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PRACTICAL USAGE OF DATA SCIENCE MODELS IN BUSINESS PROCESSES

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Abstract. The paper address various aspects of productization of data science models in business applications. Process integration includes among others building trust into artificial intelligence. Technical integration has to take in account model quality and concept drift. The paper gives an overview of different possibilities to use artificial intelligence in SAP products such as SAP Conversational AI, SAP Intelligent Robotic Process Automation, SAP Data Intelligence, based on SAP HANA database. Some practical examples from different application areas help understand advantages and challenges of using AI in business applications.

Key words: artificial intelligence; machine learning; data science model; automated document creation; visual inspection**.**

INTRODUCTION

The important step in usage of data science models in business application is productization of the model. For prototyping purposes notebooks can be used, but it doesn't scale for production. Not only version control repository manager (e.g. GitHub or GitLab) should be in place, the complete lifecycle management system is required. Another important aspect, which needs to be considered is data quality. Even data used for prototyping is similar to data available in production, reading data from backend could be a challenge. Using open source or hybrid approaches, combining open-source algorithms and commercial software packaging, can lead to problems in the future. Application has to fulfill certain product standards and it should be fully integrated into business process and user flow [1]. For successful Artificial Intelligence (AI) project close cooperation between domain experts, data scientists and software engineers is required (Fig. 1).

PROCESS INTEGRATION

Some typical examples of process integration are automation of manual steps, predictive maintenance or decision-making support [2]. If, for example, machine learning (ML) is used to automate some previous manual steps, it is important, that user has trust in AI. To build the trust it is recommended to start with proposal process. In this case user is still responsible for the decision but gets support by AI. Next step, if the model is getting better and trust in AI is increasing, user can observe the process and react only in critical situations, if AI send kind of alert. Final goal of such process integration would be full automation without user interact.

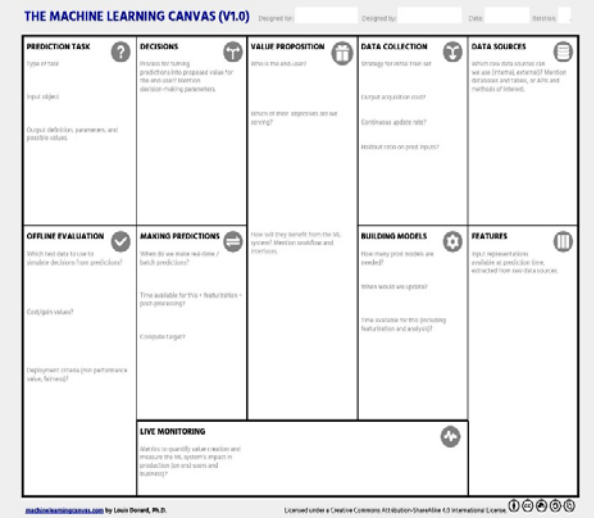

Fig. 1. Communication tool for expert cooperation

Another possibility is to change the maintenance process by introducing ML. Usually the process is based on regular checks. By the new process sensors information is taking into account and maintenance is triggered not because the regular interval is over, but by unusual situation on the machine behavior or in case if failure can happen in foreseeable future.

In both cases building trust in the AI is an important aspect for business applications. Explainable AI helps user to understand why certain decision was made. In scenario of maintenance, user want to understand why model proposing specific conclusion and what parameters are important for the model.

In addition, AI ethics needs to be considered by embedding ML in business processes. Recognizing the significant impact of artificial intelligence on people and society, SAP designed guiding principles to steer the development and deployment of AI software [3].

TECHNICAL INTERGATION

One of the important aspects in the technical integration is model quality. Overtime, concepts used by learning of the model are changing. For example, for computer virus classification antivirus programs learned certain classification of viruses. Virus programmers try to adopt virus in the way, that they will be not detected by antivirus program. Target of classification changes is called model drift (Fig. 2). Viruses are changing over the time and model can't detect them anymore. Option with respect to model quality is retrain the model and activate the new model [4]. For such operations lifecycle management system is required.

SAP intelligent scenario lifecycle management system is a framework that allows to perform lifecycle management operations on machine learning scenarios.

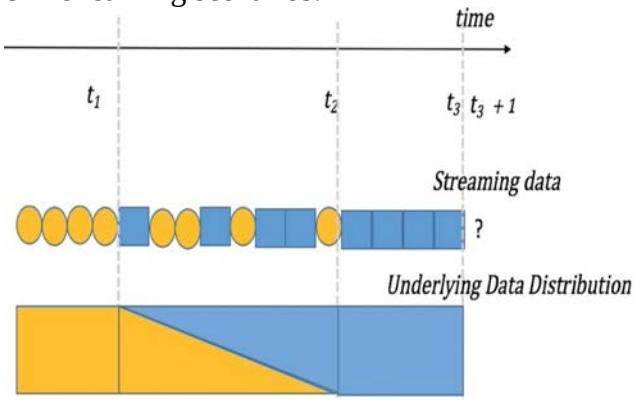

Fig. 2. Model drift

SAP ARTIFICIAL INTELLIGENCE

Currently SAP offers different possibilities to use artificial intelligence in the products.

SAP Conversational AI provides customers and employees experiences using chatbots and take the lead in the conversation-driven economy [5]:

– an end-to-end bot building platform allows to train, build, connect and monitor intelligent chatbots in any language;

– SAP product chatbots and a unified enterprise digital assistant are used to provide conversational interfaces for the entire SAP portfolio.

SAP Intelligent Robotic Process Automation leverages robotic process automation, machine learning, and conversational AI in an integrated way to automate business processes [6]. SAP Intelligent Robotic Process Automation services can be used to:

– reduce manual activities, respond to customer needs proactively, and make smarter decisions;

– accelerate integration with SAP applications like S/4HANA and Intelligent Business Process Management (IBPM) with preconfigured content and bots.

SAP Data Intelligence helps to manage machine learning model performance and lifecycles automatically, so information technology and data science teams can focus on higher value tasks. It allows to scale artificial intelligence enterprise-wide while connecting the data regardless of its location or type, to enable next-generation information management [7].

SAP HANA is the all-in-one, in-memory data platform that can natively process transactions and analytics on any data type [8]. The in-database machine learning capabilities enable AI and ML to become part of the business process by operating with minimal execution latency and in real time. SAP HANA has:

– 90+ built in business algorithms;

– integrations with TensorFlow + R + SageMaker;

– streaming and live data support;

– embed into business process;

– services to build custom spatially aware business applications with optimized industry solutions, across all business processes;

– intelligent Business Process Management.

All this allows improve business process productivity, transform paper-based processes into digital assets, provide intelligent automation of structured workflows, decisions and tasks, optimize with process intelligence and insight to action, and improve business process experiences and flexibility.

PRACTICAL EXAMPLES

One of examples of using ML in business applications is **Automated Creation of Sales Orders from Unstructured Data** (SAP S/4HANA Cloud Sales). A significant amount of sales orders are captured from email, fax, PDF or other unstructured format. To generate the sales order, internal sales representative have to enter these data manually in the structured format as required by the system. Automated creation of Sales Orders from unstructured Data leverages a machine learning based recognition engine, based on SAP's Document Information Extraction service to extract content from an unstructured source format (email, pdf, fax, etc.) and creates a draft sales order autonomously. It allows.

– cost savings by reducing manual effort to create sales orders;

–Improvement of data quality by sales order process automation;

–automation shifts effort towards better service quality.

Another example is related to calculating of **Predicted Delivery Date for Stocks in Transit** (Fig. 3). Transferring stock among storage locations or plants is a business scenario which applies for most customers. For the latter case it is necessary to create stock transport orders. With the app "Overdue Materials – Stock in Transit" it is possible for customers to track materials in transit/open stock transport orders for which no goods receipt has been posted by the receiving plant yet and which have e.g. already exceeded the estimated time in transit allowing the business user to take action. With embedded ML the app was enhanced with 'Predicted Shipment Dates' for each Goods Movement to allow Users to take action and manage delivery delays.

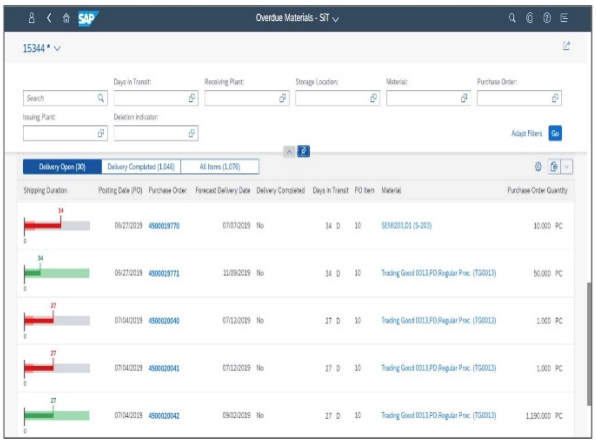

Fig. 3. Predicted Delivery Date for Stocks in Transit

SAP Digital Manufacturing Cloud for Insights Predictive quality offers **Visual Inspection** (Fig. 4).

Machine learning models assist operator on the shop floor to execute visual inspection tasks of manufactured products. Using a Production Operator Dashboard, it simplifies the identification of defects and logging the right Nonconformance to ensure defective parts are handled as business requires.

Key Capabilities of the application are:

– upload pre-trained machine learning model and deploy it to shop floor supporting the operator on visual inspection tasks;

– capture images of manufactured products inspected by the machine learning model;

– assist operator to identify defects and log the right Nonconformance using the machine learning model;

– create custom production operator dashboard with visual inspection plugin;

– very performant edge inference: Machine learning model runs on the shop floor locally and does not require image to be send to the cloud.

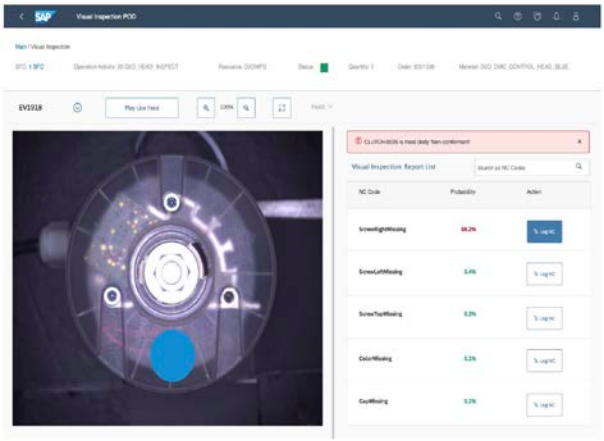

Fig. 4. Predictive quality: Visual Inspection

SAP Cash Application intelligently learns matching criteria from the history, reads and processes payment advice documents, and automatically clears payments with minimal intervention.

It allows lower manual efforts by automatically extracting remittance information from unstructured advices (email, PDF, paper, etc.) to enhance payment matching.

Intelligently matches of lockbox payments to open receivables and enriches missing or incomplete fields helps to maximize automatic clearing (Fig. 5).

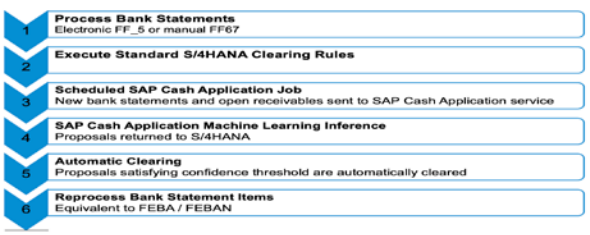

Fig. 5. Line Item Matching Process Overview

ML proposals appear in Reprocess Bank Statement Items Fiori app, seamlessly integrated with the standard process. Explainable AI shows which features influenced the match, making proposals actionable and automatic clearings auditable.

Technically the solution consists in a bundle of cloud services to simplify the process of bank statements clearing (table 1).

Table 1

Machine Learning Services

Service	***Purpose***
Receivables Line-Item matching	Provides proposals for matching open receivables with bank statements
Receivables Line-Item matching for Lockbox	Provides proposals for matching open receivables with incoming Lockbox files
Payables Line - Iem matching	This service is to match vendor initiated payments
Payment Advice Extraction	It is the service to extract unstructured payment advices and return structured payment information
Customer Account Identification	Provides proposals to identify the payer of a bank statement item

The solution combines the best of both automation worlds:

– use the enhanced reprocessing rule engine to process predictable transactions such as general ledger (GL);

– leverage ML for sophisticated matching.

CONCLUSION

In this paper some challenges of using AI in business applications were considered. Different possibilities to use artificial intelligence in the products are offered by SAP such as Conversational AI, Intelligent Robotic Process Automation, SAP Data Intelligence and SAP HANA. The journey is started with some practical examples of using AI in following business applications: Automated Creation of Sales Orders from Unstructured Data, Predicted Delivery Date for Stocks in Transit, Visual Inspection, SAP Cash Application. Further work is related to using ML capabilities in other business applications according to SAP AI Innovation Road Map.

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МЕТАДАННЫЕ

Название: Практическое использование моделей Data Science в бизнес-процессах.

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Аннотация: Рассматриваются различные аспекты производства научных моделей данных в бизнес-приложениях. Интеграция процессов включает, среди прочего, укрепление доверия к искусственному интеллекту. Техническая интеграция должна учитывать качество модели и дрейф концепции. В документе дается обзор различных возможностей использования искусственного интеллекта в продуктах SAP, таких как SAP Conversational AI, SAP Intelligent Robotic Process Automation, SAP Data Intelligence, на основе базы данных SAP HANA. Некоторые практические примеры из разных областей применения помогают понять преимущества и проблемы использования ИИ в бизнес-приложениях.

Ключевые слова: искусственный интеллект; машинное обучение; модель науки о данных; автоматическое создание документов; визуальный контроль.

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