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Building Blocks of an AI Framework for an Enterprise

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Abstract

Speaking broadly, an AI framework consists of six main layers starting with Data Integration layer. All AI applications need some kind of integration with the input data sources from enterprise applications. So, it is essential that AI framework has the capability to integrate with different data sources for seamless data exchange. This study is an overview of the building blocks of an AI Framework to deal as an analytic tool for the manager's tussle with AI's influence on their industries. The core of the framework is an "AI Ecosystem" where all AI, ML & NLP capabilities or "AI Assets" will reside and will have the option to pick and choose the best of the breed capabilities for building AI, ML applications. These AI capabilities can be versatile, like cognitive text processing, speech, computer vision, cognitive search, etc. Also, the framework should be able to connect to different hosting applications or channels to host AI applications or solutions. It is also advisable to have a Framework Management layer wherein features like setup & configuration, monitoring of different services, monitoring and reporting can be embedded. As security is one of the key elements of any framework, it should also be accounted for while designing a sustainable AI framework. Such a framework is going to provide flexibility and agility while building any AI solution. As AI is purely data-driven, this study intends to provide an insight into an enterprise-wise policy or data standard to designing and assembling an AI system.

Keywords: AI Framework, Data Integration Layer, AI Ecosystem, Computer Vision and Cognitive Search

1. Introduction

Some organizations are already into their Artificial Intelligence journey while many are yet to embark on or have just started, probably in a very nascent stage. The typical challenges that every organization encounter while stepping into their AI journey are similar at a broader level, so the solutions to overcome those are also somewhat similar. An AI Framework or it can be termed as an AI Platform can help to overcome many of those challenges. An AI framework can be as light as the only couple of core components, capabilities and libraries loosely integrated to start with. But this will create a huge difference in terms of the flexibility and agility that it can bring while building AI applications and solutions.

The reason why an AI framework plays a major role is, AI is an evolving field, many of the AI capabilities are still maturing and many times some amount of experimentation or R&D is indispensable while developing most of the AI solutions. Even while building solutions leveraging AI capabilities from external providers it empowers with the flexibility to experiment with different capabilities from different providers for the best results (Bhatia, 2017). Secondly, a framework boosts rapid development because the developers can concentrate on the functionalities of the use case and need not have to ground up everything from the scratch every time which saves a lot of time and effort (Harald Gunia, 2018) and most importantly, a framework is always proof of concept (PoC) friendly, PoCs can be developed quickly within the framework and showcased those to the stakeholders for further perusal and confidence building for decision making (Dialani, 2019). Also, a framework will provide the power to try and test alternative approaches quickly and "Fail Fast".

Speaking broadly, an AI framework consists of six main layers starting with a Data Integration layer. All AI applications need some kind of integration with the input data sources from internal or external enterprise applications. So, it is essential that AI framework has the capability to integrate with different data sources or it is capable of sitting on top of a data platform for seamless data exchange. The data platform can be a Big Data platform or a Data Lake which probably is widely popular nowadays in an enterprise environment (AIM, 2020). If a data platform is already available within the enterprise that can process and offer data in a format that can be

directly consumable by the AI applications, then curated data can be directly integrated with the framework. But in most cases that may not be the case, and data scientists end up doing the heavy lifting transforming the raw data to an AI ingestible format within the AI framework. There are some data platforms available in the market today, they use machine learning and other data processing techniques and can provide data in an abstract layer wherein the machine learning algorithms and AI applications can directly consume those as input.

2. Literature Review

AI has proven itself as a technology that has the potential for disruption of the status quo. Using AI/ML the tasks of prediction has now become simpler, easier and more accurate. The value of prediction realized with faster, accurate predictions having high productivity. Enterprises have leveraged this in several ways (Tesafaye, 2019).

Prediction becomes easier when a variety of data are available to be ingested in AI platforms. Since data is the backbone of these AI frameworks, the amount and variety of data availability is very necessary for better prediction (Fintech News, 2020).

There has been research on AI frameworks in finance sectors and there are multiple use cases developed to predict and assist loan requirements for customers. Automating the process of insurance using AI techniques has been successfully verified with many use cases with faster and more reliable results with fewer paper works (Buchanan, 2019).

However, the development of the AI platforms is still at a nascent stage and many enterprises are yet to adopt the platforms. The rudimentary problems faced across is not domain-specific rather is a generalized issue in nature.

There has been less research on building blocks of AI frameworks and insights on an enterprise-wide policy or data standard to designing and assembling an AI system upon which is the main purpose of this research paper.

2.1. AI Framework and AI Ecosystem

The core of the framework is an "AI Ecosystem" where all the AI, ML & NLP capabilities or "AI Assets" will reside and will provide the flexibility to pick and choose the best of the breed capabilities for building any AI, ML applications (Wade, 2020). These AI capabilities can be versatile, like cognitive text processing, speech, computer vision, cognitive search, advanced analytics services, machine learning and deep learning capabilities etc. AI ecosystem may also consist of NLP engines & capabilities or even cognitive OCRs and automation capabilities like RPA/iRPA. These AI capabilities or AI assets can be from external providers as well as capabilities developed in-house that comprises the core of the framework.

Around the core AI & ML assets, one may build custom capabilities which can either be specific to a domain or specific to the group of use cases. The capabilities or components a level above the granular services helps rapid use case development just by connecting the components instead of building it from the algorithm or asset library level (AIQRATE, 2020). Examples can be cognitive knowledgebase search engine, NLP processing engines of specific use or even any other analytics engines for that matter, or the components powered by Fuzzy Logics or other ML custom classifiers reside.

Another capability which is essential for an ideal AI framework is, it should be able to connect to the different hosting applications or channels to host the AI applications or solutions (Paschen et al., 2019). The channels or hosting applications can be any of the enterprise applications and mobile apps or social media channels like Facebook, WhatsApp, Skype and Emailing systems etc. Hosting channels can be even virtual assistants like Alexa, Google Home, Siri or any other voice-enabled devices. Hosting channels can be in many times the applications & mobile apps in the partner ecosystem. This layer essentially acts as a middleware with a variety of connectors to hook AI solutions to different hosting channels.

It is also advisable to have a Framework Management layer as the bottom-most layer in AI framework wherein features like setup & configuration, provisioning and monitoring of different services, monitoring and reporting can be embedded. This layer essentially will become the foundation of the framework and will be responsible for providing support to different services of various AI applications running on top of it. In many cases, some of the infrastructure-related stuff can also be controlled and configured in this layer. As security is one of the key elements of any framework, it should also be accounted for while designing a sustainable AI framework. Security features can be ranging from data security, securing AI applications, security aspects of integration points and interfaces, all can be configured and managed at the framework level in the management module.

At an advanced stage, as the AI framework matures, one should also think of "Templatized Use Cases" and solutions built-in to the framework or custom wizards for building solutions. This topmost layer ideally should contain different template applications that can be dragged and dropped into the framework workbench, and the application with minimalistic features and algorithms should be ready just by dragging and dropping. For example, if someone wants to build a recommendation engine of some kind of a solution on credit risk assessment or even a ChatBot; it should be able to just drag and drop the template recommendation engine or chatbot in the workbench and the recommendation engine or the chatbot in its simplistic form is just ready with minimal features or MVP (Minimal Viable Product). The minimalistic algorithm required for the use case along with interfacing with the input data sources and hooking with y hosting channels will be ready. So, the ground-zero activities and the heavy lifting that someone normally does while building any application is now just a click away. This can reduce up to sixty percent of the time and effort that which is usually spent just to build the skeleton of any application (Buckl, 2010). Once this huge chunk is automated, developers can concentrate on rest of the things like adding more features, fine-tuning for better accuracy and all types of optimizations and polishing which are anyways beyond the scope of automation in an enterprise environment.

Other essential elements of the AI framework are "Domain Vocabulary" or Metadata and a "Feedback Learning" process (Pruss, 2017). As AI, machine learning algorithms need domain specific information to better perform, so maintaining a domain vocabulary is desirable. Similarly, any AI application is going to faulter in certain scenarios and may throw those into an exception queue wherein most cases it will expect human intervention although some automation is possible in some of those scenarios as well nowadays. In either case, integrating feedback learning process within AI applications through framework will essentially increase the accuracy of AI applications over the period of time and such an approach can reduce those exceptional scenarios significantly.

3. High-Level Building Blocks of an AI Framework

Analytical and balanced Platform which is modular, customizable and help to build rapid solutions connecting the knowledge assets of the enterprise (Paschen, 2019). It is a platform which provides a building solution. The deployable run times are available on the cloud environments like AWS, Google, Azure, IBM Bluemix and this has resulted in lower costs and easy maintenance. Switching between different environments was easy as cloud integrators were modular and were easier to deploy.

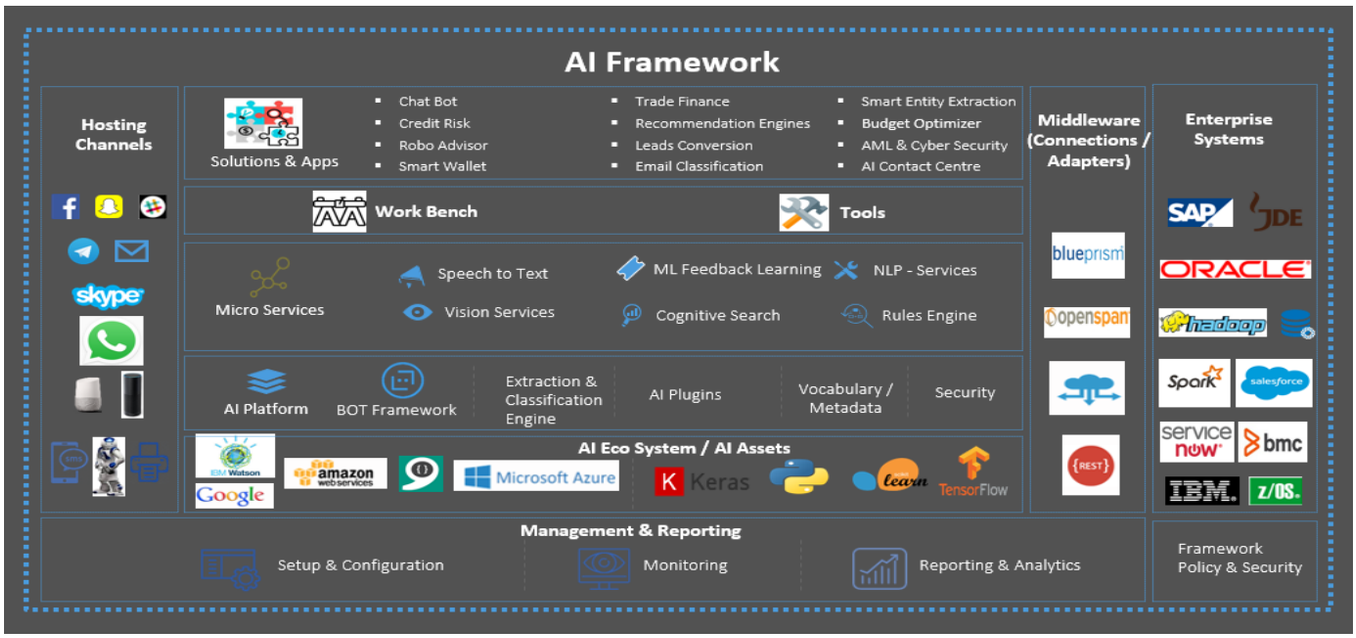

Fig. 1: Framework Architecture

3.1. Building Blocks of an AI Framework

The AI framework has six major building blocks on a high level.

The First Block is an AI Eco System (AI Assets) – It consists of a range of different AI capabilities and provides the flexibility of integrating the best of the procreate capability for providing different AI solutions like chatbot, text processing, speech synthesis and analytics, computer vision, NLP engines, standard machine learning models or any other AI applications (Tesafaye, 2019).

The Second Block in the Framework is AI Plugins: The plugins help to choose the best capability and build a hybrid solution. AI plugins are used for custom services to be written and integrated into the form of Machine Learning, NLP and Deep Learning capabilities. Plugins are a level higher in the abstraction from the core granular AI assets (Tsiukhai, 2020).

The Third Block is Cognitive Engines: Orchestration between all the different blocks and bringing the AI Services live is what the Cognitive Engines does. It wires and provides the services for the realization of different AI solutions (Singh, 2019).

The Fourth Block is a Connector to Hosting Channels: The platform provided the flexibility of delivering AI capabilities on many different Channels. Those could be channels like Web, Mobile Apps, Facebook, Slack, WhatsApp and conversational channels like Alexa, Google Home, Siri etc. (Shvayetsky, 2020).

The Fifth Block is Middleware or Connectors/Adapters for Enterprise Systems: As the fifth block or the platform, it provides intelligence in the context of the enterprise knowledge assets along with many transactional features. These knowledge assets reside in different internal and external enterprise systems, the adapters provide a vital link to join and leverage the information in the enterprise systems (Bennaceur, 2013).

The Sixth Block is Domain Vocabulary: Artificial Intelligence solutions or NLP engine, it requires knowledge contextual to the enterprise and its domain. We have maintained and have kept enriching domain vocabulary related to banking & finance so that existing knowledge could be brought to the chatbot, text processing and other AI solutions.

The framework also provides the Setup, Configuration, Analytics and Reporting capabilities which came under Framework Management Core Services.

These services make the platform complete and fully customizable. It should also provide services for underlying infrastructure provisioning and management.

4. Conclusion

Some of the benefits of the framework approach are, it will also help in standardization and consolidation of the AI applications in an organization's AI landscape which is essential when the number of AI applications grows in the organization.

Bringing the AI framework up to a stage wherein independent AI solutions that can be built on top of it may be a bit time consuming and one may not be able to justify the time and the investment to the higher management or decision makers easily. But the beauty of this approach is, the development of the framework and some of the AI solutions that are being targeted to achieve can go in parallel. So, essentially it will be possible to deliver some of the AI solutions while the framework development phase is in progress. The framework, once it's ready even in its very basic form can improve the development efficiency and reduce the timeline for development and testing to a great extent. It can really bring the agility in AI application development lifecycle in any organization operating in whatsoever domain.

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