KONICA MINOLTA

Laboratory Europe

Cognitive Platforms for the Workplace of the Future

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The Evolution of Operating Systems to Manage Complexity

There was a time when computers were able to run only one program at a time: all of their hardware and software settings were needed to perform a single task. As they evolved over time operating systems (OS) changed this panorama and enabled computers to efficiently manage their hardware and software resources. This dual management allowed them to perform in a fully multitasking mode of operation and to better exploit both system computational power and storage capabilities simultaneously.

Today, operating systems have become an intrinsic element of our everyday live and are available not only on laptops, desktops and larger machines but also on all of the mobile devices, cyber physical systems, sensors and tools that are part of our digital world. Operating systems are now the key components for managing the increasing complexity that characterizes both our personal and business lives.

In the future, operating systems will evolve further to become more discrete entities that will be capable of cooperating amongst themselves, together with a strong AI foundation that enables them to appropriately aggregate and interact to manage this ever-greater complexity.

Orchestrating AI & Cognitive Computing

Management of complexity is both a major challenge and an opportunity within any kind of business. At Konica Minolta, we strongly believe that AI and cognitive computing will play an essential role in providing the solutions needed to seize this opportunity. However, currently most developments seem to be focussed on AI algorithms and AI platforms that are targeted for specific applications; but these are only a quick fix that in many cases simply work to create silo solutions and ultimately lacks a holistic vision. The emphasis in development would be better placed on the orchestration and integration of AI services with contextual information to provide solutions that support more reliable and intelligent decision-making.

In all sizes of enterprises: from the small, to the medium and even in the largest companies, there is a need for what we term the ‘middle ground’ that is more focussed on the requirements for team-working and collaboration that is at the heart of an enterprise’s efficient operations.

The ever-present drive to increase this efficiency brings together multiple aspects that are in a competition with each other

- finding a balance between the needs of customers
- the empowerment of employees
- the management of the wave of high-speed changes in technologies;

and the increased availability of data. All of these elements need to be orchestrated to fully deliver the benefits to an organisation from its complexity.

Dr Dennis Curry | Konica Minolta Inc.

The AI Platform Ecosystem

In examining the cognitive computing ecosystem, it is helpful to begin from a consideration of the Artificial Intelligence platforms and services that are currently available in the market. In the domain of solutions that are focussed on individuals there is a large set of AI systems that are working one-to-one, such as, for example, personal assistants that are mainly based on Natural Language Understanding. Such systems offer only basic solutions and services for the consumer mass-market.
At the opposite end of the spectrum, there are a number of highly scaled and processed AI platforms for enterprise solutions that offer specifically customized services, albeit with limited flexibility, for businesses and large groups of people (mainly targeting software developers).

CONSUMER

General Purpose

Personal Assistants

- Google Home
- Amazon Alexa
- Apple HomePod w/ Siri
- Microsoft Cortana & Harman Kardon Invoke
- Samsung Bixby
- Jarvis
- Mycroft AI
- Facebook M

Specialized

Home Automation Assistants

- Bridge.ai (*not yet launched*)
- home.ai
- Josh
- UNIFY.ID

Business & Scheduling

- x.ai
- Zoom.ai
- Vesper
- My Ally
- Kono
- Clara
- Julie Desk

Professional Networking

- Etch
- BrightCrowd

Travel & Scheduling

- Emma
- ETA

Education & Media

- Jottr
- BRiN
- Bond

Research Assistants

- Apollo.ai
- Iris.ai
- Ferret.ai

Health

- Ada
- Abi

The AI Platform Ecosystem

ENTERPRISE

General Purpose

Content Management, Cognitive Search

- IBM Watson
- Google Cloud Platform
- Microsoft Azure Machine Learning
- Amazon Web Services AI & ML
- Box Content Management AI
- M-Files Content Management
- WIPRO Holmes

Specialized

Machine Learning and Business Process Tools

- IBM Watson Work
- AYASDI
- Infosys Nia (fornerly Mana)
- Salesforce Einstein
- Element AI
- Rainbird
- Bitvore
- CrowdFlower
- Receptiviti
- Adobe Sensei

Industry Specific

- Skipflag
- GE Predix
- Premonition
- Chorus
- Conversica
- Rocketfuel
- Dstillery
- AdBrain
- Outbrain
- Summly
- Euclid

Bot/Virtual Assistant Builders

- AWS Lex
- API.ai
- Wit.ai
- Vital.ai
- Meya.ai
- MindMeld
- KAI

In the table, some of the most relevant AI platforms that belong to the two main categories targeting enterprise or consumer markets have been mapped. These platforms have been selected primarily because of their size and popularity (with a consequence that the plethora of recently emerged minor start-ups has not been included). The AI platforms are further clustered in the chart into different sub-classes to provide an overview of the main application fields to which they are devoted. It is appropriate to highlight that within the enterprise AI platform category the group of services offering solutions for very specific applications in the fields of data analytics (such as H2O, Bonzai, Dataiku), or those related to Big Data management (Apache Spark, Hadoop, to mention a few) and deep learning (such as

The AI Platform Ecosystem

Tensorflow, Caffe, Dlib) have not been included in the analysis. All of these groups of solutions are tailored to particular needs that target mainly software developers. These are sometimes referred to as 'boutique services' and are outside of the current view presented here of the AI platform ecosystem.

Within the two-fold view that partitions the AI platforms into the enterprise or consumer markets, there are only a few companies such as the technology heavyweights including Amazon, Google or Microsoft that may be considered as located in the intersection of the two differentiated markets. This dearth of offerings in this middle ground leaves the needs of those customers that occupy this space as wholly unsatisfied. Within the niche of this middle ground Konica Minolta strongly believes there is room for developing new AI platforms that can support this market. These customers work throughout the full range of small, medium and large enterprises and need an AI platform to manage the complexity that they experience in their daily work and personal lives, and to enable them to make better and more informed decisions.

The Cognitive Trap and the Future of AI

Currently available AI platforms, such as those shown in the infographic presented here, that are centred on the enterprises' needs and requirements only are limiting for the evolution and the future of AI. These platforms have been built predominantly for cost, for security and to provide stability. In other words, they have been created to primarily provide value to customers and have not focussed on the solutions that are needed to meet the individual's intrinsic requirements. Their logic has necessarily been developed to suit a very general set of users and their general needs and therefore their ability to fine-tune to focus at the individual level is greatly limited. The high scale, fixed logic behind these services has certainly improved in the last few years but people now need far more flexible choices. They need a way out of this cognitive trap.

To exploit the true potential of AI we need to overcome this deadlock. The solution lies in the form of distributed operating system applications that occupy the unserved middle ground identified in the AI platform analysis. These operating systems can integrate and orchestrate AI services to enable better team working and collaboration among individuals:

- providing aggregated services whose location is distributed amongst cloud, edge and hybrid solutions, on the basis of particular needs at the time of request
- allowing small, medium and large enterprises to access distributed intelligent information and edge devices seamlessly
- interfacing with smartphones and tablets, and other cyber physical systems
- managing the environment through sensors and IoT devices
- supporting enterprises in taking decisions that are more objectively based
- augmenting human decisions and general/specialised intelligence on the basis of the contextual information available from an individual, a group or from a wider organisation

The Cognitive Trap and the Future of AI

Leveraging the many AI services and platforms already available today we need a system of systems to really transform the role of technology in the workplace. This change will not be achieved from yet another digital assistant. The solution will be an AI aggregator at the service of your own intelligence, capable of learning and predicting your needs from an understanding of context, rather than being based on self-defined logic created for a few specific applications. As the user switches between operational, tactical and strategic tasks they will be able to create, organise and browse information through a single-entry point. The focus of any AI concept in today's age should be to improve the way in which we work, to connect with other individuals and teams, and to support better decision-making. Within the context of a working environment, where collaboration is often a critical element for successful execution, AIs will need to learn about how people gather information, how they analyse its context, how they then take decisions and finally about how they perform actions – all within a seamless process. In the future, AI based applications will be able to support decision-making by complementing those elements that are usually involved when humans make decisions such as, human feelings, personal history and physical senses. In addition, the system will continuously evaluate the success of its decisions to adapt and improve itself over time. Supported by an analysis of digital information that captures both the context and the factors typically involved in taking decisions, we are now entering an age in which systems will be capable of augmenting our own human intelligence, increasing our capabilities through the application of AI based, in-depth analyses. There are already many advances in the field of Human Computer Interaction that can be coupled with the AI based applications to deliver a more flexible and powerful interface. Such fundamentals of human communication as our facial expressions, gestures and our speech, should be integrated through a truly multimodal interface, to offer the flexibility that so many look for in today's expanding physical world.

As humans, we do not strive for an alternate intelligence to lead us: we look for mechanisms that can improve ourselves so that we can become the architects of our own human-AI combined intellect and in the future, these will enable us to perform activities and work in ways that are unimaginable now.

In the end, it all links back to the same point that AI has the greatest potential for tomorrow's world. If it is executed properly AI based operating systems will become the centre for augmenting our own intelligence, and thereby transform the wider workplace.

Cognitive Hub

At Konica Minolta, within our research project known as Cognitive Hub, we are exploring ways to develop this concept of an AI based operating system. As an emerging form of distributed intelligence, it will help orchestrate the physical and digital resources of the workplace of the future, enabling organisations to make more insightful business decisions.
The research that we carry out in our laboratories in Europe, Japan and the United States is bringing together the various components and platforms that will form Cognitive Hub. Now, we are looking for early adopters, partners and leading technology players to join us on this exciting journey.

For further information on Cognitive Hub and our wider knowledge in this research area, please visit: http://research.konicaminolta.eu/

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