Magic Quadrant for Cloud AI Developer Services

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Cloud AI developer services are emerging as a crucial element of modern applications, and enterprises that don't use these services will find themselves at a disadvantage. This Magic Quadrant addresses the AI services that software engineering leaders need to enable powerful, next-generation applications.

Market Definition/Description

Gartner defines cloud AI developer services (CAIDS) as cloud-hosted or containerized services/models that allow development teams and business users to leverage artificial intelligence (AI) models via APIs, software development kits (SDKs), or applications without requiring deep data science expertise. These hosted models deliver services with capabilities in language, vision and automated machine learning (ML). Examples of these services include natural language understanding (NLU), sentiment analysis, image recognition and machine learning model creation.

Our view of the market is focused on the transformational capabilities of the technology to deliver on end users' future needs; it is not necessarily focused on the market as it is today. Vendors offering these services are varied. Public cloud vendors typically have a full portfolio of these services, while other providers focus on only the automated machine learning (autoML) tools and services. Vendors that only offer language service or vision services were excluded from this Magic Quadrant. They are numerous and, in many cases, specialized for specific use cases.

Magic Quadrant

Figure 1: Magic Quadrant for Cloud AI Developer Services

Source: Gartner (February 2021)

Vendor Strengths and Cautions

Aible

Aible is a Visionary in this Magic Quadrant. Its value proposition, which the company pioneered, is autoML centered on business impact. The company operates in North America and Europe and targets customers in the healthcare, retail, CPG, insurance, banking, manufacturing, government, higher education, technology, energy and telecom industries. As such, Aible is designed to be easy and intuitive for developers and business users. Aible guarantees payback within a 30-day immediate impact project and provides excellent customer support. The vast majority of Aible users who contacted Gartner's client inquiry service revealed that they purchased Aible to drive innovation. Although the Aible platform can address a wide range of business problems in both asset- and

service-centric enterprises, it has seen most successes in solving marketing, sales, and service and operations use cases.

Strengths

- **Low-/no-code augmented ML:** Aible's platform is strong in terms of its business-user-oriented capabilities. A series of functions first allow subject matter experts (SMEs) to express desired outcomes, then allow the technology to work backward toward the specified goal. This guides users toward data that supports the use case, to autocustomizing models to deliver business impact. Users can then work interactively with the platform through business scenarios and simulations to reach desired goals while considering trade-offs.

- **Strong collaboration capabilities:** Although business-user friendly, the Aible platform also serves developers' needs. Data scientists can build models independently or refine models suggested through business user and developer interactions, therefore leveraging both data scientists' expertise and SMEs' business acumen. To enable that duality in building models, Aible has built strong integration capabilities with common analytics platforms (such as TensorFlow, Jupyter Notebooks and H2O.ai) and other application environments (such as Salesforce, SAP, Oracle and Boomi).

- **Operationalization of models:** In addition to its business-focused model building capabilities, Aible boasts strong business optimization capabilities. The efficacy of these models, in production, is made possible through the platform's focus on business impact and profitability, as well as the monitoring of model performances. Aible incorporates predictions into customers' applications so that insights are available to users. It monitors business outcomes, compares these with what was predicted, and adjusts for "model drift" when ROI diminishes.

Cautions

- **External natural language processing (NLP) capabilities:** Aible uses third-party techniques and analytics for its NLP capabilities, which are mostly subsymbolic (i.e., machine learning oriented). Despite strong integration, often as part of preexisting scenarios, the platform's possible analysis capabilities are limited to those scenarios. Little customization is therefore possible, limiting the range of the possible analysis leveraging unstructured data.

- **Limited image analysis functions:** From an image recognition or video content analysis perspective, Aible offers light capabilities. These are useful and pertinent to the scenarios that the vendor offers alongside its autoML capabilities, avoiding the need for manually tagging images. However, users should not invest in the Aible platform principally for its image and video analysis features.

- **Integration with other platforms:** Despite significant progress in the last year, some technical and infrastructure integrations still require workarounds in Aible's platform. For ease of integration using standard APIs and tools, the company still requires some investment. Aible has seamless,

end-to-end integrations with Boomi, Salesforce and Tableau. Other than the Boomi solution, integrations with external systems are only possible via connectors, which may require the help of Aible's support team. Integration with AWS or Microsoft Azure is straightforward and designed in such a way that Aible does not see customer data or the trained model, which remains in the customer's cloud account. But integration is otherwise the area in which Aible is least mature — sometimes due to the external strategy of third parties (such as MLflow) that have a difficult time establishing leadership in a highly competitive sector of the market.

Alibaba Cloud

Alibaba Cloud is a Visionary in this Magic Quadrant, and a new entrant this year. The Alibaba Cloud product offers a complete set of CAIDS spanning language, vision and autoML, packaged in a number of ways to suit both professional and citizen developers, as well as industries. Alibaba Cloud is a subsidiary of Alibaba, a publicly traded company. Its operations are mostly in China, with 48 offices also spread across EMEA, Asia/Pacific and North America. Alibaba Cloud has over 1,000 R&D staff for AI spread across seven global research centers. Prebuilt vertical-specific services include banking, finance, insurance, education, government, healthcare, manufacturing, media and entertainment, retail, transportation/logistics, and gaming.

Strengths

- **Offering (product) strategy:** Several features such as high-resolution, multimodal video (image, speech, gesture) analysis and the use of knowledge graphs with transformer models for language demonstrate Alibaba Cloud's technical prowess, strong vision and productive R&D capability.
- **Market understanding:** Alibaba Cloud has an extensive set of CAIDS services, with industry-leading accuracy packaged for use by both professional and citizen developers. Its comprehensive roadmap covers generative AI for video, voice personalization, recommendation services, federated ML, transfer learning, and expansion of vertical offerings in the legal and medical domains.
- **Vertical industry strategy:** Alibaba Cloud has rich solutions across a broad base of industries (10+) including over 100 scenarios and 30 computer vision templates.

Cautions

- **Geographic strategy:** Alibaba Cloud has limited coverage outside of Asia/Pacific, with only two regions in the U.S., two in Europe, one in the Middle East and no regional coverage in South America. While some of its CAIDS have extensive language support, such as translation, the vast majority of Alibaba Cloud's clients for CAIDS are based in China (99%). Its 2021 expansion plans will continue to focus "locally" in China and Asia/Pacific.
- **Overall viability:** Despite a rich set of services, Alibaba Cloud just turned profitable in the last quarter of 2020. Users often report challenges with pricing and cost management of services.

- **Operations:** Enterprises outside of China will have concerns about the security of running their data over Alibaba Cloud's cloud-based AI services, and using its cloud-based ML service to build models. Data security regulation compliance for the local market by country or region is unclear, leaving Western organizations with a quandary over whether to adopt one provider globally or two systems/applications for China and the rest of the world.

Amazon Web Services

Amazon Web Services (AWS) is a Leader in this Magic Quadrant. Its CAIDS offering has a wide range of services and products. These allow software engineering leaders to incorporate a comprehensive set of AI- and ML-enabled capabilities into the applications they are building. AWS offers language, vision and autoML services for developers. The company also benefits from having an extensive set of cloud infrastructure and platform services (CIPS) that are broadly adopted in enterprises. This makes it easy for existing AWS customers to add these services to their contract. More than any other vendor in this Magic Quadrant, AWS is very developer-centric; other providers target data science professionals, with developers being a secondary target.

Strengths

- **Offering (product) strategy:** AWS offers a wide range of services, products and capabilities that allow developers to enhance the applications that they are building or revising for the enterprise. These products perform well overall and offer good functionality in the areas of language, vision and autoML.

- **Innovation:** Amazon SageMaker Autopilot is AWS's autoML capability, allowing building models without data science expertise. It automatically cleanses and repairs data, evaluates several algorithms and identifies the most accurate model. Amazon SageMaker offers a number of model preparation, management and ongoing management capabilities in SageMaker Studio, including Data Wrangler and Feature Store. AWS has also recently introduced SageMaker Clarify, which also helps with data preparation. But these are recently announced products. SageMaker gives the ability to manage model workflows with a model registry, facilitating easy incorporation into a continuous integration/continuous delivery (CI/CD) pipeline for ModelOps.

- **Overall viability:** AWS's strong position in CIPS gives it an advantage when adding extra products and services for clients, as the relationship already exists and it is always easier for enterprises to add a product than to add a new vendor.

Cautions

- **Marketing execution:** AWS may have one of the largest sets of services, tools and capabilities, but this plethora of products and services can be challenging for developers and their teams. AWS does package these offerings together in solutions, but developers will likely need guidance to discover these solutions as they are a small part of the total AWS product portfolio. While

developers often want to use more AI and ML in their application development, they often lack the understanding or expertise to use the technologies.

- **Market understanding:** AWS often struggles to get developers to actively adopt and use the products it offers. While the vendor has one of the strongest product and service portfolios and a number of solutions that combine these, it struggles to help developers understand and navigate its offering, partly due to its complexity.
- **Vertical/industry strategy:** AWS tends to be product focused and does not offer a strong portfolio of vertical-market-specific offerings. The vendor does have some vertical-market-specific offerings such as Amazon Comprehend Medical and selected solutions that are vertical market specific. AWS does customize its products and services for deployment in specific industry implementations, but this is a common practice among the vendors in this market.

Baidu

Baidu is a Niche Player in this Magic Quadrant. Baidu is best known for its search engine, the third largest search engine globally and the largest in China, with 75% of the Chinese market. Baidu also offers an extensive range of products and services that includes AI. These services are branded as Baidu Brain (Ai.Baidu.com), which supports both company internal AI and external commercial AI services. The commercial portfolio includes services and APIs for ML, natural language and computer vision functions. Other services include: PaddlePaddle, an open-source deep learning framework; Baidu Maps; and Baidu's virtual assistant DuerOS with Apollo autopilot related expressions, enabled on multiple devices.

Strengths

- **Innovation:** Baidu is an industry-leading AI innovator. In December 2020, it ranked No. 1 for most AI-related patents of any organization in China for the third consecutive year. These were in all areas of AI, including deep learning, language, vision, autonomous vehicles and industry-specific solutions.
- **Product or service:** The AI portfolio offered by Baidu Brain is both broad and deep. It includes PaddlePaddle — the first China-based, open-source deep learning framework — and the Baidu-enhanced language model ERNIE, designed for better Chinese language understanding.
- **Offer strategy:** Baidu's ML platform offers a comprehensive range of model deployment modes — APIs in public cloud, private deployments, device SDKs and integrated software-hardware packages. As a result, Baidu is able to meet a broad range of application and enterprise service requirements.

Cautions

- **Geographic strategy:** Baidu's AI solutions are primarily geared for Chinese developers. While many solutions are available in both Chinese and English, much of the documentation is only available in Chinese. Baidu does have plans to expand in North America and more broadly in Asia, but success in those markets remains to be demonstrated, especially given the lack of non-Chinese language support.

- **Marketing strategy:** While Baidu's AI technology is market leading, its ability to commercialize its AI R&D, even within China, is limited. While Baidu has neither a business domain like Alibaba's e-commerce platform, nor a social platform like Tencent's WeChat, the company has delivered selected industry solutions.

- **Market responsiveness:** As a large cloud service provider, Baidu is somewhat reliant on its large strategic partners for its solution delivery and customization services. The result is that midsize enterprise buyers and developers may get support from a mix of Baidu and partner sales before purchasing, or technical support after purchasing. This can reduce the speed of solution deployment and the chances of succeeding with the highest performance possible for many customers and partners.

Clarifai

Clarifai is a Niche Player in this Magic Quadrant. The company has strong vision and autoML offerings. Clarifai established itself by winning several ImageNet awards for image classification. It has built its AI platform with offerings across language, vision and autoML services. The ability to deploy on any public cloud or bare metal gives it flexibility that is often preferred by enterprises. Clarifai is customer-centric and works directly with customers to deliver the use cases that enterprises need. Clarifai is growing its capabilities and has a very aggressive roadmap for additional functionality in the coming year. This will build on an already strong offering and positions the company for continued growth.

Strengths

- **Product or service:** Clarifai has a very strong offering in the area of vision services, with strong prebuilt models in the image recognition, video content analysis and optical character recognition (OCR) services.

- **Innovation:** Clarifai has focused its assets on engineering and is aggressively adding prebuilt models and additional functionality to its platform. The company is expanding its capabilities rapidly and will have a more complete offering by the end of 2021, making it very competitive with larger players in the market.

- **Market understanding:** Given the customer-driven product plans and the responsiveness to current customer needs, Clarifai is enjoying rapid growth. As a result of this focus and the

engineering-driven asset allocation, the company has seen strong growth that reflects its market understanding.

Cautions

- **Overall viability:** Clarifai is still a relatively small company and is competing with the cloud giants. While the company has enjoyed strong growth since its founding, it is venture funded and still needs to execute very well to sustain its success.
- **Product or service:** Clarifai has limitations in its current language-centric offering, with limited language support and no current conversational tooling available. While the image recognition and autoML services are strong, it may not be the best partner for language-centric solutions.
- **Marketing execution:** As noted, Clarifai is still resource constrained in some areas, one of which is marketing. While it does conduct selected marketing via very targeted vehicles, it will continue to be constrained by limited awareness in the market and this will limit its rate of growth to some extent.

Google

Google is a Leader in this Magic Quadrant. It offers services in all three areas evaluated — language, vision and autoML — and delivers them from its public cloud, Google Cloud Platform (GCP). Google emphasizes its commitment to the quality and accuracy of models. Its operations are geographically diversified, and its customers span a variety of industries. GCP also underpins many SaaS offerings from other technology providers. The vendor is actively engaged in open-source communities originated in Google — TensorFlow, BERT and Kubeflow. Lately, Google has increased its solution focus by releasing such offerings as Document AI, Contact Center AI, and Visual Inspection. The vendor is also active in the area of responsible AI.

Strengths

- **Innovation:** Google taps into its research technology, including Google Brain and DeepMind, to innovate across the AI stack. This has resulted in products like Cloud AutoML, Vizier, WaveNet, BERT and Federated Learning. Other innovation examples are feature store, edge inferencing, neural architecture search and purpose-built hardware for deep learning. Select customers directly engage with Google on applied research.
- **Simplicity and cohesiveness of AI services:** Developers without extensive ML expertise can quickly infuse AI into their applications, rapidly prototype and increase the speed of deployments. AutoML offers model management capabilities in a simple point-and-click interface. Google designs its AI services for ease of combination with each other. It also provides ease of integration with other GCP products.

- **Clear and flexible pricing:** Google's pricing reflects its emphasis on a value-driven approach to building AI solutions and maximizing developer productivity. Customers have a choice to pay for specialized models, capabilities, use of pretrained APIs, and for compute and storage. There are also free tier options to ensure that all customers can access Google services.

Cautions

- **Time to market:** Many Google services and innovations linger in beta versions. While customers can experiment with products early in the cycle, doing so requires additional work. Google's pre-GA cycles enable the vendor to deliver on its commitment to high quality and accuracy.

- **Deployment options:** Google does not support some language services for deployments in the private cloud, on-premises or in hybrid on-premises. However, workarounds exist via edge deployment capabilities, Kubeflow and Google's AI Platform Pipelines offering (in beta).

- **Enterprise presence and mind share:** Although Google has a rapidly growing number of enterprise customers, its major competitors have a greater enterprise AI mind share. While many enterprise customers continue to come to Google to experiment and innovate, more enterprises are beginning to build main AI solutions on GCP as well. Google has an especially good opportunity to execute within the retail industry, given the current successes with its retail customers.

H2O.ai

H2O.ai is a Visionary in this Magic Quadrant. Driven by its mission to democratize AI, H2O is known for its widely adopted open-source ML and AI software. H2O Driverless AI is the vendor's commercial offering, intertwined with many open-source add-ons. H2O aims to enable developers to build AI to power applications and services. It plans to further simplify AI for business users and accelerate AI innovation. In its latest development, the organization has significantly enhanced its developers' capabilities via its H2O Wave package, allowing developers to leverage existing pipelines to solve problems and integrate models within external solutions.

Strengths

- **Homogeneity of the platform:** The H2O.ai platform has gained in homogeneity in the last year. From a plethora of pretrained models across language, vision and autoML to the seamless assembly of these capabilities, the H2O platform is both flexible and functional. With H2O-3 (open source), H2O Driverless AI (autoML) and H2O Wave (low-code AI development framework), developers can seamlessly assemble NLP and visual findings and capabilities in existing ML models.

- **Unified app store:** Fostering a large community through meetups while maintaining a diverse app store, the company offers developers the ability to bootstrap their AI development efforts. Users can share models and results across the full functionality and services available on the platform; and this through a cloud-agnostic environment.

- **AutoML thought leader**: Even among the exclusively ML platform pure plays, H2O remains a thought leader in autoML. The company has sharpened its leadership by offering a series of responsible AI capabilities with wide model interpretability and diagnostics capabilities, documentation and operationalization functions. For more advanced developers, there is the possibility to dig into deeper functionalities to open up models and leverage the ML capabilities of the platform.

Cautions

- **Constrained NLP capabilities**: Developers can use many text preprocessing and labeling capabilities through NLP pretrained models and transformer models, but this functionality is principally limited to subsymbolic ML techniques and environments (such as BERT, or embeddings for sentiment analysis). These environments require developers with data science skills.

- **Uneven video and image capabilities**: H2O boasts robust and approachable image analysis capabilities. But its video and OCR functionality are heavily dependent on existing pretrained models that might not leave enough flexibility for the many use cases with which developers are confronted. Users who wish to exploit more flexible video analysis functions might have to consider embedding other capabilities from other libraries. This is possible through the H2O open environment and open-source focus, but requires special coding skills.

- **Limited ModelOps across capabilities**: Despite significant progress and the ability to monitor models through a much wider range of functionalities, the openness of H2O's development platform now requires much deeper and, at the same time, accessible ModelOps capabilities to fully enable developers. The H2O MLOps roadmap is encouraging and should provide a much more functional model government environment in the year to come.

IBM

IBM is a Leader in this Magic Quadrant. An early entrant into the AI market, IBM has a robust offering with services and products that span all segments of the cloud AI developer services market. In addition, IBM has a very strong Research division that is driving innovation and fueling the advancement of its CAIDS offering. IBM has a very strong vertical market strategy with strong presence across multiple geographies. The company also has its own professional services offering, which complicates its partner strategy but gives the company direct insight into the enterprise market needs.

Strengths

- **Product or service**: IBM language services offer strong tooling for the developer. This is especially evident with IBM Watson Knowledge Studio and IBM Watson Discovery, which can streamline the discovery and creation of intents and entities to facilitate the creation of custom virtual agents. In

addition, IBM Maximo Visual Inspection offers developers strong capabilities to build custom image inspection and video content analysis solutions with an easy-to-use tool.

- **Market understanding:** IBM has demonstrated a good understanding of the CAIDS market. Its portfolio of services is strong and addresses the needs of the market, with a focus on best practices and delivering strong solutions to developer customers. The tooling is very developer friendly and gives developers a combination of low-code and coded development assets that allow them to build solutions rapidly.

- **Overall viability:** The robustness of its CAIDS offering, combined with a very strong geographic strategy and vertical market focus, gives IBM insight into the best practice capabilities needed by developers in a wide range of use cases. This breadth of understanding, coupled with a bold AI strategy, allows the vendor to offer tools and services that are well-suited to the developers who use the IBM services.

Cautions

- **Sales strategy:** IBM has a sales strategy that is somewhat confusing for developers. One of its preferred partners is its Global Business Services arm, which in some cases will be seen as directly competitive to independent development firms.

- **Product or service:** While IBM's overall offerings are comprehensive and competitive, they are not on a par with those of some of the other providers in this Magic Quadrant, especially in autoML tooling. IBM's offering in the data preparation and feature engineering areas can be considered sufficient, but not best in class for capabilities such as data cleansing and automatic labeling. Additionally, the sentiment analysis for language models is lacking some advanced features.

- **Sales execution/pricing:** Some customers state that IBM pricing can be perceived as excessive, with high transaction costs over the course of a project.

Microsoft

Microsoft is a Leader in this Magic Quadrant. Microsoft's Azure AI platform offers a comprehensive offering for ML, computer vision and natural language. The offering is suitable for both developers and nondevelopers. Microsoft's familiarity to many enterprise developers gives it an advantage in the enterprise market due to an existing relationship. Developers are used to working with the company's tools. Microsoft embeds many of its AI capabilities into its commercial products with everyday AI features. It also contributes to the development of standards and guidelines for best practices associated with AI, including the responsible use of AI.

Strengths

- **Product or service:** Microsoft continues to enhance its cognitive services, ML and autoML portfolio, which applies to multiple personas: data scientist, developer and citizen data scientist.

The Azure Machine Learning designer offers a visual flow design tool to connect datasets and modules to create, test, train and deploy pipelines and ML models. Cognitive services provide stand-alone and customizable models for speech, language and vision.

- **Market understanding:** Microsoft is among the more flexible providers of CAIDS in terms of deployment options. Its services are deployable in the Azure cloud, a virtual private cloud or on-premises via containers, based on enterprise customers' needs. Microsoft also integrates services with extended systems and devices with its intelligent edge options.

- **Innovation:** Microsoft continues to advance its industry-leading natural language functions, recently adding neural voice for text to speech in 49 languages and expanding its Azure Cognitive Search capabilities. It has also clarified its conversational AI offering with a developer-focused approach based on Bot Framework, and a business-user-focused approach based on Power Virtual Agents. These two options can be combined in a single solution as needed.

Cautions

- **Marketing strategy:** Microsoft focuses its citizen developer AI offerings on its Power Platform; for instance, PowerBI and Power Virtual Agents. While Power Platform has prebuilt connectors to industry systems, the separate positioning of the citizen platform may force upon companies an enterprise roadmap for which they were not planning.

- **Sales execution/pricing:** While Microsoft offers a free initial price tier and trial period for Azure AI and Power Platform, enterprises planning projects should model the expected production loads to better anticipate the costs once the trial period is over. This is particularly true with multicloud implementations.

- **Market responsiveness:** Microsoft delivers AI services predominantly via its partner network and selectively engages directly with enterprises to develop solutions. This approach is not unique to Microsoft, but it can nevertheless prove challenging for organizations new to developing cloud solutions themselves.

Oracle

Oracle is a Niche Player in this Magic Quadrant and a new entrant this year. Oracle has an aggressive roadmap for its 2021 capabilities. However, the current offering is clustered around Oracle Digital Assistant, extended with microservices. Other CAIDS offered include speech to text and text analytics. Oracle clients for CAIDS are based in North America, Europe, Asia/Pacific, Latin America and the Middle East. To date, clients are exclusively large enterprise development teams. Customized versions of some services are available for verticals that include banking, telecom, education, government, healthcare, manufacturing, retail, professional services, technology, transportation and logistics.

Strengths

- **Innovation:** Oracle has a very well-developed stack for speech, language and conversational services, using both deep learning and semantic tools. Language-related APIs share common components, while models provide greater reuse of components and consistency in dataset across modalities.
- **Customer experience:** Customers using Oracle services such as Oracle Digital Assistant report strong satisfaction with functionality, consultancy, delivery and overall vision.
- **Market understanding:** Oracle has a market vision that combines data and low-code tools to deliver developers with tooling that is both accessible and powerful. The company states that it believes “data replaces the programming language.”

Cautions

- **Business model:** Oracle’s CAIDS are commonly provided and priced as part of embedded experiences inside existing Oracle applications. However, Oracle Digital Assistant is available as part of the Oracle Cloud Infrastructure (OCI) cloud for developers. While Oracle’s CAIDS are built on top of the data science platform, the services are often tightly coupled with APIs to Oracle environments and may require additional effort when integrating with other applications.
- **Product or service:** Oracle falls far short of having a full set of CAIDS and does not yet support many features such as natural language generation (NLG), text to speech, translation, video analysis, OCR, feature engineering and automated model building. Oracle has a strong deep learning stack for natural language services. But it must deliver on its ambitious roadmap for 2021 to gain parity with some of the other enterprise software vendors in this group.
- **Geographic strategy:** While Oracle has broad geographic coverage, it has limited language support within CAIDS, with only nine languages supported for NLU. The company does have plans to expand the languages it supports in 2021.

Prevision.io

Prevision.io is a Niche Player in this Magic Quadrant. Its offering includes Data Studio to create and deploy models, and enterprise AI as a service with App Exchange to use AI models and maintain them in production in the cloud or on-premises. Prevision’s cloud AI developer services is especially strong in autoML, with increasing language and vision analytics capabilities. While the focus of Prevision is on delivering enterprise-grade solutions, it also innovates by aiming at automating the construction of quantum ML models. The company’s customers span various industries. In the past year, Prevision has introduced vertical AI offerings for banking and finance, transportation, energy and retail.

Strengths

- **Ease of use and implementation:** The Prevision platform is attractive to customers seeking a streamlined, end-to-end AI applications life cycle, even if they lack AI skills. Prevision provides a friendly environment for developers, where they can use pretrained ML models, create new ML models or build AI applications. Despite its simplicity, the platform provides sophisticated ML and continuous delivery capabilities.

- **Model management and monitoring:** The Prevision AI App Exchange is an innovative way of implementing model management and monitoring capabilities, where business users can access internally developed and prebuilt (by Prevision) AI models, apps, recipes, notebooks and data packs for industries. The growing number of pretrained solutions accelerates customers' AI projects.

- **Cloud partnerships:** Prevision partners with cloud providers such as Microsoft Azure, AWS, Google Cloud and Alibaba Cloud to make its offering available on the customer's cloud platform of choice. Some partners also contribute their solutions to the Prevision AI App Exchange.

Cautions

- **Limited geographic presence:** Prevision operates mainly in Europe (where it has an impressive list of customers across multiple industries). In 2020, the company expanded to North America and aims to expand globally.

- **Incomplete AI services offering:** Although Prevision introduced NLU and text similarity in 2020, most other language AI services are currently not offered. For vision services, only image recognition is currently offered. The company plans to partially fill these gaps in 2021.

- **Pricing:** Enterprise customers prefer a greater pricing flexibility than Prevision currently offers. The company intends to address this demand in 2021.

Salesforce

Salesforce is a Niche Player in this Magic Quadrant. It offers embedded, preintegrated AI capabilities in its cloud offerings which can be used by business people and developers. Einstein AI's autoML, vision, natural language, prediction, discovery and next best action functions are embedded within the vendor's commerce, marketing, service, sales and search solutions. The Einstein AI offering is different because it is not intended as a general purpose CAIDS platform, but rather is targeted at Salesforce administrators and users. Similarly, the no-code goal is to put AI broadly into the hands of CRM and front-office users. This approach is unique among the vendors in this Magic Quadrant.

Strengths

- **Market strategy:** Salesforce is a market leader in providing a simple, democratized approach to developing AI capabilities. It offers embedded, pre-integrated AI functions within the Salesforce Cloud solutions that require no technical or development skills to deploy. Some of the advanced AI

functions offered in its Einstein Platform target administrators and business developers. The Salesforce Trailhead e-learning platform offers a way for citizen developers to acquire needed AI skills.

- **Product or service:** A distinguishing feature of the Salesforce Einstein Platform is its ML pipeline. The predictions, training and testing data reside in the same environment, where the predictions are built and the results are returned. These are all based on the same Salesforce objects (tables and fields). These capabilities are largely built into the platform and operate without user intervention.
- **Market responsiveness:** Salesforce provides guidance on how to ensure the quality of predictions, and on reducing bias in training data. The platform is configured to make it easy for users to identify and adjust for bias in prediction models.

Cautions

- **Sales execution:** Enterprises with needs beyond Salesforce's core customer-centric use cases may require supplementary services from other vendors. Salesforce's overall AI services portfolio is much slimmer than those of other vendors in this Magic Quadrant. The developer-focused capabilities are confined to Einstein Platform Services, which provides only targeted services, not a full AI portfolio.
- **Sales strategy:** Pricing and packaging for Salesforce Einstein's AI-related services is multifaceted. The pricing and packaging is based on different SKUs depending on who the users and buyers are, and the cloud service involved. This results in six SKUs: sales, service, marketing, analytics, prediction, and vision and language. Many Einstein Platform functions, such as APIs, are billed on a usage basis. Users should verify that their specific needs can be met with the package being purchased.
- **Customer experience:** While some of Einstein AI's services are transparently integrated with the core product, users should not underestimate the complexity of developing and operationalizing ML solutions for their needs. Customers planning to use the AI services should anticipate a significant learning curve before they can use many functions. AutoML, Recommendation Builder with NBA, or Einstein Form Reader will all require advanced skills. The Salesforce Trailhead tutorials are intended to assist in gaining needed skills.

Tencent

Tencent is a Niche Player in this Magic Quadrant. A top 10 company in terms of market capitalization, it is perhaps best known as the world's largest gaming company, and for its billion-user WeChat and QQ messaging, social media and mobile payment applications. It has hundreds of subsidiaries in numerous industries and is one of the world's largest venture capital companies. Tencent launched its AI Lab in 2016 and opened an AI research center in Seattle, Washington, U.S.

This exposure to innovation sources, implemented solutions, consumer platforms and an array of multimedia data gives Tencent the ability to develop advanced scalable capabilities.

Strengths

- **Powerful computer vision services:** Extensive AI resources for gaming, vision, and other products and services gives Tencent a strong base to experiment and perfect its components' functionalities. From multiple video services (including face recognition, human body analysis and sentiment analysis) to image manipulation and analysis, including robust OCR capabilities, Tencent offers a rich computer vision portfolio.

- **Wide NLP portfolio:** In the languages that Tencent covers (mainly Asian languages, except in translation where the company has a wider set), developers can expect solid and scalable capabilities and the ability to train models on a large amount of available data. Through its aggressive pricing strategy, developers can develop large prototypes and therefore test the scalability of their approaches. Tencent also organizes competitions for developers to not only boost the usage of the platform, but also ultimately share that experience among developer communities.

- **Expansive platform reach:** In leveraging the presence of Tencent in consumer businesses through analytics and operations, the company has developed one of the broadest ecosystems in the market. Tencent also has a strong partnership program, not only with service providers and other software platforms, but also with existing clients of various sizes in different industries, many of which are accessible to developers. This extends its access to a wide array of domain expertise and technical services.

Cautions

- **Limited ML capabilities:** Tencent's autoML capabilities remain limited compared with the rest of its technology portfolio, and the majority of its competitors in this Magic Quadrant. Most of its ML services are oriented toward knowledgeable ML practitioners. Developers will need strong data science competencies to take advantage of Tencent's ML services.

- **Asian-market resources focus:** The company is essentially focused on the Asian markets and principally China. This is reflected not only in its go-to-market strategies, but also in its language products. When it comes to sentiment and text analytics, for example, the company offers those services only in Chinese.

- **A heterogenous set of services:** Some of Tencent's AI services are easily accessible and can be easily tested, even at scale (for example, most of its computer vision services); others are much more challenging (for example, autoML). This heterogenous experience is true from an individual service perspective, but even more acute if developers want to mix services in the same solution. The company will have to make significant investment to bring all of those components under a single platform umbrella and then harmonize the experience across services.

Vendors Added and Dropped

We review and adjust our inclusion criteria for Magic Quadrants as markets change. As a result of these adjustments, the mix of vendors in any Magic Quadrant may change over time. A vendor's appearance in a Magic Quadrant one year and not the next does not necessarily indicate that we have changed our opinion of that vendor. It may be a reflection of a change in the market and, therefore, changed evaluation criteria, or of a change of focus by that vendor.

Added

- **Baidu** — We changed the inclusion criteria for this year's CAIDS Magic Quadrant to allow for vendors that only serve one geographic region. This allowed us to consider Baidu.
- **Alibaba** — We changed the inclusion criteria for this year's CAIDS Magic Quadrant to allow for vendors that only serve one geographic region. This allowed us to consider Alibaba.

Dropped

- **SAP** — SAP changed its AI strategy to move to embedded capabilities in its applications and platform. Due to this change, it discontinued offering CAIDS.

Inclusion and Exclusion Criteria

To qualify for inclusion, each vendor had to:

- Demonstrate a go-to-market strategy for cloud AI developer services (CAIDS).
- Offer a functional set of automated machine learning (autoML) services that can create functioning ML models (as outlined below).

Vendors may also offer any of the language services and vision services as listed below.

Language Services

- **Speech to text or automatic speech recognition (ASR)** — This service is a subset of computational linguistics that will take analog input and convert it to text output. This text output can be the final product, or it can be entered into an NLU model so that metadata can be extracted. Many computing devices have some ASR capability built into the devices, such as personal computers and smartphones.
- **Natural language understanding (NLU)** — This service is a subset of natural language processing (NLP) that deals with machine comprehension. It takes textual input and extracts metadata from the text. Extracting metadata is relatively straightforward, but being able to understand the intent of the person entering the text is challenging and often requires supplemental models. These

models can be built using semantic techniques, deep neural network models or a combination of both. NLU is often used as part of a chatbot or virtual assistant solution.

- **Chatbot virtual assistant frameworks/dialogue management —** These frameworks allow enterprises and/or their partners to build models that supplement the hosted language services by allowing enterprises to add domain-specific learning to support the specific use cases needed by the business.
- **Natural language generation (NLG) —** Services that create natural language from a machine representation such as concepts, datasets or minimal descriptions in a knowledge base or a logical form, such as a return form that generates a letter to the customer. The body of text delivered in a natural language form can be thought of as translating data to language.
- **Text to speech —** This service converts textual input into analog output or speech. This can be done via normal conversion of text to speech or via symbolic linguistic representations such as phonemes.
- **Translation —** This service takes text input from the source language and converts it to a target language as output. This is a very challenging task as it is not just translating one word to the corresponding word in another language. Differences in language structure make accuracy of this service very challenging to achieve.
- **Sentiment analysis (emotion AI) —** This service analyzes the words that are typically entered into a conversational or social model to analyze the language for positive, negative or neutral sentiment based on the words that are chosen by the user. This service may be supplemented by other services that analyze the tone of analog inputs.
- **Text analytics —** This service analyzes unstructured text using algorithms to extract elements — such as concepts, topics and keyword attributes — and add these as metadata.

Vision Services

- **Image recognition —** This service normally identifies what objects or people are contained in an image. Some implementations can also identify attributes of the elements in the image such as color or patterns. A common use for this service is to identify whether people are in the image, or items of interest, and adding metadata to classify or tag the images.
- **Video content analysis —** This service normally combines image recognition and automated speech recognition to identify people and objects in the video, as well as creating a transcript for the audio portion of the video. Some services also identify objects or people in the video and track direction for the people across multiple frames of the video.

- **Optical character recognition (OCR)** — This service converts electronic images of typed, handwritten, printed text or text in images or video into machine-encoded text and adds metadata to the content.

Automated machine learning (autoML)

These services allow people without significant ML or data science skills to customize the services listed above or build purpose-specific ML. In using autoML services, developers can create custom models or supplemental models to be used in conjunction with the existing general services.

These services can include the following:

- **Automated data preparation** — This service can prepare the datasets to be used for training of the models. It can cleanse and augment datasets from the raw data that is provided by the enterprise.
- **Feature engineering** — This is a service that adds metadata to the dataset that is submitted to the provider. This augmentation can be done via the use of crowdsourcing capabilities or via ML models that evaluate the data and add metadata to the submitted dataset in an automated manner. The feature may also allow for automated detection and classification of features and the generation of new features from existing ones.
- **Automated model building** — These models require the users to provide datasets that can be used to train the models. In addition to the raw data, users must provide datasets that include metadata tags that have the attributes they want the models to be trained to identify. They must also identify the variable that they want the model to predict. This autoML service analyzes the data and evaluates and recommends or selects the potential algorithms that can be used to build and optimize the model based on the best results. The service automatically optimizes the performance and accuracy of the model by tuning the hyperparameters of the model. The service may also blend algorithms to optimize model performance.
- **Model management** — This service provides analytics and, in some cases, allows for corpus management for data used to train models to ensure that models continue to perform optimally. The service may provide automated training of the model by creating training, validation and testing datasets. The service may also select optimal hyperparameter values.
- **Model deployment** — This service may offer model factory functionality to automate the building of ML pipelines, including model training, deployment, monitoring and management of models in production. The service may also provide for packaging and provisioning of the infrastructure for the models created. This service should also automate the creation of APIs needed to access the models.

Additionally, at a minimum, each vendor was required to fulfill one of the following criteria:

Either:

The vendor must have at least $15 million annual revenue in 2019 from its CAIDS offerings.

Or:

The vendor must have added at least 50 paying enterprise customers for its CAIDS in 2019.

We excluded vendors that:

- Did not offer autoML services in their CAIDS offering.
- Only offered these services as part of a professional services contract, where the services are used exclusively by the vendor's consultants.
- Offered services that were not native services created and delivered by the vendor.

Evaluation Criteria

Ability to Execute

Product or Service: Core goods and services offered by the vendor for the defined market. This includes current product/service capabilities, quality, feature sets, skills and so on, whether offered natively or through OEM agreements/partnerships as defined in the market definition and detailed in the subcriteria.

Overall Viability: Viability includes an assessment of the overall organization's financial health, the financial and practical success of the business unit, and the likelihood that the individual business unit will continue investing in the product, will continue offering the product and will advance the state of the art within the organization's portfolio of products.

Sales Execution/Pricing: The vendor's capabilities in all presales activities and the structure that supports them. This includes deal management, pricing and negotiation, presales support, and the overall effectiveness of the sales channel.

Market Responsiveness/Record: Ability to respond, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customer needs evolve and market dynamics change. This criterion also considers the vendor's history of responsiveness.

Marketing Execution: The clarity, quality, creativity and efficacy of programs designed to deliver the organization's message to influence the market, promote the brand and business, increase awareness of the products, and establish a positive identification with the product/brand and organization in the minds of buyers. This "mind share" can be driven by a combination of publicity, promotional initiatives, thought leadership, word of mouth and sales activities.

Customer Experience: Relationships, products and services/programs that enable clients to be successful with the products evaluated. Specifically, this includes the ways customers receive technical support or account support. This can also include ancillary tools, customer support programs (and the quality thereof), availability of user groups, service-level agreements and so on.

Operations: The ability of the organization to meet its goals and commitments. Factors include the quality of the organizational structure, including skills, experiences, programs, systems and other vehicles that enable the organization to operate effectively and efficiently on an ongoing basis.

Table 1: Ability to Execute Evaluation Criteria

Evaluation Criteria	*Weighting*
Product or Service	High
Overall Viability	Medium
Sales Execution/Pricing	Medium
Market Responsiveness/Record	Medium
Marketing Execution	Medium
Customer Experience	Medium
Operations	Medium

Source: Gartner (February 2021)

Completeness of Vision

Market Understanding: Ability of the vendor to understand buyers' needs and translate these needs into products and services. Vendors that show the highest degree of vision listen to and understand buyers' wants and needs, and can shape or enhance those wants with their added vision.

Marketing Strategy: A clear, differentiated set of messages consistently communicated throughout the organization and externalized through the website, advertising, customer programs and positioning statements.

Sales Strategy: The strategy for selling products that uses the appropriate network of direct and indirect sales, marketing, service and communication affiliates that extend the scope and depth of market reach, skills, expertise, technologies, services and the customer base.

Offering (Product) Strategy: The vendor's approach to product development and delivery that emphasizes differentiation, functionality, methodology and feature sets as they map to current and future requirements.

Business Model: The soundness and logic of the vendor's underlying business proposition.

Vertical/Industry Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of individual market segments, including vertical markets.

Innovation: Direct, related, complementary and synergistic layouts of resources, expertise or capital for investment, consolidation, defensive or preemptive purposes.

Geographic Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of geographies outside the "home" or native geography, either directly or through partners, channels and subsidiaries, as appropriate for that geography and market.

Table 2: Completeness of Vision Evaluation Criteria

Evaluation Criteria	*Weighting*
Market Understanding	Medium
Marketing Strategy	Medium
Sales Strategy	Medium
Offering (Product) Strategy	High
Business Model	Medium

Evaluation Criteria	*Weighting*
Vertical/Industry Strategy	Medium
Innovation	High
Geographic Strategy	Medium

Source: Gartner (February 2021)

Quadrant Descriptions

Leaders

Leaders have robust offerings in all three key service areas: language, vision and autoML. Their services are API-accessible and do not require developers to have data science expertise. Leaders also have ancillary services that support or enhance the capabilities of their core services. Leaders serve multiple geographies and support multiple languages.

Challengers

Challengers are often large businesses with substantial assets. They may have the resources to invest significantly in services, but limited portfolios because of other priorities that compete for their attention and resources. Challengers may operate and even be dominant in one geography.

Visionaries

Visionaries are most commonly, but not exclusively, focused on autoML, as this segment is viewed as the most important for application leaders and development organizations. Their autoML services facilitate customization of ML models. These models can be developed to deliver predictions, classifications, next-best-action recommendations and numerous other uses that can enhance applications being delivered by enterprises. Some Visionaries may be enjoying strong growth but are still smaller than the dominant vendors in the market.

Niche Players

Although one might expect Niche Players to offer only language or vision services, this Magic Quadrant requires providers to have autoML services, with language and vision services being optional. Providers that offered only language and/or vision services were therefore excluded from

evaluation. Niche Players may have limited penetration outside their home region or they may have a narrower scope for the services and products that they offer. Additionally, Niche Players may be resource constrained.

Context

This Magic Quadrant excludes vendors that do not offer automated machine learning services. This is because most developers want autoML services to create or customize the ML models they need. Having a single vendor that also offers language and vision services in addition to the autoML services is a plus for developers that are looking to avoid managing too many different vendor relationships. However, Gartner chose to include vendors that offer only autoML services, as these services can be used for any use case that a developer requires and, as a result, potentially offer the greatest value for development teams. Most development teams will not build ML models themselves and will rely on either autoML services to build models or rely on a combination of AutoMl and in-house models built by a data science team. In addition, development teams are likely to want to move fluidly from enabling applications with language-based services, to doing the same with vision-based services and custom models, with no continual emphasis on one type of service.

For enterprises that need only language services or only vision services for specific purposes, several providers not evaluated in this Magic Quadrant could prove valuable partners. If development teams plan to eventually use all services considered in this Magic Quadrant, they might consider starting with the vendors in the Leaders quadrant with the broadest portfolio of services. Having multiple vendors is not out of the question, however.

Enterprises that want to use ML services or models in the Chinese market should consider Alibaba Cloud, Baidu and Tencent, as their strengths are in this market and they are all well-established.

The reason this Magic Quadrant focuses on three types of service — language, vision and autoML — is that these services are the most mature. There are, however, many custom AI and ML services that focus on specific use cases, where models are built to address a predefined need or use case. Many of these models may be of interest to development teams. But there are too many such offerings to discuss in this Magic Quadrant. Each should be evaluated on the merits of the particular capabilities of the models delivered.

Market Overview

The role of application developers is changing in response to the increasing use of artificial intelligence (AI) and machine learning (ML). The models built with these technologies can classify information, predict trends, assess risks, automate processes, and improve the business across all functional areas and all workflows.

One of the best ways to enhance existing applications or create new categories of applications is to use ML models to add functionality or automate processes that are currently done manually. The

services evaluated in this Magic Quadrant allow developers to do that. The rising number of Gartner inquiries about AI or ML, and from developers in the inquiry, is evidence of increasing interest in the topic.

Developers have “assembled” applications for some time by combining hosted services, using prebuilt modules and components and templated front-end designs. Increasingly, developers are adding API callable ML models to the mix of elements that they use to build compelling applications. As developers become more familiar with these AI and ML models and the functionality that they can add to applications, they will increasingly take on the role of model ops. They will be responsible for model monitoring and management in the applications where they are deployed. While it is unlikely that the majority of developers will take on data science responsibilities, they will use these models to add features previously unavailable to the applications they have built.

Developers will build conversational agents, extract information from or add metadata to unstructured text or image assets. They will build ML models that suggest next best actions and forecast prospects’ propensity to purchase or automate decision making for business workflows. All of these development efforts can be done without turning developers into data scientists by using the products and services that are offered by the vendors in this Magic Quadrant.

Gartner believes that enterprise development teams will increasingly incorporate models built using AI and ML into applications. These services currently fall into three main functional areas: language, vision and automated machine learning (autoML). The language services include natural language understanding (NLU), conversational agent frameworks, text analytics, sentiment analysis and other capabilities. The vision services include image recognition, video content analysis and optical character recognition (OCR). The autoML services include automated tools that will let developers do data preparation, feature engineering, create models, deploy, monitor and manage models without having to learn data science.

Evaluation Criteria Definitions

Ability to Execute

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