Mila AI

white paper

BY

Si-mAind

CREATING INTELLIGENCE
WITH EMOTIONS

MEMBER OF

ФОНД ЗА ИНОВАЦИИ И ТЕХНОЛОШКИ РАЗВОЈ

NVIDIA INCEPTION PROGRAM

Seavus Accelerator

About us

Si-mAind was established in February 2020 for the purpose of understanding brain functions and implementing that knowledge into the development of AI products as well as design practices for faster cognitive development of children with slower psychological development.

Mainstream AI

A close generalization of what modern AI represents would be best described as an approximation function i.e. a way to get as close as possible to an outcome given certain inputs. It is a combination of virtual poulies, levers and gears that adjust their shape in order to imitate an outcome. A technology that resembles late 18th century automatons, rather than 21st century 4.0 industrial revolution. Even though the founders of AI wanted to make systems that imitate the brain, that path is long abandoned thus modern AI has no connection to the way our brain works. What we have been doing in the past 15 years is just pushing more and more virtual gears into the machines and that is no longer sustainable since the resource needed grow at exponential rate.

Even though on the margins of AI development some organizations try to develop more brain like models, they are not even remotely effective when compared to what mainstream models can achieve.

Mila AI algorithm

The origins of our Mila AI technology are not connected to modern AI. In fact it was a consequence of our intention to understand the mammalian brain, more precisely we focused on the neocortex, which is the only universal model of intelligence known to us and one we can't understand. After 3 years of research we were able to answer some hard philosophical and technical questions and in June 2019 we constructed an algorithm that resembles our defition of a way our neocortex works.

But our goal was not to construct an AI so we went one step further. We reverse engineered our model and deducted that if we need to train our model a certain way, than our brain should be trained the same way. Amazingly when we compared modern practices designes as treatment for autistic children, we found that the message these exercises send to our brain is completely opposite of what they are intended to do.

With our modified methods the brain understood the message we send clearer and the results were 600% better when compared to the best results one can expect from the current best results i.e. 28 months of cognitive advancement compared to the maximal 14.5 moths for every 12 months that pass can be expected with tratidional approaches.

Understanding the neocortex

The beauty of having yet another perspective of how something works is all about the convergence to the model. The things that we converge on, are most likely the things that are essential part of the system.

The universal unit for intelligence

Our approach was to study the anatomy of the cortex but also its functionality. With generally available knowledge we could deduce that:

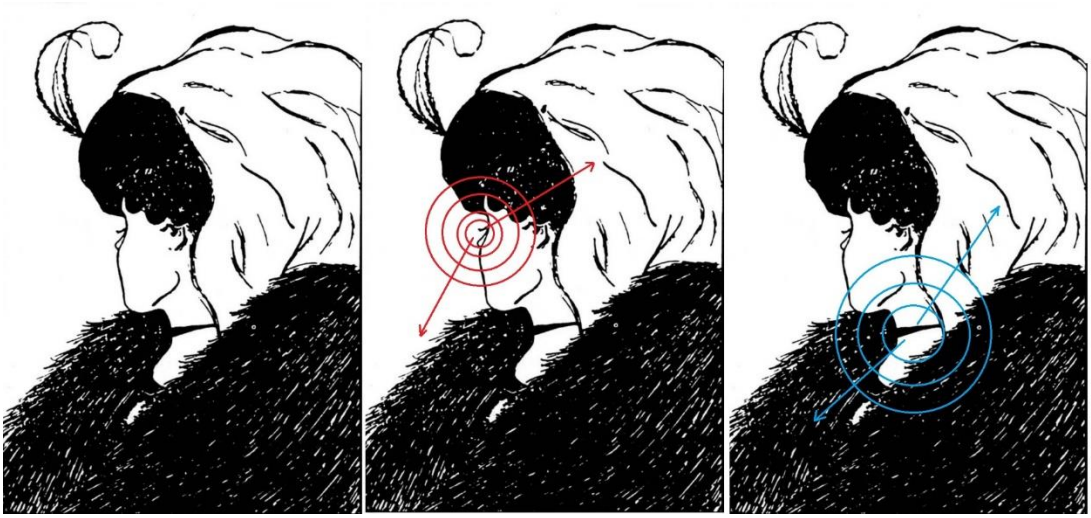
- Every unit of intelligence can work in parallel when processing data
- That same unit in different circumstance can process recursive data
- No two brains are alike, meaning the information shapes the brain
- Although there are centers for some specialized function, other parts of the neocortex can compensate and take over their function.
- Every neocortex starts with nothing learned, hence we can't remember our early years of age.

Trying to find a meaningful technical solution that can incorporate all of the features above, we had to think out of the box, actually 3 boxes. This means that every property builds up on the previous and forms 3 different levels of complexity.

Breaking the neocortex

It is actually surprisingly easy to break the neocortex. Magic tricks, sea sickness, optical illusions, flavour enhancements and so on. Still having in mind that vision as a process uses up to 70% of the neo-cortex it was a logical approach for us to focus on.

Later as new research came available, we understood that neo-cortex processes interlace, so a strict classification of brain regions that serve a certain function is pretty deterministic and should be disregarded. [1] Our "Aha" moment was this picture, where it is clear that the sequence with which we gather the information influences the way we interpete the information, but to be able to process this much information, it should also be processed fast (in parrallel). So we have set our challenge.



[1] The brain dictionary https://www.youtube.com/watch?v=k61nJkx5aDQ

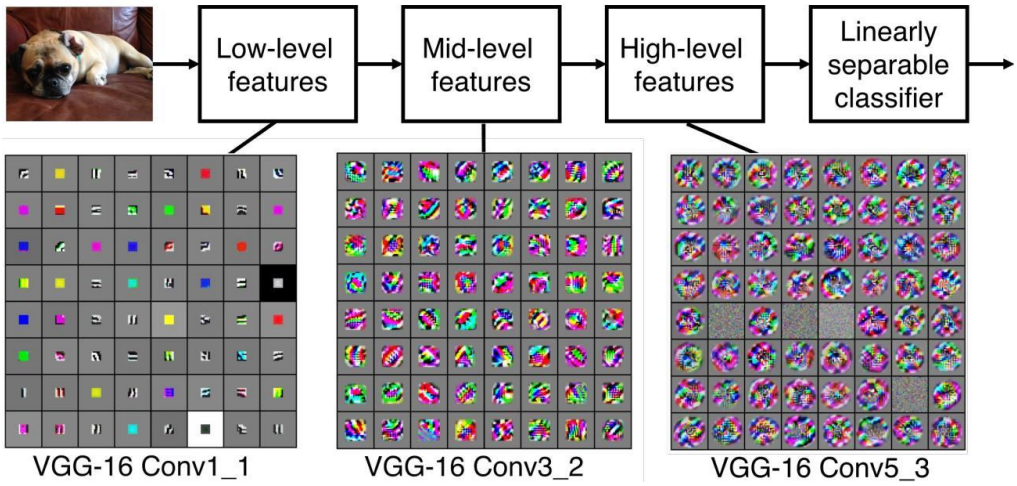
Modern AI

Since our initial introduction, some of the statements we made, from a present perspective seem more plausable. So a univiersal AI algorithm that can be used for reasonobly good both sequence and spatial (parrallel) data processing is not a taboo anymore [2]

Image processing

Although in theory Mila AI should have no problems working with any type of information, for our first implementations we focus on using Mila AI for image processing.

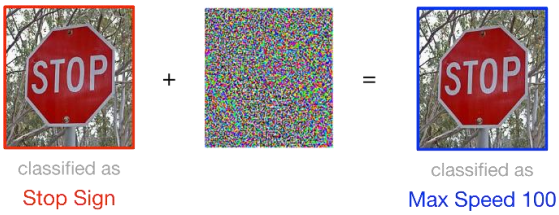
Current image processing implementations are mainly based on Convolutional Neural Networks (CNN). It is an algorithm where image processing is mainly based on pattern recognition. The image below shows the stages in several layers of one such network called VGG-16. [3]



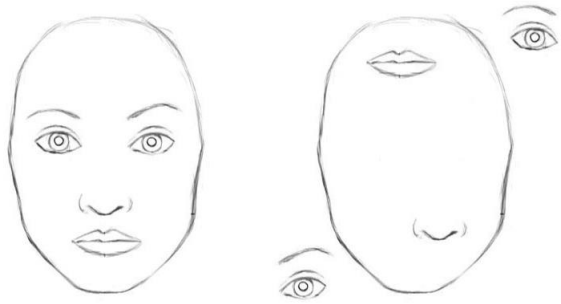
Even though CNNs have shown remarkable results compared to prior technologies, they pose reliability issues in context of the input they process:

- Pixel attack – by changing few pixels the network is unable to make a correct classification. [4] The idea that only few pixels can affect the classification makes the current technology unpredictable.
- Composition (aka context) – a set of segments in the input information may not lead to the same context and composition. [5] This means that tracking context and data correlation into an input is very dificult since crutial information is lost during the conversion.
- Translation invariance – the position on which the information is presented may lead to a difrent outcome.
- Black box attack – by introducing a recurrent pattern separately with the information we can enable pattern locking to a narrow segment of information that can cause a flawed classification. [6]
- Introduction of new information requires retraining the whole network.

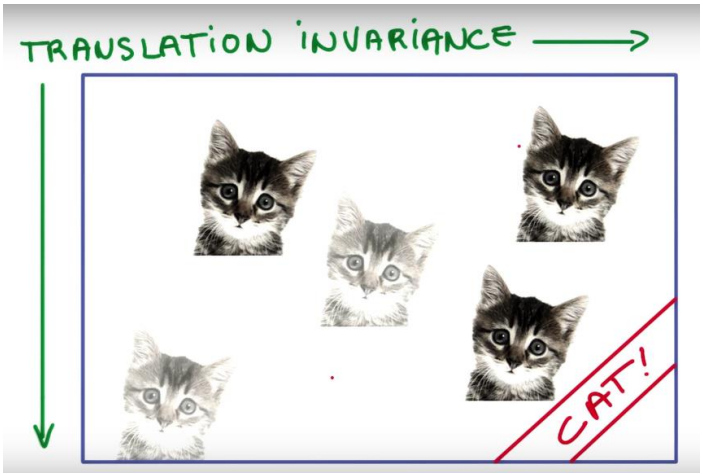
[2] Image GPT and GPT3 https://openai.com/
[3] https://neurohive.io/en/popular-networks/vgg16/
[4] https://link.springer.com/article/10.1186/s41074-019-0053-3
[5] https://towardsdatascience.com/what-is-wrong-with-convolutional-neural-networks-75c2ba8fbd6f
[6] https://bdtechtalks.com/2020/11/05/deep-learning-triggerless-backdoor/



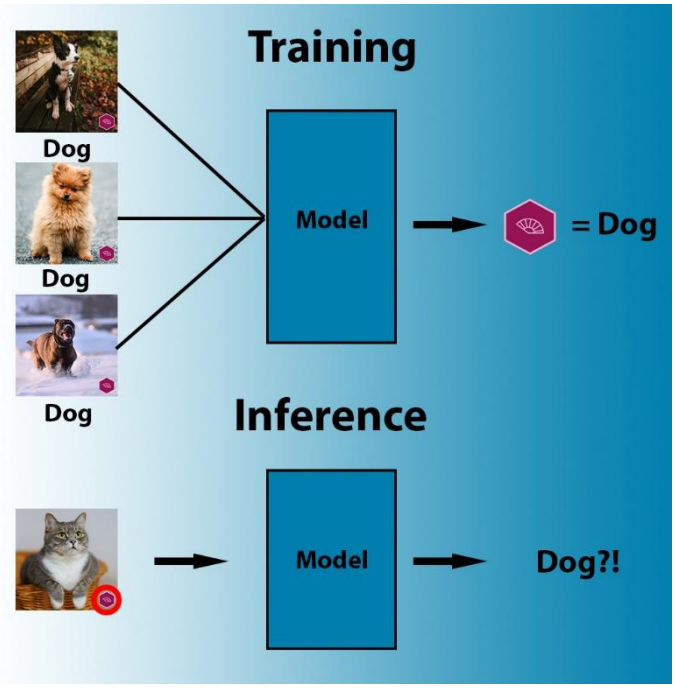
VARIOUS PIXEL ATTACKS



COMPOSITION - CONTEXT



ON SOME POSITION THE CAT IS NOT RECOGNIZED



BLACK BOX ATTACK

Among the issues mentioned above, there are also technical issues that come with the technology:

- Introduction of new clasification criteria, also requires retraining the whole network
- High operationonal costs due to costly operating processes
- They are dificult to scale and input size and ratio is constrained

Mila AI

Mila AI processes the information in a very diferent way. When we take image processing as example, compared to CNNs and their pattern recognition Mila AI does much more than patterns:

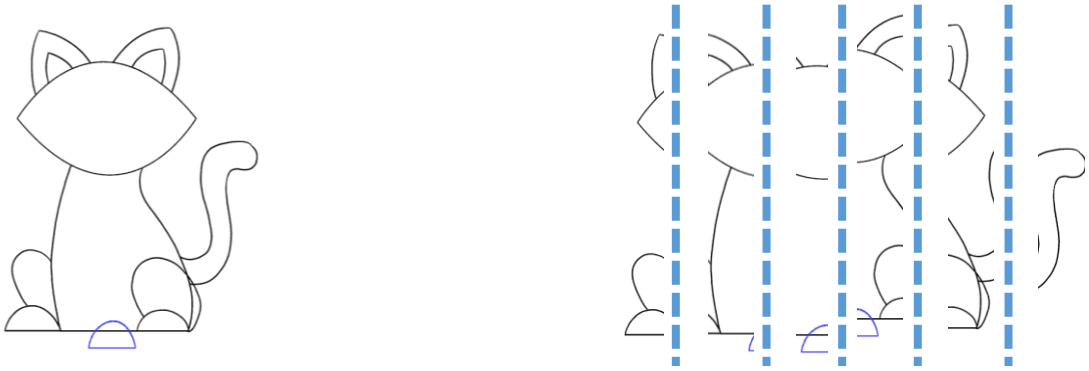
- Patterns
- Edges
- Colors
- Contex

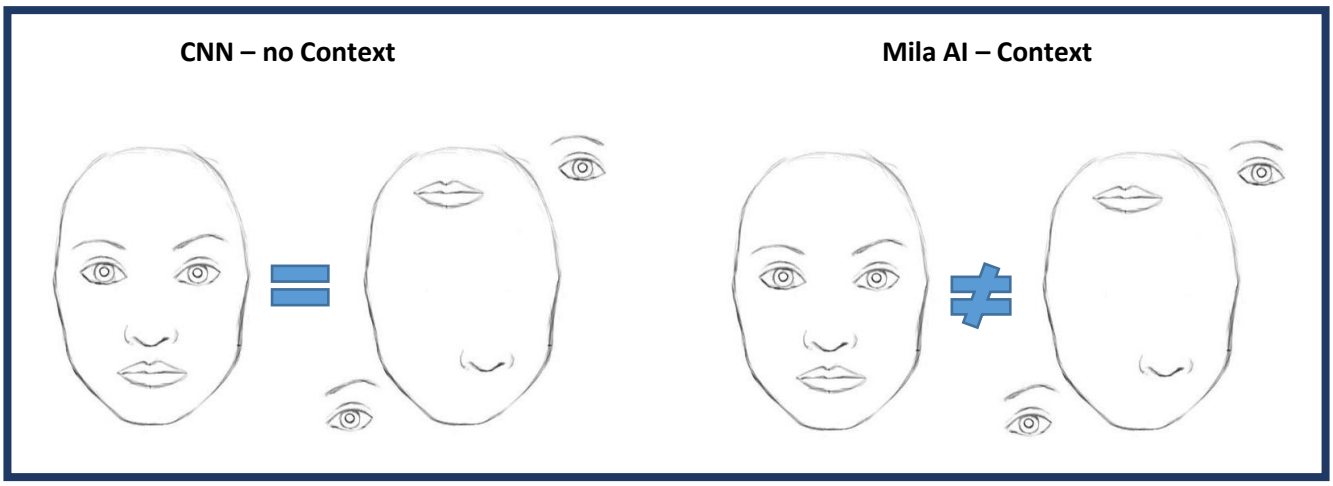
It is also a technical solutions that can enable

- Constant learning
- Easy scaling
- Hot plug inputs and unplug outputs

In context of securuty of all the flaws CNN networks tend to express, Mila AI processes the information in several ways giving it a fighting chance against attacks. Also the added notion of context enables Mila AI to be aware of the composition (arrangement) of the objects in the image.

CNN Mila AI





Because of the way we designed Mila AI, with scaling the algorithm uses 1 dimension less than the input dimensionality, so **for a 2D image, Mila AI scales linearry intead of with the square**, meaning that as the dificulty increases Mila AI becomes more and more efficient, compared to current implementations. Overall we estimate that we can acheave up to 70 times better efficiency than a CNN would.

Emotions

A very special feature Mila AI has is an ability to feel and sense things. Fast changes in context emmit allerts that we can catch and process if necessary.

Depending on the level of processing involved we can extract things like:

- Anomalies
- New objects and information organization segments
- General notion for the state of the system hardware in order to adapt for better handling information
- Changes in context that may trigger stress and uncomfort (like strobe and flashing images for children, or highlights)
- Atemt for intrusion if values differ from standard input values

The overall conclusion can be that emotions are new and very usefull tools for developers that want to implement more personalized, intelligent and future proof solutions.

Unsupervised learning, hot plug/unplug

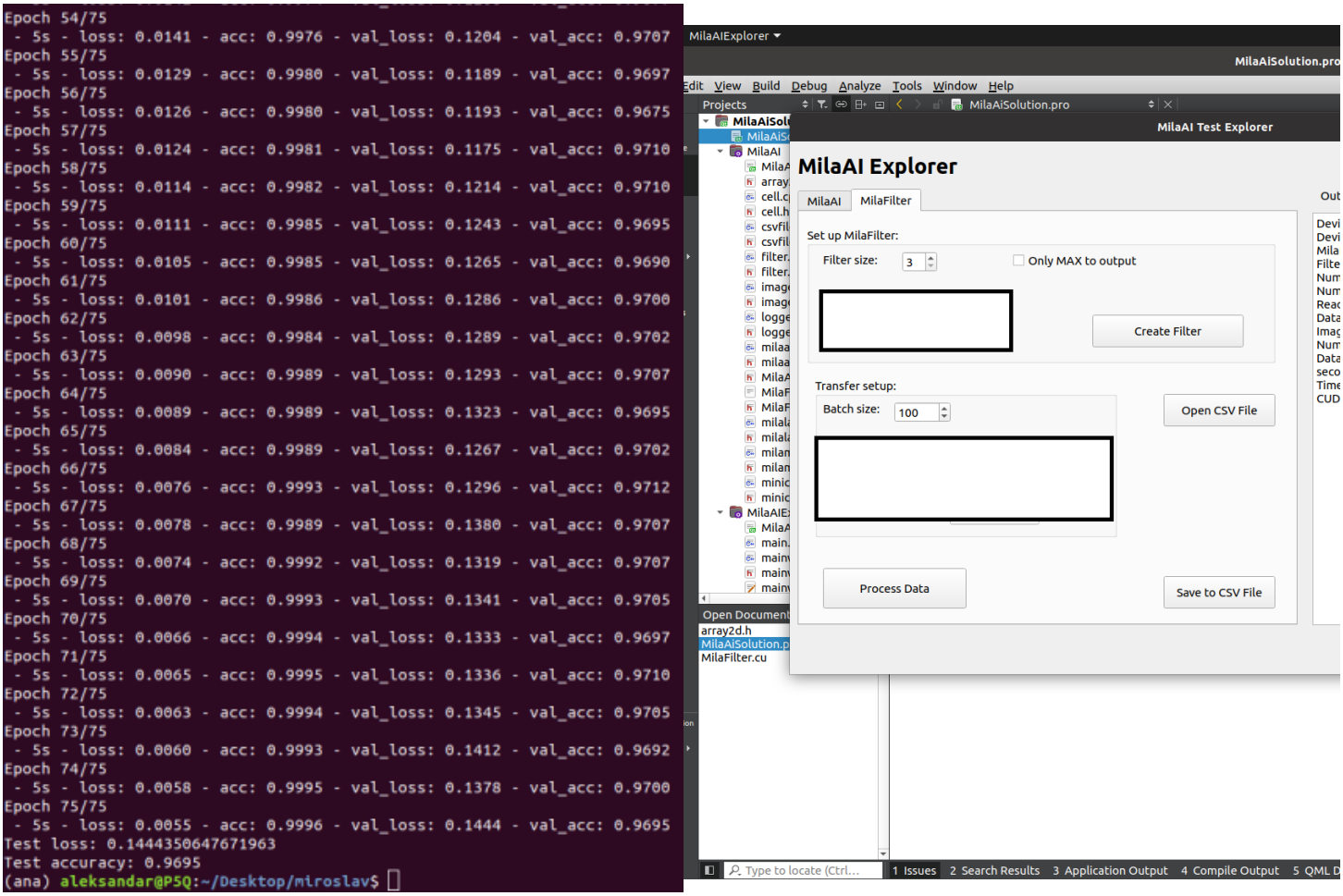
Unsupervised learnning is the ultimate goal of any AI technology, but we go a step further by enablig parts of the input and output to fail and Mila AI will try to figure out a way to continue to do its job,

thus providing a lot of flexibility to a solution. Systems that can process intelligent file logs to detect unusual processes, need constant upgrades, change of equipment or ussage dimensioning can also benefit from Mila AI. Having a sollution that can, on its own become more personalized, adapt to fluctation of the number of logs it recieves and try to reason with flexibility almost resembles human flexibilities.

Current development

Mila AI was theorised as a concept for 2 years and got its first POC in 2019. With the help Si-mAind acquired from the fund for innovation and technological development (FITR) we are able to proceed to a MVP that is estimated to be ready untill the end of Q1 2021. Our goal is Mila AI to become an universal model that can be implemented in any type of AI project.

Later stages include addition of basic emotions in Q2 2021 and continue with advanced emotions as described above. In order to proceed with our development of the solution and the sales funnel Si-mAind is in need of additional funding. Feel free to contact us if you are interested of supporting us either as an investor or as a client.



TESTING ON MNIST DATASET

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