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MEISTER SMART™ BUSINESS APPLICATIONS FOR SAP WHITE PAPERS: AUTOMATION

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Gateway Architects Product Document

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Overview

Automation is one of the widely used technical terms that could mean anything from a single program that performs a repetitive process to a quasi-heuristic neural network capable of learning and augmenting its power with newly learnt information. In this white paper, we analyze the steps which Meister takes to go from the simplest automation processes and the path towards machine learning using the existing SAP ecosystem present at the environment without the need of Hana support.

Meister introduces automation in various ways, Smart cRPA as a form of automation of existing tasks driven by outside RPA frontends, to preemptive analytics to preemptive caching, and finally to machine learning.

Analytics as a tool – Preemptive Analytics

Although SAP has a concept of user profile, it is mostly used to provide authorization to execute a given line of business with profiles and roles. It does not, at least insofar as the set of modules are concerned, provides a holistic baseline to learn user habits and derive contextual knowledge from this learning curve. Meister introduces a process which, based on a user or an organization unit containing users, learning could be achieve by means of directives to the analytics engine. Consider for instance a user, say AROSENTHAL, which is enabled to perform certain line of businesses tasks as defined by the user profile and roles. Meister is capable of inspecting the given user and finding out what kinds of things have been done at SAP by this user, and figure out how to expedite these tasks based on the user's habits and choices.

Assume, for the sake of completeness, that a given user AROSENTHAL belongs to the Supply Chain group and within this group, it operates on a given asset which could be an oil field in North Dakota or a plant in Oklahoma. The user also creates purchase orders and requisitions on a regular basis.

Let the set of operations by this user be the set $S(f^i, g^j)$ where each function f^i and g^j represent an action done defined as follows:

$$f^i(I,O) \;=\; \sum_{k=1}^{i} \begin{pmatrix} a & b \\ c & d \end{pmatrix}^i \;\; and \;\; g^j(I,O) \;=\; \sum_{k=1}^{j} \begin{pmatrix} a & b \\ c & d \end{pmatrix}^j$$

Equation 1

$$where\ each\ matrix\ element\ x\ is\ a\ linear\ system\ whose\ inputs\ belong\ to\ set\ S(i)\ , i \geq 1$$

The matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is nothing else but a (perhaps dynamic) linear system where the matrix elements are the variables of the learnt operation for a given $S(i)$ producing a $S'(o), o \geq 1$ of outputs. The summation of all these linear systems is the history of operations performed by user AROSENTHAL in a given period of time, relevant only insofar as the breadth of learning abilities is concerned.

If such function $f^i(I, O)$ could be created, it would then be a generic learning curve for any user on a given period of time, producing the canonical output defined by the function representing what the user has done in said period.

For automation to be feasible now, we need to introduce another function

$$\varphi(u,t) = A\frac{\partial f}{\partial t} + B\frac{\partial f}{\partial t}$$

Equation 2

representing the second derivatives of function $f^i(I, O)$ with respect to the user and time, respectively. In this case, support functions

$$u(t) = \int_0^x g(\mathrm{t})$$

Equation 3

representing all roles which learning was derived.

Equation 2 is nothing else but the gradient of learning as time passes, indicating the local minima and maxima's change in time and how the learning impacted the gradient.

In order to construct a meaningful learning curve, we need to construct a line integral for equation 2:

$$\oiint_{t\geq 0, u\geq 1}^{T,U} \varphi(u,t)$$

Equation 4

Which represents a cube whose sides are based on the learning based on the roles and profiles, and whose high are based on the time scale of operations done with these roles.

Clearly equation 4 is sufficient to define the cube of learning for either one user (where u = 1) or a set of users for an OU (where u > 1).

Automation based on Analytics – Preemptive Caching

Meister uses equation 4 and produces a canonical result whereupon knowledge of the user could be stored and reevaluated as time progresses producing a better cube each time it runs. Possessing this knowledge is imperative for automation given that, with this cube already produced, Meister could simple perform a query on the cube, now disguised as a start schema, and find out for instance that user AROSENTHAL uses company code CO01, Plant 1000, Organization Unit OU01, Organization Group OG10 75 % of the time when creating purchases orders, and some other tuples for the remainder of the 25 %. The other combinations that might have been used fall outside the two standard deviations and are therefore discarded as spurious noise, or more specifically, these points fall outside the MINMAX linear programming function defined by the query.

With this knowledge, Meister proposes the usage of the top most used tuple combinations ahead of time to the UI could propose these first, thus automating the process of purchase orders' creation in a way not feasible to be done without Meister.

It is even possible for Meister to propose a cloning of mostly done operations based on existing patterns of usage by the agent which is nothing else but the augmentation of the same process insofar as the number of tuples are concerned.

Deeper Automation based on Analytics – Machine Learning

NetWeaver was never intended to be a mathematical powerful engine, and therefore supports floating points to an extend needed for business operations. Machine learning needs a much large support of floating points pushing the limits of NetWeaver, thus making the coding of robust ML inside NetWeaver via ABAP not appropriate and prone to rounding errors and over/underflows.

To circumvent this limitation, Meister introduces a wrapper on top of commercially available ML tools like Tensor Flow, and delegates to the underlying kernel implementations of said tools the burden of calculations. This simple yet powerful idea enables native ABAP code to ask for patterns of learning for pictures, documents, and complex data far beyond what equation 4 could analyze, given that the line integral now is not two dimensional anymore, and could be of much larger dimensions, making the implementation at NetWeaver not appropriate as shown above.

It is important to note that this is not the only way Meister implements ML; it could, instead of leveraging kernel local calls as provided by Tensor Flow, use Cortana online calls instead without loss of contextual power but with a loss of computations power, which could be a matter of seconds in delay given the instantiation of remove calls over the internet. At the moment, we do not have enough data points to clearly identify the loss, which will be addressed in another white paper written specifically for ML tools that lives on the Internet rather than collocated in the same box as the SAP Gateway 2.0 that hosts Meister.

