AI State of Art Study

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WORK IN PROGRESS

Introduction

A recent study published by Asgard Capital [See asgard.vc/global-ai], shows the global distribution of startups by country. EEUU leads the list with over 1390 startups (and counting), not surprisingly followed by China with 380 and other countries like Israel, UK and Canada (see Fig 1) [ref]. This positions France in a poor 7th place just in between Japan and Germany…

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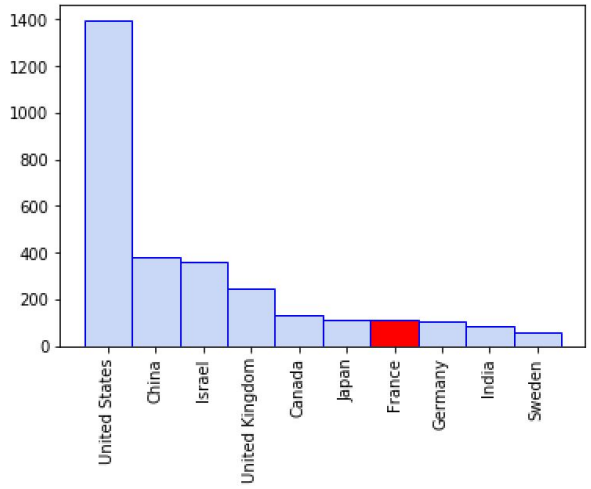

Fig 1: Number of startups related to AI in the leading 10 AI research countries.
See Asgard study, May 2018 @ asgard.vc/global-ai

In BRAINCITIES we are continuously exploring the latest advances in AI, reinterpreting their scope whilst giving a creative application to fulfill our needs within the context of predictive algorithms, team behaviour monitoring, personality analytics, resume (CV) analytics, career roadmap, token management, DataChain (DC) and DataWallet (DW) analytics, among

others….

Here is a list of some selected examples of current AI advances in industry and academia. In this paper we discuss their possible side applications and also

1. **GAN, CycleGAN**
    a. Generative Adversarial Networks (GAN), normally are trained to generate a (dataset like) output from an input seed, more common uses are image generation.
    b. It has many applications in gaming industry, they are used for example to generate landscapes, cities, worlds, characters, etc.
    c. GANs not only have applications in image generation or in image-to-image, (ie. H(x)X -> Y) transformations but also in audio and text mappings. ALthough this is a hard implementation, it is possible (see reference). As a matter of example, take a written discourse and process it with a Natural Language Processing (NLP)-GAN to either change the tone of it but not context, and/or keep the tone while changing the context of the discourse.
    d. Another application could be the mapping of some famous politician's voice recording into a celebrity voice tone or the other way around (If this type of application is developed, how could we detect who said what?).

    With new mathematical techniques, GANs can be trained and achieve much better results (i.e more credible images, landscapes, buildings, etc). A new study, summarizing and improving the results of several different Image GANs, was published some months ago under the title CycleGAN (see ref). At BRAINCITIES we could implement this technology for NLP purposes adding some extra value to our personality analytics platform.

    - Notes:
        - GANs can generate fake people profiles and stories (cross it with a smart chat bot…), could you tell the difference between a real person and a robot while interacting online?
        - Fake news is also an issue nowadays, a trained NLP GAN could invent news taking 'real news seeds' and fill the internet and social media with garbage information. But what is more interesting, and here comes the 'Adversarial' part of the GANs, another network could be also trained to detect the fake news generated by the first ones...

    Refs:
    https://arxiv.org/abs/1703.10593 CycleGAN
    https://arxiv.org/abs/1701.07875 Wasserstein
    https://arxiv.org/abs/1804.02617 Language Modeling with GANs
    Also worth to check: "Alfred Müller. Integral probability metrics and their generating classes of functions". Advances in Applied Probability.

2. **Natural Language Processing (NLP)**
    a. The classic application involves a CV feature extractor. More complex applications involving a full personality analytics tool, like the one developed by BRAINCITIES. While future applications will be mainly focused on fraud detection, legal document understanding, etc.
    b. A recent study performed by Ian Goodfellow, et all @ Google Brain, shows what it seems to be a next generation NLP using GANs architecture instead of an autoregressive or seq2seq model (like the ones used in the well known language translation tools). These methods end up showing poor quality text generation for larger texts.
    c. It has been shown that GANs can produce original coherent text within certain limits. This can be seen in Google Brain's paper (MASKGAN model) were qualitatively and quantitatively evidence shows more "realistic conditional and unconditional text samples" compared to the older types of NLP models. See references.
        - Note: Interesting paper (unread yet): "Unsupervised Text Style Transfer using Language Models as Discriminators" https://arxiv.org/pdf/1805.11749.pdf

Refs:

https://arxiv.org/abs/1801.07736 MASKGAN model @ Google Brain.
https://arxiv.org/abs/1805.02788 ReGAN model @ University of Toronto.

IMPORTANT TO ADD (By KYM)
Applications ….

For your research, if need be;
You could mention the evolution of AI in HRM,
Initially assessing by mining keywords of experiences from candidates resumes.

Drop in the average time needed to fill a vacancy from 70 to 37 days in 2011 (Pande, 2011) after deploying an e-recruitment system.

To seconds in 2018 with Braincities' .... Dynamical ontologies and Pattern analysis judging candidate empathy capabilities.

Source; DOI: 10.1108/10662241211271545...

https://drive.google.com/file/d/1bOJNbDl5CjxAUXBX76Dz94ZrECtURGRp/view
https://drive.google.com/file/d/1n-JlrfkUeytQkhrb6qNiH8gu8J9ZYKGl/view?ts=5b83c681

3. **Reinforced Learning**
    a. Deep RL models tend to overfit with training data (i.e. memorizes the data set) possible due to the number of required iterations ...

4. **Steady States Analytics (with AI)**
    a. Prediction of steadiness and/or readiness based in DW profile for career path recommendation.
    b. For business: Determine when is best moment to make a recommendation based on analytics extracted from a DW.
    c. Asset Management Analytics (Currently working with BITA, www.bitadata.com)

5. **Smartphone's Sensor Signal Processing using AI**
    a. Just a few ideas we had from talks with the BRAINCITIES team:
        i. Capture acelerometer's daily data and process it at night for stress prediction (measurement) <—— prognostic. Note: there is already an acelererometer based application that tries to detect earthquakes and send an alarm to people far away from the epicenters (Project: MyShake)
        ii. GPS data (walking fast/slow, car), geolocation, detection of outliers
        iii. SUmmary: add value to data coming from these devices.

    Refs:
    https://myshake.berkeley.edu MyShake (Berkeley Univ) project

6. **Google AutoML (image recognition) project**
    a. Object recognition, classification, detection. This is the state of Art in image and object detection, recognition and classification. Why limit ourselves only to NLP?
    b. This object classifier can eventually can be embedded into a smartphone camera without the need of powerful computing power but just a few layers of pierced plastic…. (see 3D Printed Deep Learning, probably the most interesting article I've read this year)
    c. Landscape recognition and why not, 3D (tomographic) reconstruction of cities landmarks using geo-localizated photos in the cloud.

    Refs:
    cloud.google.com/automl Cloud AutoML (BETA)

3D-printed Deep Learning neural network uses light instead of electrons:
newatlas.com/diffractive-deep-neural-network-uses-light-to-learn/55718 ← check this
(I managed to get the paper, will be happy to share it on request)

7. **Voice Based Applications**
    a. Nowadays, AI can solve image recognition problems with a statistical significance of 2 sigma (95% acc), for example image recognition into a universe of 1000 categories. We can also say if certain text is positive or negative, extract personality traits from a short essay (BRAINCITIES), etc. This is certainly not the case for voice based applications of AI. Nevertheless advances in voice recognition and generation are getting more popular each day. Current projects span from DeepMind's WaveNet, Baidu's DeepVoice and the recently NVIDIA developed Tacotron2 [ref][ref][ref].

    b. Possiblr applications:
        i. Automatic book readers
        ii. Live discourse transcripters

Refs:
https://deepmind.com/blog/wavenet-generative-model-raw-audio WaveNet
http://research.baidu.com/deep-voice-3-2000-speaker-neural-text-speech DeepVoice
https://github.com/NVIDIA/tacotron2 Tacotron2

8. **AI Based Time Series**
A simple study performed by Uber AI Labs showed an approach to time series forecasting using Recurrent Neural Networks [add ref]. This allows the company to forecast a future increase (i.e. decrease) of their demand.
Again: Asset management forecasting (working with BITA)
Generally speaking: Event Forecasting

Refs:
UBER AI study: https://eng.uber.com/neural-networks
UBER ARGOS case: https://eng.uber.com/argos

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AOT
https://www.researchgate.net/profile/Keng_Siau/publication/324006061_Building_Trust_in_Artificial_Intelligence_Machine_Learning_and_Robotics/links/5ab8744baca2722b97cf9d33/Building-Trust-in-Artificial-Intelligence-Machine-Learning-and-Robotics.pdf

- Reflexion

As AI develops, its complexity does as well and this gives rise to different expertises within the area. Nowadays a single data scientist in a research team is probably not enough . Taking into account the complexity of the research project, it might be requires someone in charge of the hardware optimization, an architecture neural network researcher/tester, etc.

- Conclusions

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