistic (NP-hard tasks)
- Different use cases of AI in the real world and how the field is evolving (let’s start with it)

AI Hype Cycle[1]



[1] www.gartner.com

AI ethics and regulations[2]

Inequity and fairness

ML can contribute to and amplify social inequity

For foundation models, it is useful to separate:

- intrinsic biases (properties in the foundation model)
- extrinsic harms (harms in specific applications)

Source tracing to understand ethical/legal responsibility

Mitigations: proactive interventions/reactive recourse

Environment

Foundation models involve significant training/emissions

One perspective: amortised cost over re-use

Several factors would be beneficial to consider:

- compute-efficient models, hardware, energy grids
- environmental cost as a factor for evaluation
- greater documentation and measurement

Economics

Foundation models may have economic impact due to:

- novel capabilities
- potential applications in wide array of industries

Initial analyses have been conducted to understand implications for productivity, wage inequality, concentration of ownership

Misuse

Misuse: the use of foundation models as technically intended but for societal harm (e.g. disinformation)

Foundation models may make misuse easier by generating high-quality personalised content

Disinformation actors can target demographic groups

Foundation models may also help to detect misuse

Legality

How law bears on development/deployment is unclear

Legal/regulatory frameworks will be needed

In the US setting, important issues include:

- liability for model predictions
- protections from model behaviour

Legal standards must advance for intermediate models

Ethics of scale

Widespread adoption of foundation models poses ethical, political and social concerns

Ethical issues related to scale:

- homogenisation
- concentration of power

How can norms and release strategies address these?

[2] www.youtube.com

Transformers

- Overall architecture: `http://jalammar.github.io/illustrated-transformer/`
- Decoder-only variant (GPT): `http://jalammar.github.io/illustrated-gpt2/`

Time for questions

Thank you *all*!