

PRICING ALGORITHMS

COMPETITION & ENFORCEMENT IMPLICATIONS

RENATO FERRANDI
International Affairs



The views expressed are personal and do not necessarily reflect those of the Authority

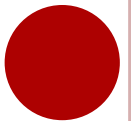
IN THE PAST...

- War strategy in the First World War based on **offensive operations**
- Degenerated into a **prolonged stalemate** (trench warfare from 1914 to 1918)



IN THE PAST...

- The war strategy failed to appreciate the impact of new technologies



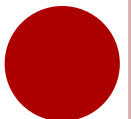


NOWADAYS

- Some new digital players




facebook®



NOWADAYS

- How we risk to see them

YOUR FILMS WILL LAST FOREVER ON
YOUTUBE
THE CHAMPION ADDRESS ON INTERNET!



Send and watch splendid and captivating films, 24/7. Sports, news, commercials and much more. The most charming and magnificent way to entertain the whole family.

www.YOUTUBE.com

Facebook
STRIKING, MIRACULOUS
SOCIAL TEAM-UP!



SHARE your photographic experiences and memories in dialogue with family, friends and acquaintances. For leisure or leisure, Facebook is the exhilarating "social book" for your social life. A comprehensive, convenient, superb user experience that that's perfect for modern living.



THE FACEBOOK COMPANY ©



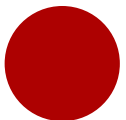
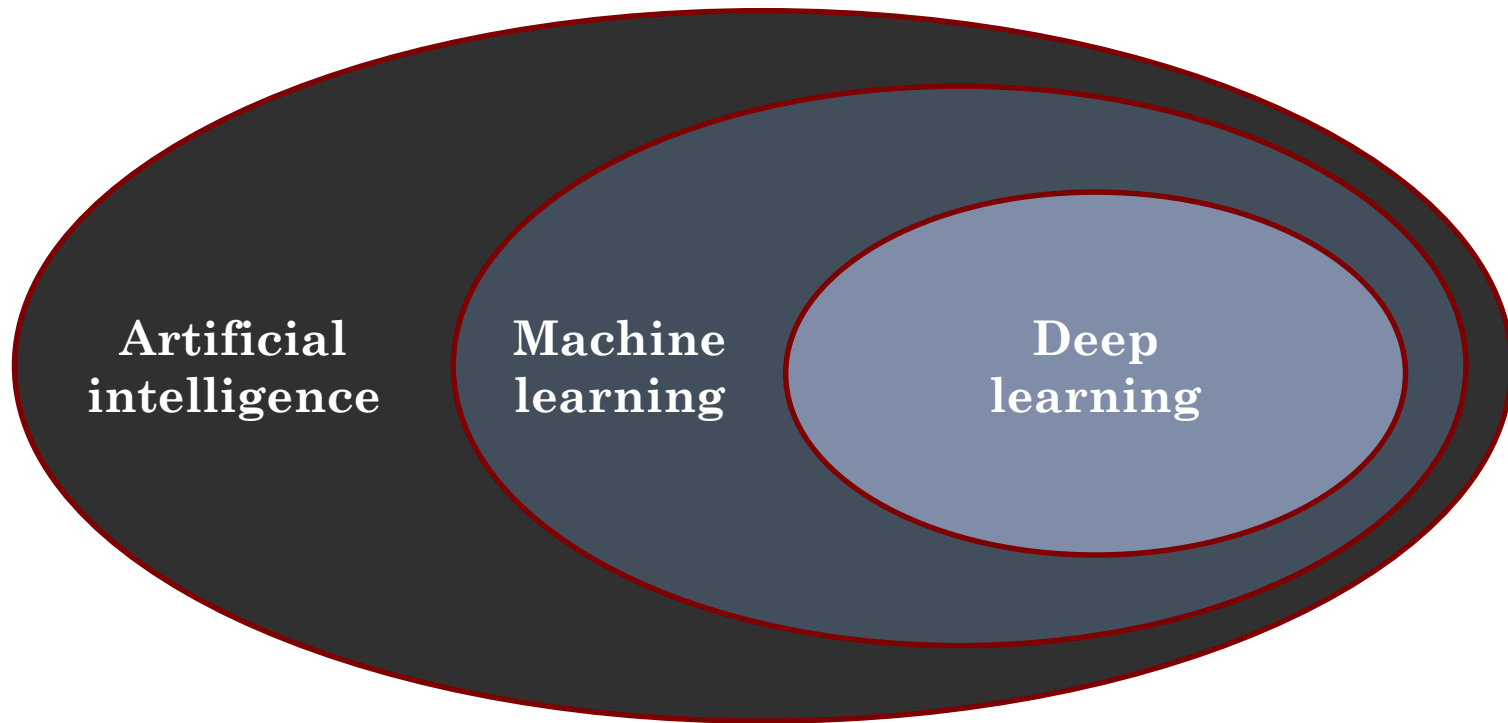
SKYPE®
THE FABULOUS VOICE SYSTEM
THAT'S ABLE TO BRING YOUR
FAMILY TOGETHER.

Skype has the finest features for your and your relatives communication needs. The best price, most convenient and easiest way to keep everyone happily bonded from anywhere. It's such easy like a telephone. It's a credible video-chat service that will get you to connect with a brand new world.



SKYPE
IMMERSIVE

THE NEW TECHNOLOGY

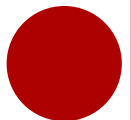


MACHINE LEARNING

THE STORY OF LIBRATUS (CARNEGIE MELLON UNIVERSITY)



- First stage
 - Libratus learns the rules of poker and plays against itself
- Second stage
 - Libratus plays against humans and selects the most suitable strategies



MACHINE LEARNING

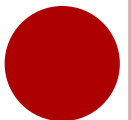
THE STORY OF **LIBRATUS** (CARNEGIE MELLON UNIVERSITY)

- Third stage
 - Humans find Libratus' patterns and adapt their strategies
 - Libratus learns to **bluff!**

Test in January 2017, Texas hold'em tournament

Winning rate 14,7%

Earned \$1,8 millions in 120.000 hands

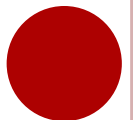


DEEP LEARNING

THE STORY OF ALPHAZERO



- 11 May 1997
 - IBM Deep Blue beats Garry Kasparov
- 5 December 2017
 - DeepMind (Google) AlphaZero defeats Stockfish and Elmo



DEEP LEARNING ALPHAZERO vs STOKFISH

- 28 wins, 72 draws
- Stockfish: 70 million positions per second
- AlphaZero: 80.000 positions per second

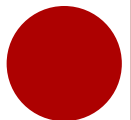


DEEP LEARNING ALPHAZERO VS STOKFISH

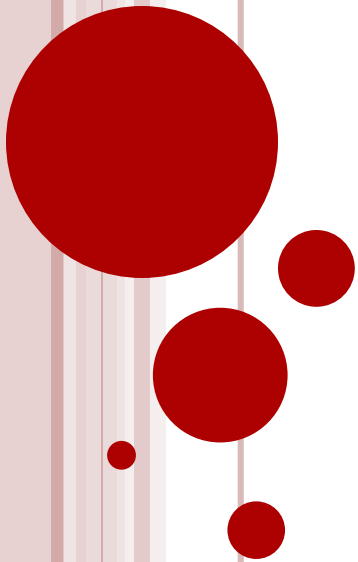
- AlphaZero compensates by using its **deep neuronal network** and focus more selectively on the most **promising options**

Article «Mastering Chess and Shaps by Self-Play with a General Reinforcement Learning Algorithm»

- To learn and defeat Stockfish, AlphaZero took...
4 hours!



PRICING ALGORITHMS AND COMPETITION



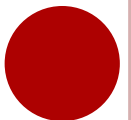
EUROPEAN COMMISSION (2017)

E-COMMERCE SECTOR INQUIRY REPORT

- **53% track online prices of competitors, of which**
 - 67% with software
 - 78% subsequently adjust prices
 - 43% only manually
 - 27% manually and automatically
 - 8% fully automatically
- Track online prices of **retailers** as well



- Online markets are characterised by **high degree of transparency**
- **Demand side:** consumer can quickly compare prices (comparison tools)
- **Supply side:** identify best positioning, dynamic pricing strategies

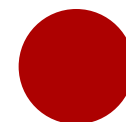


- Collection and processing of **personal and behavioural data**
- **Demand side:** targeted offers and services
- **Supply side:** personalised pricing



COMPETITON CONCERNS COLLUSION

- Algorithms may increase the ability and incentives to **reach, monitor and enforce** explicit and tacit collusion



COMPETITION CONCERNS ABUSE OF DOMINANCE

- Use ranking to the detriment of competitors
- Illegal price discrimination?



COMPETITION CONCERNS COLLUSION

- If algorithm is a tool to **increase effectiveness** of explicit collusion → nothing new
 - Equivalent of ‘outsider’ managing the agreement
 - Two recent cases of ‘outsider’ in the concrete sector in Italy



COMPETITION CONCERNS COLLUSION

- If algorithm is the tool for **information exchange** → **concerted practice**

«Fall short of a formal agreement but consists of some form of coordination that consciously replaces the risk of competition with cooperation»

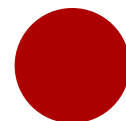


COMPETITION CONCERNS COLLUSION

Proving a concerted practice

- **Circumstantial evidence** that shows the intrinsic oddity of the conduct
- Serious, precise and consistent **indications** of collusion
- **‘Narrative consistency’**: Authority’s reconstruction should be preferable to any alternative hypothesis

In case of evidence of contacts between the parties → **burden of proof shifts on the parties**

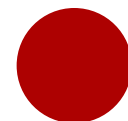


COMPETITION CONCERNS COLLUSION

	Cartel	Coordinated interaction		Conscious parallelism
Evidence	Formal agreement	Qualified contacts/ info exchange	Circumstantial evidence	Mere rational reactions
Assessment	Infringement	Type of information, effects	Intrinsic oddity of the conduct	No infringement
Burden of proof	Parties	Agency/Parties	Agency	---



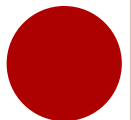
CONCERTED PRACTICE?



COMPETITION CONCERNS COLLUSION

Italian cases

- Airline fuel surcharge
- The big four



OUTSTANDING ISSUES

COLLUSION

- **Detection** → market inquiry and data specialists
- Collusive conducts may arise in **fragmented markets**, too
- **Algorithms' self learning** → liability?



COMPETITION CONCERNS ABUSE OF DOMINANCE

- **EC Google Shopping case:** abusing dominance as search engine by giving illegal advantage to own comparison shopping services
- **Booking case:** algorithms and MFN
- The role of **consumer protection** (comparison tools)



OUTSTANDING ISSUES

ABUSE OF DOMINANCE

- Relevant market and market power
- Algorithm is a **business secret**
- Overall effects of **first-degree price discrimination**?
 - E.g. risk markets
- Intersection with **privacy and consumer protection**

