



# Od Robot Process Automation do Cognitive Automation

[www.smacc.io](http://www.smacc.io)



SMACC

# Nasza historia

- **SMACC.io v1**
- **SMACC.io v2**
- **SMACC.io & Hypatos.ai**

# Wojciech Barczyński

- Head of Engineering
- Software Developer
- System Engineer
- Od 2017 – SMACC.io
- Od 2018 – Hypatos.ai

Hypatos

SMACC

# CFO, księgowość, finanse...

- Copy&Paste
- Excel
- Copy&Paste
- Bardzo manualna czynność



Uli Erxleben, Dr

McKinsey & Company  
RocketInternet SE



Janosch Novak

Deustche Bank  
RocketInternet SE

2015



Login

## Disrupt SF 2019

Startups

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Newsletters

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# Goodbye accountants! Startup builds AI to automate all your accounting



Mike Butcher @mikebutcher 2:29 pm CEST • June 28, 2016

Comment



Smacc, which uses AI to automate accounting, has secured a \$3.5 million Series A round from Cherry Ventures, Rocket

olzbrinck Ventures, Grazia Equity and

2016

SMACC

## Początki

- Szybko skalująca się księgowość dla SMEs
- Użycie najnowszej technologii do automatyzacji
- Usługi end to end włączając uzgodnienie kont, płatności i raportowanie
- Asystent księgowania
- Service—model

# SMACC v1

- Początek wielu procesów to faktura
- Co wiemy o fakturach?

123 Broadway City, State 12345		(000) 111-1111 john@smith.com																																																															
<p><b>Invoice To:</b> James Smith Generic Corp</p> <p><b>Date:</b> November 3, 2014</p> <p><b>Description of Goods/Services:</b></p> <table border="1"><tr><td>Consulting Services</td><td>October 3, 2014</td></tr><tr><td>Consulting Services</td><td>October 4, 2014</td></tr><tr><td>Consulting Services</td><td>October 5, 2014</td></tr><tr><td>Consulting Services</td><td>October 10, 2014</td></tr><tr><td>Consulting Services</td><td>October 11, 2014</td></tr><tr><td><b>Accounting Software</b></td><td>October 10, 2014</td></tr><tr><td>Hosting Expenses</td><td>October 11, 2014</td></tr><tr><td><b>Subtotal</b></td><td></td></tr><tr><td><b>Hosting Expenses</b></td><td></td></tr><tr><td><b>Web Hosting:</b></td><td></td></tr><tr><td><b>Balance Due</b></td><td></td></tr></table> <p><b>Nagłówek dokumentu</b></p> <p>Miejsce wystawienia: Warszawa Data wystawienia: 2014-01-01 Data sprzedaży / wykonania: 2014-01-01 usługi: Data zakończenia: 2014-01-01</p> <p><b>egrupa</b></p> <p><b>Faktura nr: 1</b> wg zamówienia: 1/01-2014</p> <p><b>Sprzedawca</b> E-grupa ul. Przeskok 12A 05-825 Grodzisk Mazowiecki NIP: 555-136-62-25 tel.: +48 601 686 414 www: egrupa.pl e-mail: adres@email.pl bank: Nazwa banku Nr konta: 11 2222 3333 4444 555 Nr SWIFT/BIC: BIC</p> <p><b>LOGO FIRMY</b></p> <p><b>FAKTURA</b></p> <p><b>Faktura nr</b> 100/2018 Data wystawienia 23.02.2018 Data dostawy lub świadczenia 23.02.2018</p> <p><b>Sprzedawca</b> [Imię Nazwisko] [Nazwa firmy] [NIP] [Ulica] [00-000 Miasto]</p> <p><b>Nabywca</b> [Imię Nazwisko] [Nazwa firmy] [NIP] [Ulica] [00-000 Miasto]</p> <p><b>Tabela Detalów Faktury</b></p> <table border="1"><thead><tr><th>Lp.</th><th>Nazwa towaru lub usługi</th><th>Ilość</th><th>J.m</th><th>Cena netto</th><th>Vat [%]</th><th>Kwota Vat</th><th>Wartość brutto</th></tr></thead><tbody><tr><td>1</td><td>Towar 1</td><td>1</td><td>szt.</td><td>245.0</td><td>23</td><td>56,35</td><td>301,35</td></tr><tr><td>2</td><td>Towar 2</td><td>1</td><td>szt.</td><td>124.0</td><td>23</td><td>28,52</td><td>152,52</td></tr><tr><td>3</td><td>Towar 3</td><td>1</td><td>szt.</td><td>1,240.0</td><td>23</td><td>285.20</td><td>1525,20</td></tr><tr><td colspan="6"></td><td>Razem do zapłaty</td><td>370.07</td><td>1979.07</td></tr></tbody></table> <p>Słownie: tysiąc dziewięćset siedemdziesiąt dziewięć i siedem groszy</p> <p>Sposób płatności: Przelew Termin płatności: 2018-03-07 Bank: ŚWIETNY BANK Numer konta: 00 0000 0000 0000 0000 0000</p> <p><b>JANINA KOWALSKA</b> imię, nazwisko i podpis osoby upoważnionej do odebrania dokumentu</p> <p><b>JAN KOWALSKI</b> imię, nazwisko i podpis osoby upoważnionej do wystawienia dokumentu</p>			Consulting Services	October 3, 2014	Consulting Services	October 4, 2014	Consulting Services	October 5, 2014	Consulting Services	October 10, 2014	Consulting Services	October 11, 2014	<b>Accounting Software</b>	October 10, 2014	Hosting Expenses	October 11, 2014	<b>Subtotal</b>		<b>Hosting Expenses</b>		<b>Web Hosting:</b>		<b>Balance Due</b>		Lp.	Nazwa towaru lub usługi	Ilość	J.m	Cena netto	Vat [%]	Kwota Vat	Wartość brutto	1	Towar 1	1	szt.	245.0	23	56,35	301,35	2	Towar 2	1	szt.	124.0	23	28,52	152,52	3	Towar 3	1	szt.	1,240.0	23	285.20	1525,20							Razem do zapłaty	370.07	1979.07
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# SMACC v1

- RPA
- Użycie najnowszej technologii do automatyzacji

Company

SMACC GmbH

Netto

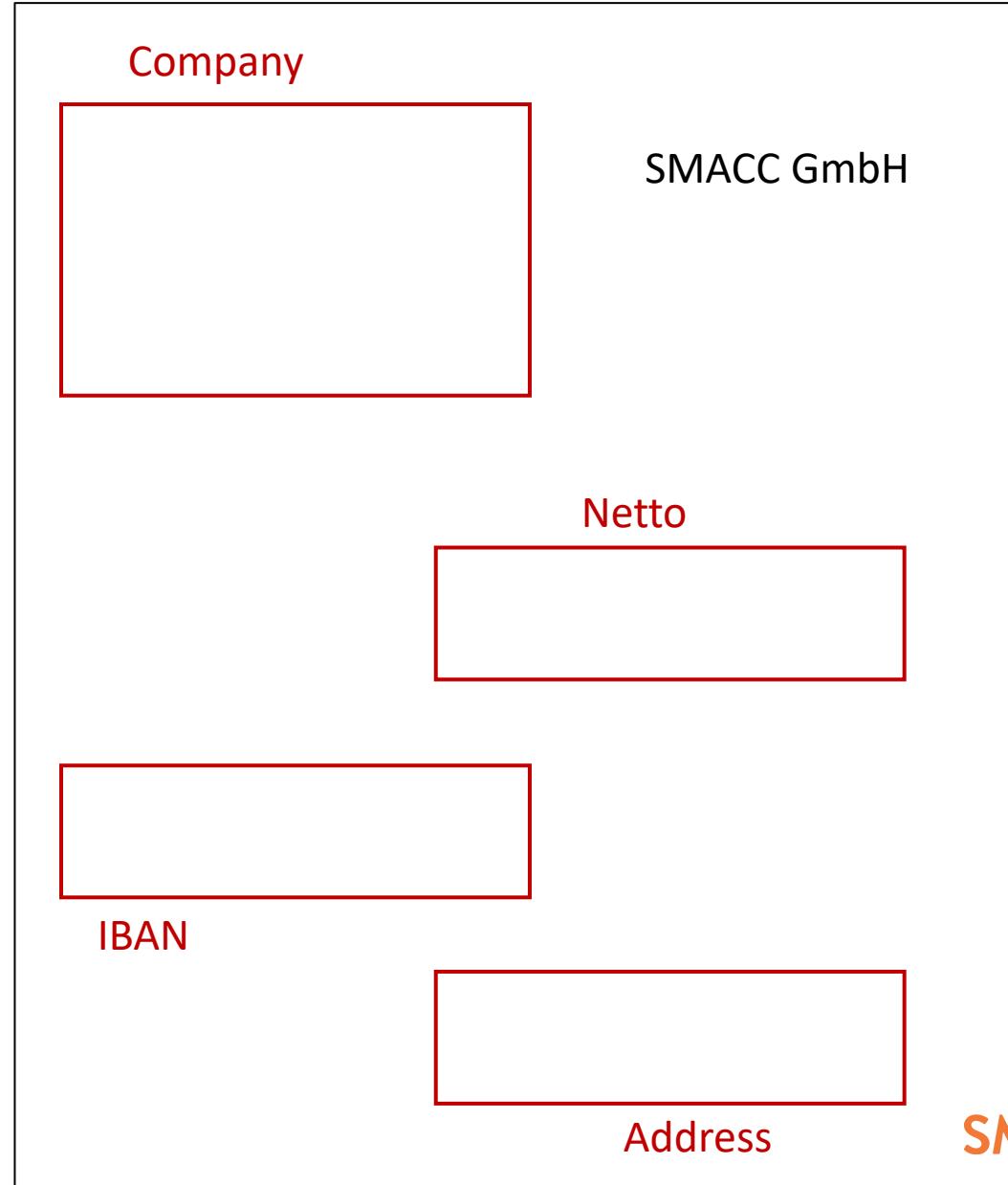
IBAN

Address

SMACC

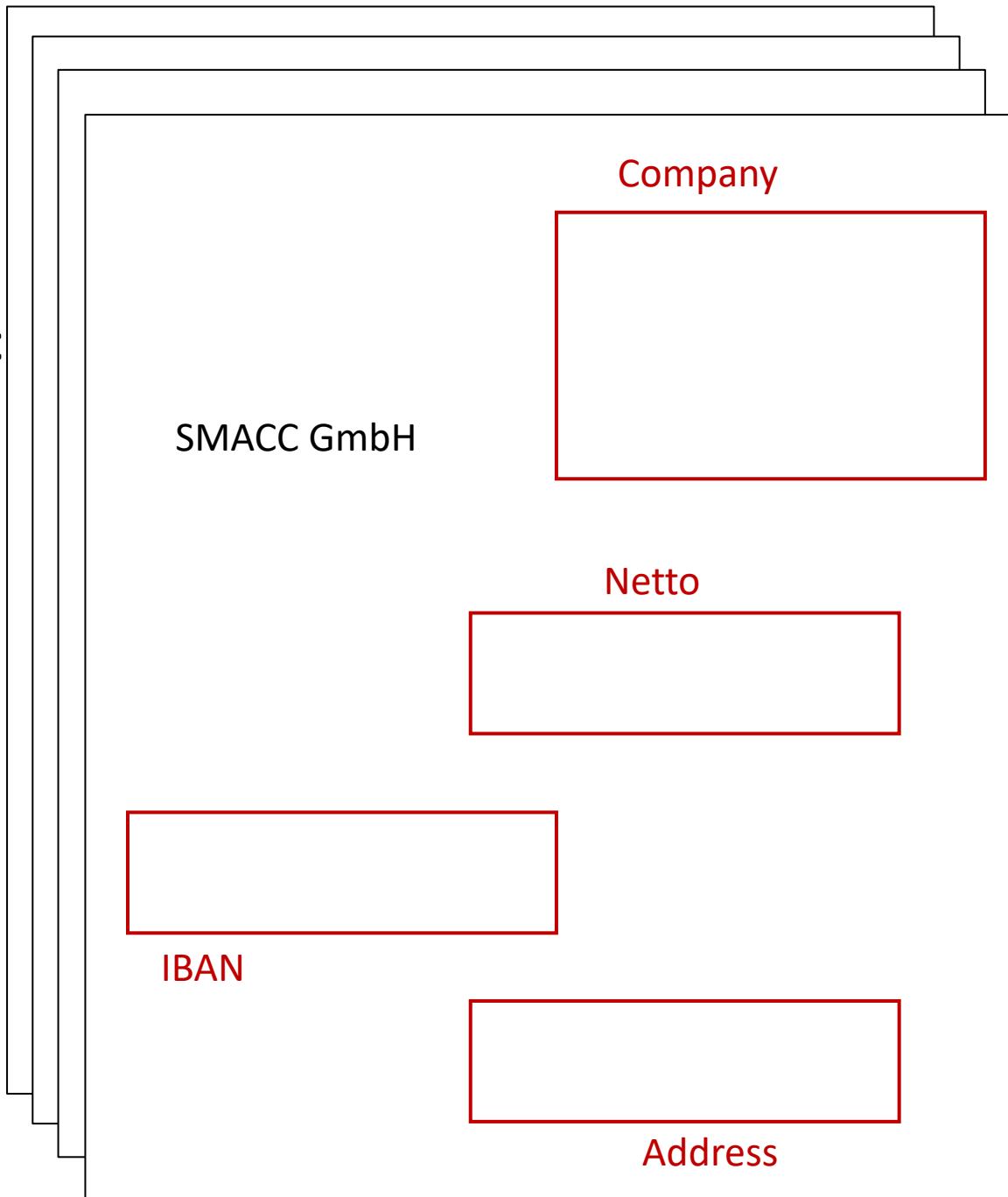
# SMACC v1

- Nowa faktura?



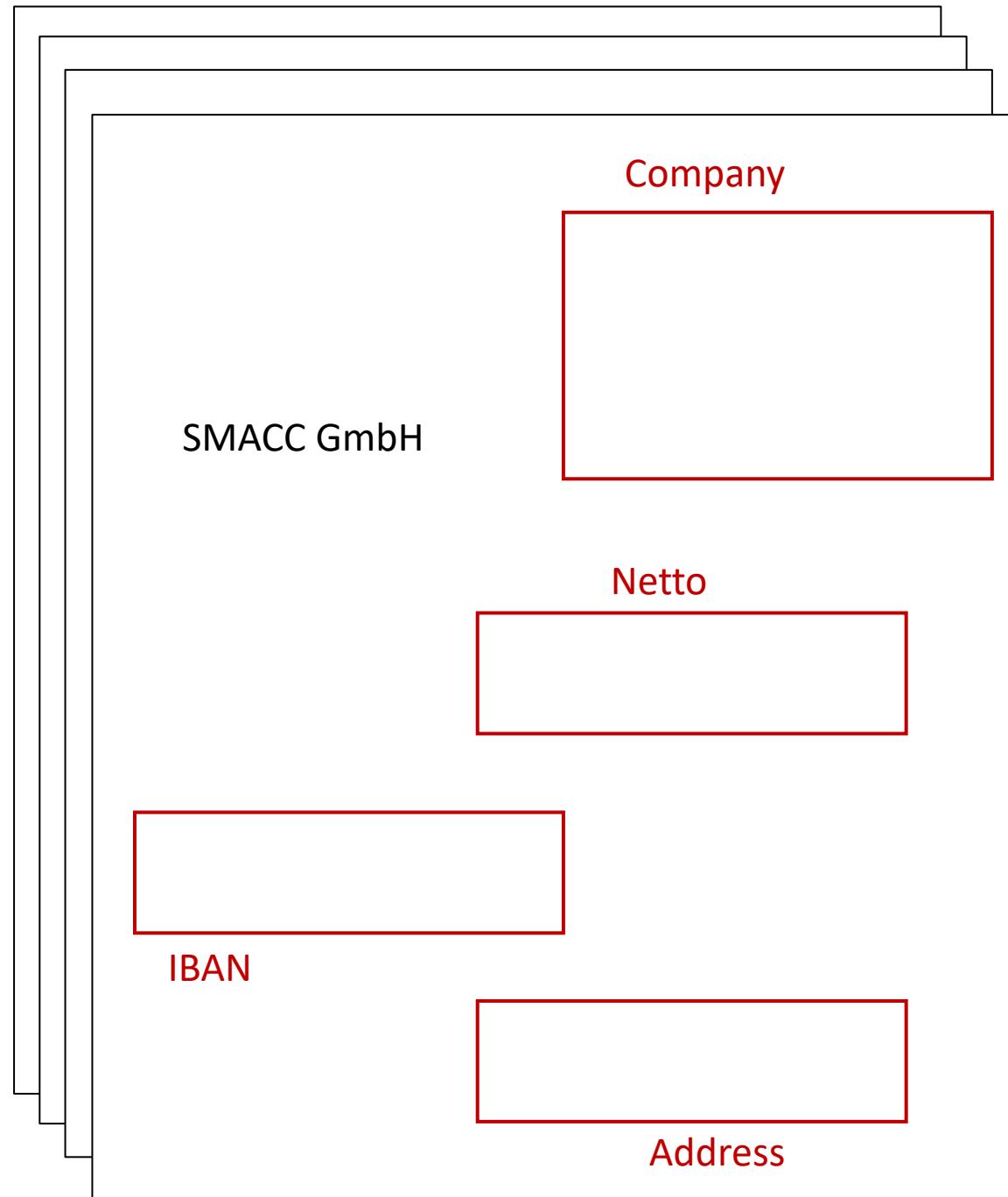
## SMACC v1

- Szybko skalująca się księgowość dla SMEs
- Użycie najnowszej technologii do automatyzacji



## SMACC v1

- I tak było z dużą ilością technologii state-of-the-art
- Nie tylko faktury



2016

## Nauka

- Faktury kosztowe są bardzo różnorodne niż szacowaliśmy
- Dodawanie i zarządzanie template-ami
- Dokonała jakość odczytu to warunek konieczny automatyzacji

2017

# Sieci Neuronowe

HISTORICALLY LEARNED



= Apple



= Apple



= Apple

GENERALIZED APPLICATION



= Apple



= No Apple

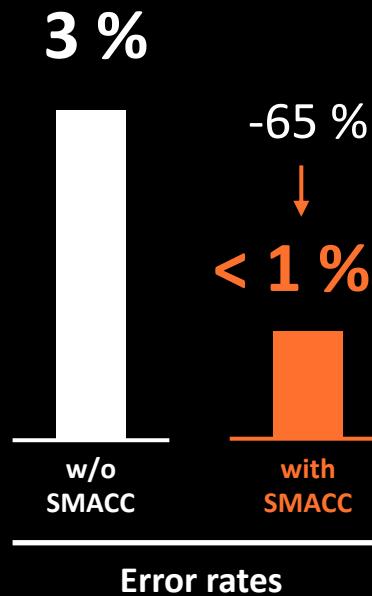
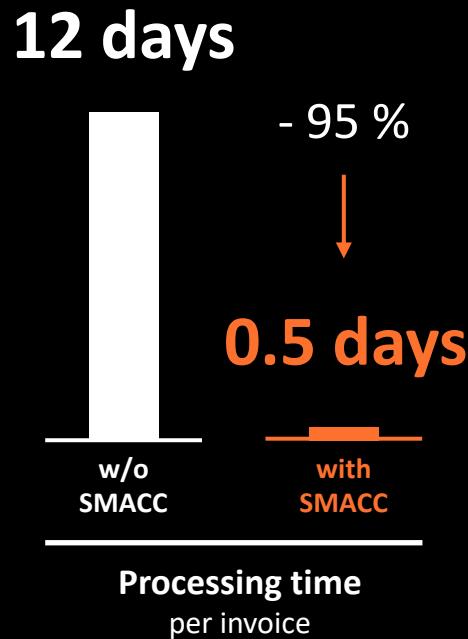
## Transformacja:

- CFO, księgowość, finanse → IT z CFO
- IT z CFO → Uczenie Maszynowe  
z wiedzą o finansach



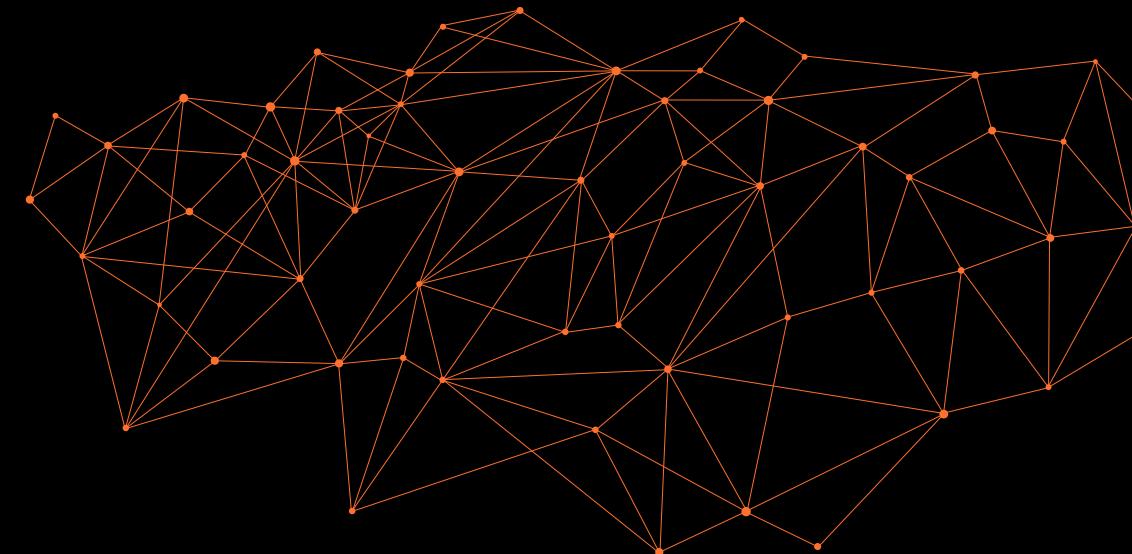
# Faktury kosztowe z SMACC A/P SaaS

SMACC has large impact on processing time, cost and accuracy compared to industry benchmarks



# Faktury kosztowe z SMACC A/P SaaS

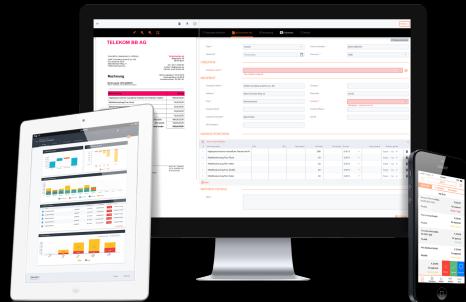
- Produkt SaaS skupiony na fakturach kosztowych
- Odczyt
- Walidacja
- Workflowy
- Asystent Księgowania
- Eksporty i integracje



# SMACC.io

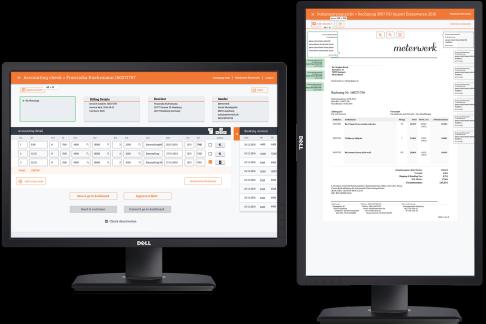
## UI for Company

- Financial management user interface for client use addressing all aspects of financial management



## UI for Service Providers

- Backend functionalities comprising data capturing/completion, accounting entry, communication, and ticketing



## Micro-Services

- Fully proprietary modular micro/webservice in docker containers managed in Kubernetes cluster



## API Gateway

- All services are available through API gateway for quick system integration



## System Integrations

- Full integration with core accounting system
- Two-way sync of data between accounting backend and client UI



kubernetes



Azure



Google Cloud



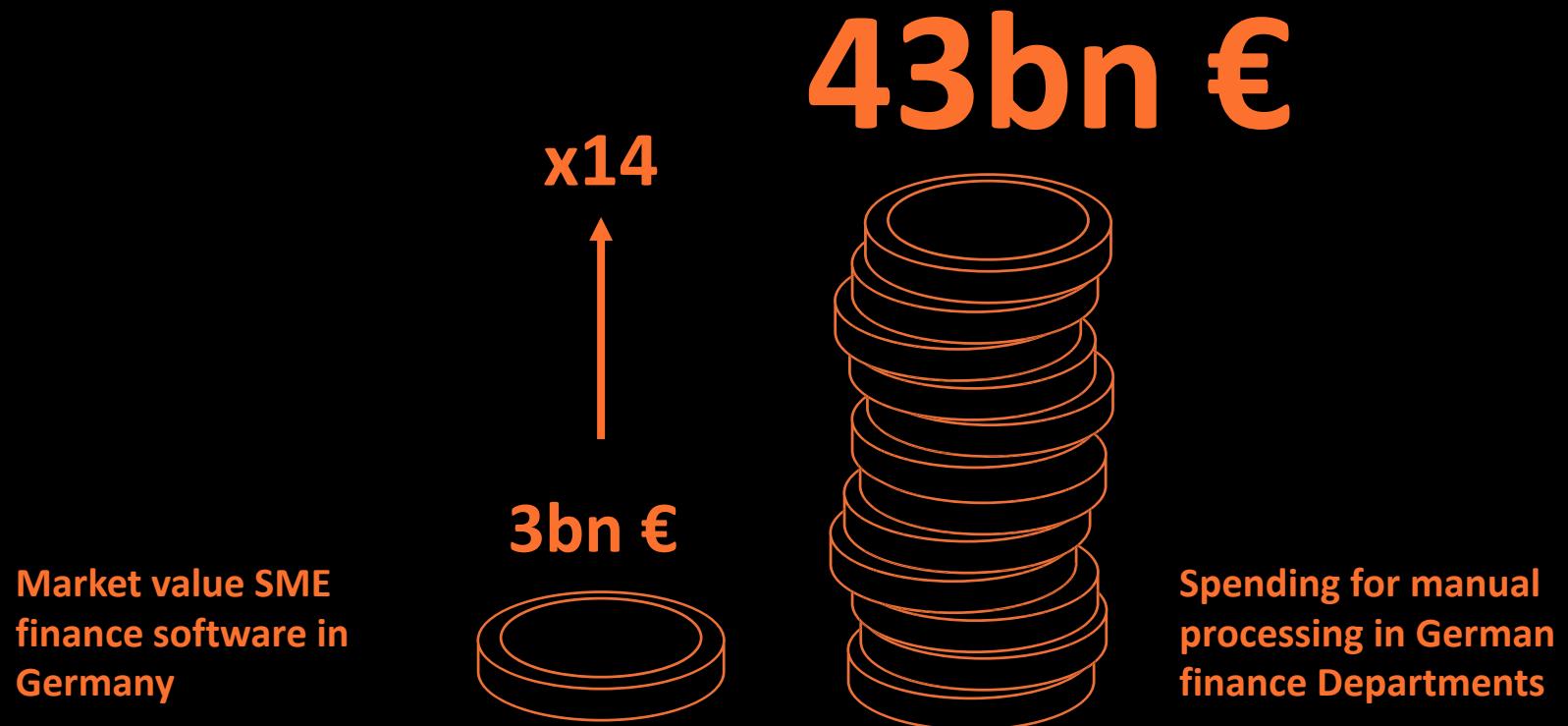
aws



On Premise

SMACC

# To nie tylko nasz problem



# Hypatos

The Hypatos team developed a novel deeplearning-based document understanding approach outperforming traditional rule-based systems

**OCR** Built-in OCR technology as well as support for any OCR in hOCR format

**Pre-processing** Word embedding trained with custom domain specific corpus to understand words in invoices

**Data capturing** Combination of RNN and CNN deeplearning models to capture data and meaning from documents

**Post-processing** Custom pattern matching, clean up and normalization function, to ensure „cleanliness“ and consistency of extracted data

 Capture large data sets from complex docs

 Plug and play implementation with instant ROI

 High adaptability to longtail and edge cases

 High accuracy with transparent confidence indicators

**Document text understanding**  
Word embedding + multiple RNNs

**Word understanding with Word Embedding**  
Vector representation of words to understand words in a generalized way

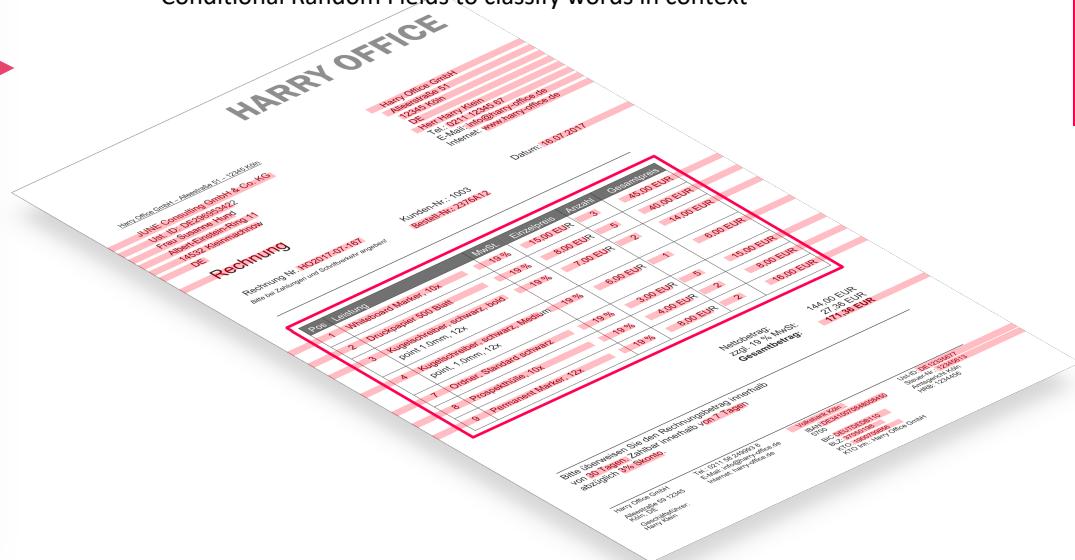
**Text understanding with Recurrent neural networks (RNN)**

Ensemble model of multiple RNNs, temporal CNNs and Conditional Random Fields to classify words in context

**Table understanding**  
Multiple CNNs

**Computer vision with Convolutional Neural Networks (CNN)**  
CNNs to analyse visual imagery like graphs & tables to understand table structures

**Advanced capturing of**  
Up to 74 data points and position information incl. confidence scores



We provide our automation models as micro-services that can be accessed by RESTful-API



Fasttext

PYTORCH



Cloud or On-Prem

Kubernetes





Hypatos

# Hypatos → semi-structured documents

## Highly structured documents

Simple automation cases with  
template based systems

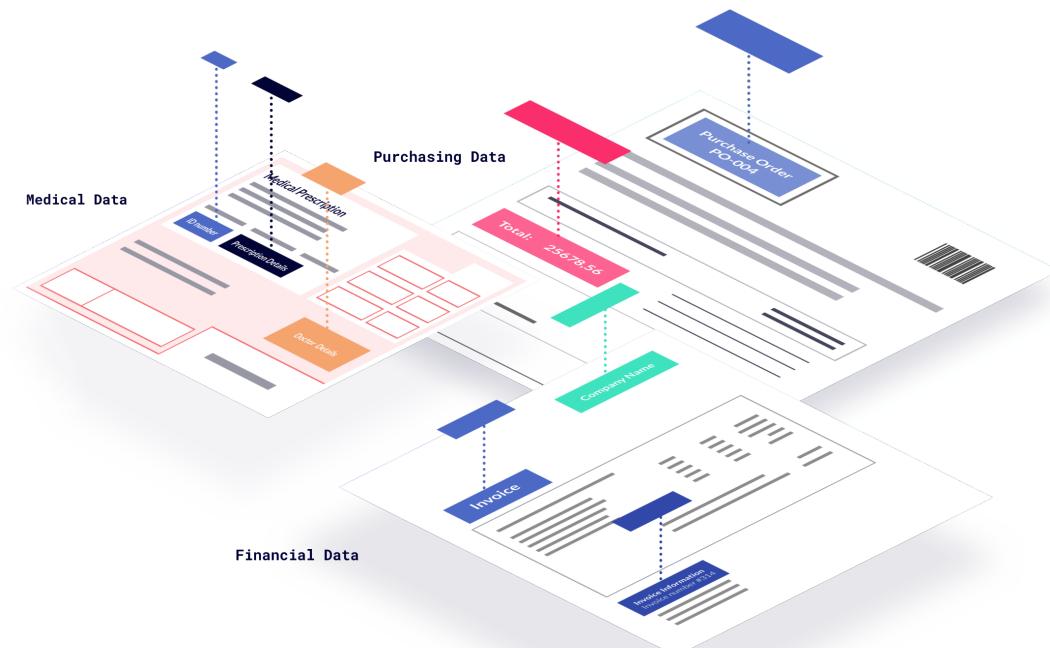
**Major player:**  
Abbyy, Readsoft, Workfusion



degree of structure

## Semi-structured documents

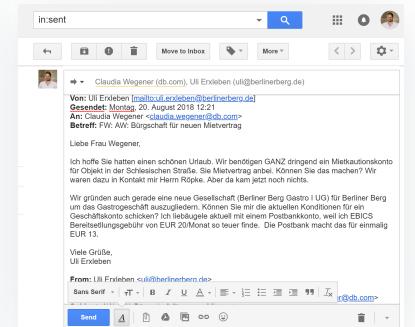
Document type-specific combination of pre-trained  
deeplearning models to understand tables, meaning of text  
and document components



## Hypatos

## Unstructured documents

Company and use case specific  
deeplearning and NLP models



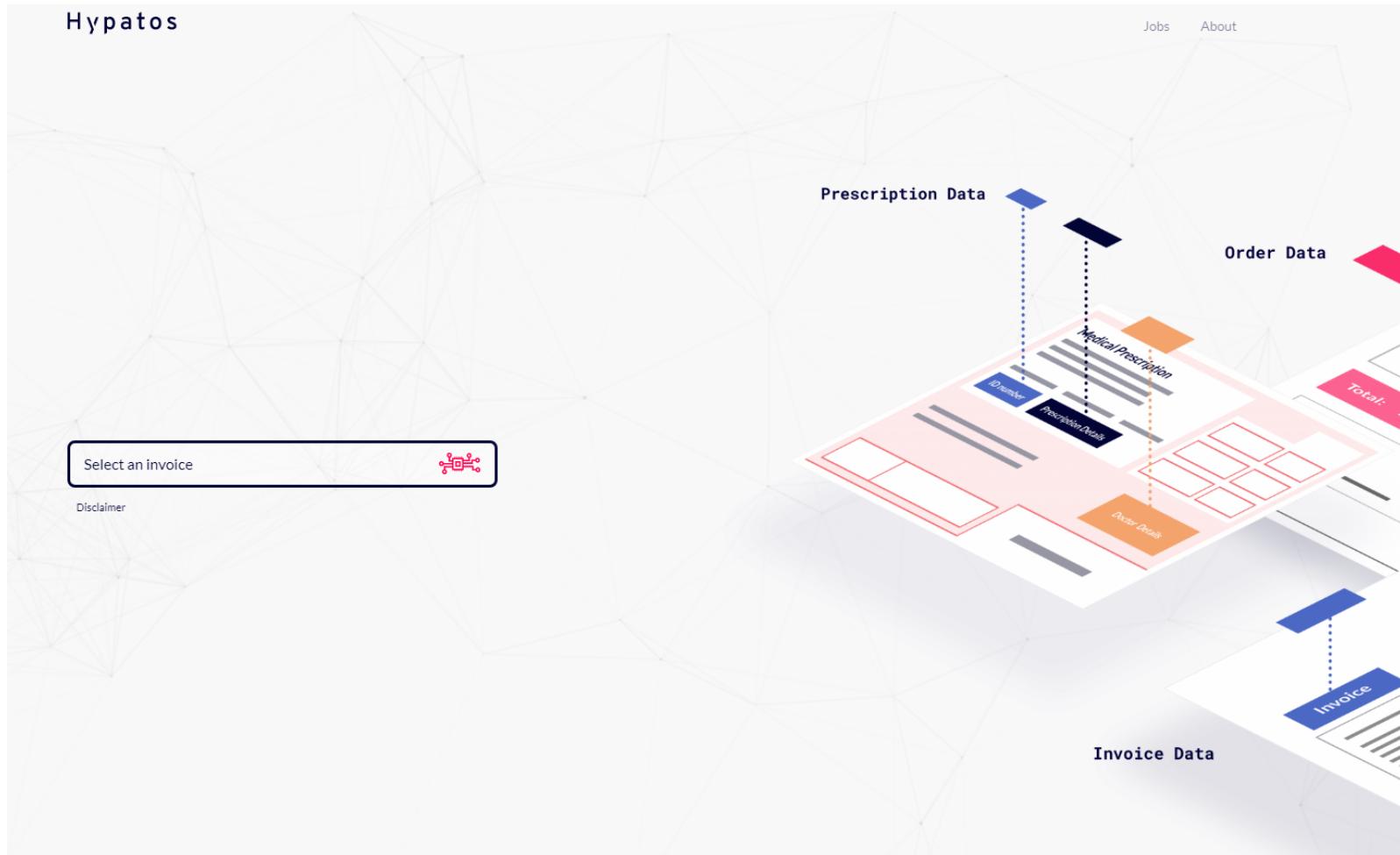
**Major player:**  
IBM Watson, Leverton, Eigen Technology



degree of structure



# DEMO – Advanced Invoice Capturing & Accounting





# Hypatos offers ML automation models (skills) for various document processing tasks

## Pre-trained Skills

Pre-engineered and trained automation models and validation rules for major back office tasks

```
class TemporalBlock(nn.Module):
    def __init__(self, n_inputs, n_outputs,
                 super(TemporalBlock, self).__init__()

        self.conv1 = nn.Conv1d(n_inputs, n_
                           | | | | | | | | | | | | | | | |
                           stride=stride)
        self.chomp1 = Chomp1d(padding)
        self.relu1 = nn.ReLU()
        self.dropout1 = nn.Dropout2d(dropout)

        self.conv2 = nn.Conv1d(n_outputs, n_
                           | | | | | | | | | | | | | | | |
                           stride=stride)
        self.chomp2 = Chomp1d(padding)
```

## Library of deeplearning skills

### Accounts payable:

- Capturing of up to 74 data points from supplier Invoices
- Validation of invoices for tax law compliance
- Accounting for supplier invoices based on historic data

### Expense management (T&E):

- Capturing of up to 30 data points from cash receipts including item data
- Validation of receipt data and flagging of suspicious items

### Medical prescription processing:

- Capturing of doctor, patient and pharmaceutical information

### Loan applications:

- Capturing payslips and bank statements capturing
- Validation of income and fraud checks

### Auditing:

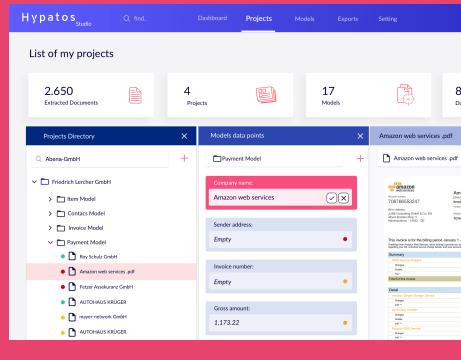
- Capturing of invoices, custom documents, etc
- Validation of tax compliance



Hypatos

# Pre-trained models for major document types and studio software to train custom models

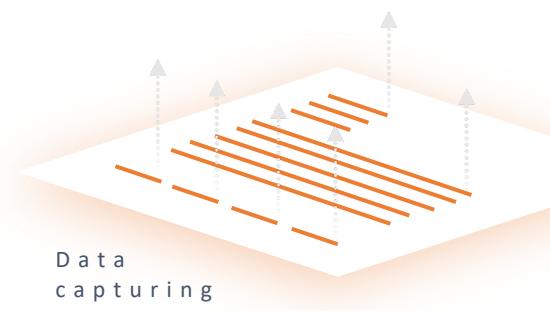
## Hypatos Products

Hypatos Products	Description
<p><b>Pre-trained Models</b> Pre-engineered and trained automation models for major document types</p> 	<p><b>Library of pre-trained models</b></p> <ul style="list-style-type: none"><li><b>Invoices:</b> Extraction of up to 74 data points from supplier Invoices</li><li><b>Receipts:</b> Capturing of data from cash receipts Including item data</li><li><b>Medical prescriptions:</b> Doctor, patient and pharmaceutical Information extraction</li><li><b>Coming soon:</b> Paystubs, purchase orders, delivery notes &amp; others</li></ul>
<p><b>Launch</b> 2019/Q4</p> <p><b>Hypatos Studio</b> Studio software enabling organizations to train custom automation models on own data without machine learning engineers</p> 	<p><b>Easy to use document training application</b></p> <ol style="list-style-type: none"><li><b>Choose data points</b> Select the information you want to extract</li><li><b>Upload training documents</b> Start with a few documents and then refine</li><li><b>Label data</b> Mark information with our intuitive tools</li><li><b>Train automation model</b> Automatically train powerful automation services</li></ol>



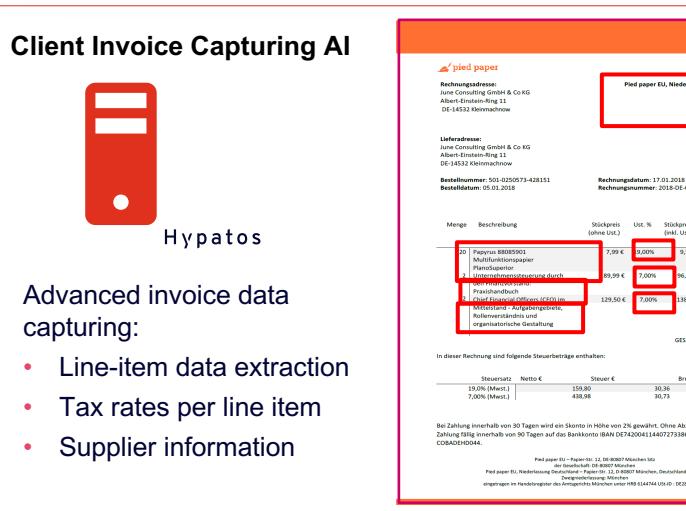
# Combining data capturing and validation into deep learning skills

Hypatos



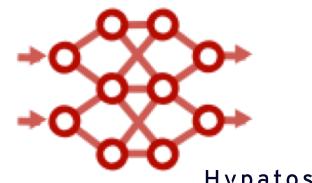
# Example Accounting Automation Implementation

## 1. Invoice and accounting data collection



## 2. AI model training

### Hypatos Deeplearning Engine



- Word embedding to generalize item descriptions
- Multilayer feed-forward neural network to predict accounting entries

Accounting automation model can be trained based on historic invoice images and SAP data to speed up learning and create quick impact

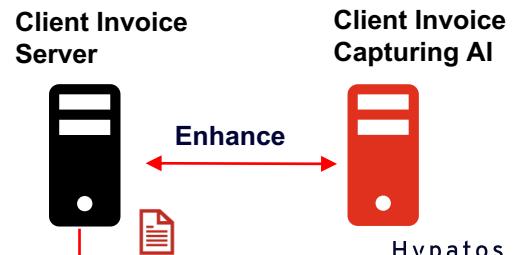
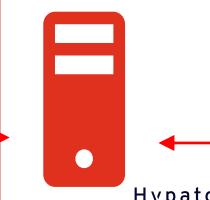
### Accounting Records



## 3. Deploy AI Accounting Model in ItP Workflow

### ItP Process

#### Client AI Accounting Automation Model



#### Accounting Predictions & Confidence Scores



Continuous learning

# Platformy RPA



<https://go.uipath.com/component/hypatos-deeplearning-invoice-extractor-5e8114>

## Lesson Learnt

- >95% rozpoznawania dokumentów jest ciągle wyzwaniem
- Wysokiej jakości dane = działająca automatyzacja
- Następny dla nas:  
udostępnienie walidacji oraz asystent procesów finansowych

# CPA? RPA project?

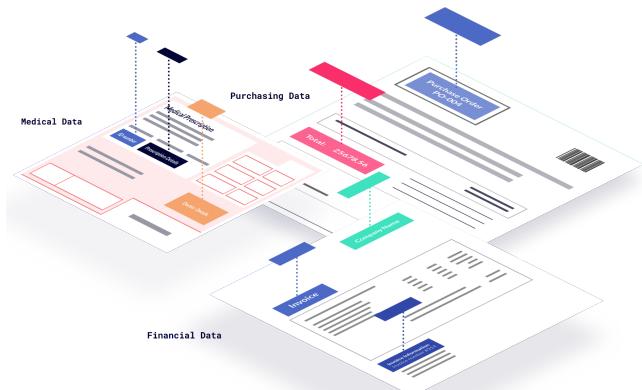
- Proof-of-Concept

# Pytania?

Deeplearning technology for document processing

Validation

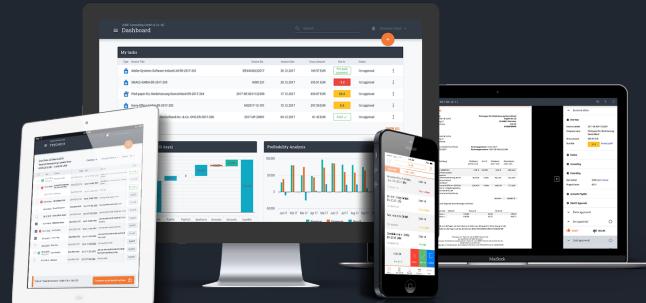
Self-Service ML Studio



Hypatos

A/P automation and workflow application

SaaS



SMACC

# Pytania?

Customers

**NORD/LB**

M M A Z A R S

**Deloitte.**

pwc

SCOPEVISIO

ERNST & YOUNG

BCG GAMMA

Wolters Kluwer

SCHWARZ  
GRUPPE

Circula

Partners

McKinsey&Company

UiPath

pwc

Microsoft



# Dziękuje

**Hypatos**

More Data. Less Work.

**Wojciech Barczyński | Head of Engineering**

[wb@hypatos.ai](mailto:wb@hypatos.ai)

[www.hypatos.ai](http://www.hypatos.ai)

# Hypatos / SMACC.io



Go



PYTORCH

TensorFlow™

amazon  
web services™



Azure

argo

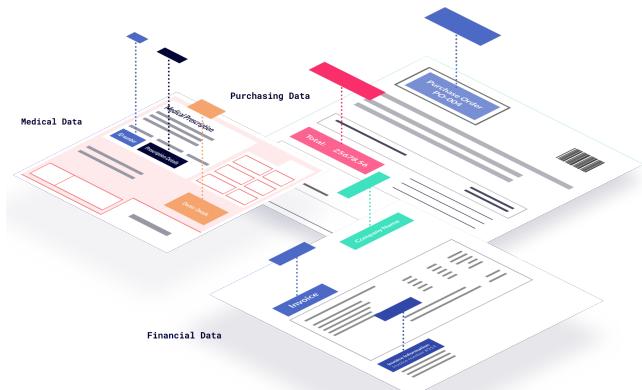
CloudNative: Prometheus, Grafana, Fluentd, Grafana Loki

# Backup

Deeplearning technology for document processing

Validation

Self-Service ML Studio



Hypatos

A/P automation and workflow application

SaaS



SMACC

# Hypatos

Our deeplearning technology automates complex document processes to improve work in backoffices & make organisations more efficient



## Reduce costs

Save resources by automating complex manual document tasks



## Save time

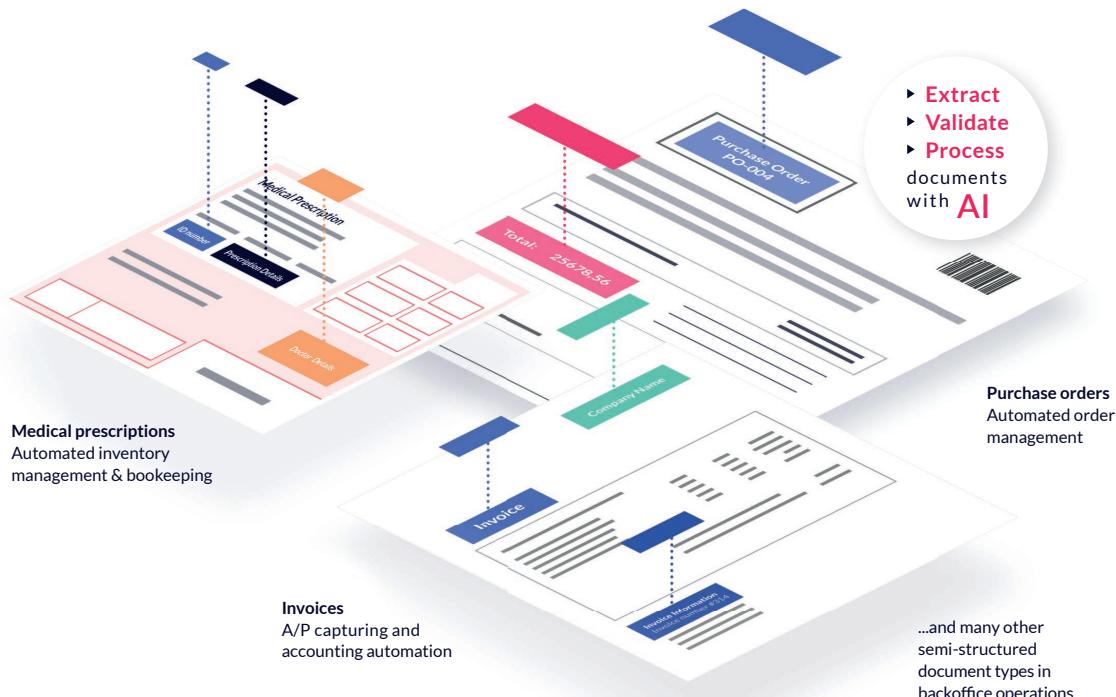
Cut processing time with light-touch automation



## Avoid errors

AI assisted work reduces human error

more  
data  
less  
work



### Deeplearning technology

Advanced NLP with Wordembedding and multiple RNNs combined with computer vision for table understanding delivers highest accuracy

### Processing automation

Combine our document understanding technology with advanced document validations and AI-powered enrichment (e.g., auto-accounting)

### No rules or templates

Our deeplearning models offer best results without rule based methods like key-value pairs, pattern finding and pre-set templates

### On premise or in the cloud

AI services in the cloud or on-premise adhering to highest security standards and trusted by leading organizations

### Many document types

Our technology understands a large variety of semi-structured documents, e.g., invoices, delivery notes, bank statements, receipts, purchase orders

### Studio Software

Easy to use training software and flexible machine learning engine for cloud and on-premise use enables in-house model training

### Built for developers

Quick and easy implementation on-prem and in cloud with RestfulAPI and SDKs

### Custom automation

We offer tailored models for all automation needs trained with clients' documents and data