Big data analytics and AI for precision medicine.

BIG DATA FOR PRECISION MEDICINE SYMPOSIUM
NCSR DEMOKRITOS, Athens 11 July 2018

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Changing landscape of healthcare

- Hospitals
- PHARMAs
- Biotechs
- CROs/IT
- HMOs
- Pharmacies
- PBMs
- Drug development
- Distribution Intermediation
- Caregiving
- Use / Patient data
- Technologies & Tools

IMPROVED HEALTHCARE SYSTEMS
Data is the new oil

We need to find it, extract it, refine it, distribute it, and monetize it.

David Buckingham

The New New Oil

The world's most valuable resource

Data and the new rules of competition
flags about the amount of data being collected because of Kogan’s academic credentials, and now claims that he deceived people at Facebook about his intents.

However, though Cambridge Analytica built profiles of 30 million US voters, its central goal wasn’t to craft ads targeted at those people. Rather, the models it built from that much smaller cohort of 270,000 quiz-takers would allow an advertiser to create proxy profiles of much larger collections of similar people on Facebook. This capability is what enabled the company to craft ads precisely targeted at small groups of voters based on personality traits. And it continues to exist even after the original data is deleted.

The method

Kogan’s technique—emulating an innovation by psychology researchers at the Cambridge Psychometrics Centre, particularly Michal Kosinski and David Stillwell—was to use a scientifically validated psychology quiz
Healthcare: a special kind of problem

Health is not like engineering or gaming

multiple interdependencies & feedback/forward loops
Artificial Intelligence - present day limits

**Can do**
- Predict 30-day all cause readmissions across pediatric patients *at discharge* 79% accuracy
- Computer Assisted Diagnosis (CAD) spotted 52% of the cancers as much as a year before the women were officially diagnosed
- Identified hypothyroidism as an unknown risk factor for statin patients developing diabetes.

**Financial Trading - Marketing Personalization - Fraud Detection - Engineering optimizations - Recommendations - Search - Self-driving Cars**

**Can’t do**
- Cure for cancer
- Comorbidities
- Ion drive
Problems with ML/DL/GAN

- Bias
- Black box – trust
- Overfitting - Context?
- Artificial General Intelligence
The problem of bias

Undesirable correlations in the training data are hard to detect yet can influence the performance of many ML/DL systems.

“Why Should I Trust You?” Explaining the Predictions of Any Classifier

Tesla drives into left lane barrier

Shotgun shell: Google's AI thinks this turtle is a rifle
https://www.theguardian.com/technology/2017/nov/03/googles-ai-turtle-rifle-mit-research-artificial-intelligence
The challenge of Artificial General Intelligence (AGI)

Now

Multiple, individual single-task AIs

The future?

... but how are the individual AIs combined to create the AGI? Are they simply “added”? Are they executed in some “sequence”?

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Share my data?... no thank you.
Pharma is setting 2 ML system objectives

Federated  Privacy Preserving
Cycle of Discovery

Value-based view of “expertise”

Process-based view of “expertise”

knowledge

expertise

information

data

cycle of discovery

Data
Information
Expertise
Knowledge

Who we are

- The **first biosciences cluster** in Greece.
- Established in 2006, by an initial group of 8 companies and the PRAXI Network, the technology transfer arm of the Foundation for Research & Technology- Hellas (FORTH).

Industry-led structure

- Greek knowledge-intensive biosciences companies
- Strong R&D focus.
- International business outlook
Some Statistics

- **Biotech and Pharma**: 11
- **Diagnostics**: 7
- **Medtech**: 3
- **Specialist Services**: 14
- **Academic Research organisations**: 9
Top Research centers as Associate members

Top Bioscience research centers with activities in basic & translational research. Support HBio companies through the development of creative research & development partnerships, and the provision of access to state-of-the-art facilities and specialized services.
HBIO Flagship Projects

- International interest
- Realistic for Greece
- Real interest of stakeholders
- Contribute to positioning of Greek biopharma industry
Thank you

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