Koen Decorte

Unlocking the Potential of AI in Enterprise:

AI and Machine Learning Integration with IBM i

www.cdinvest.eu

Who are we ?

International IBM i ISV and IBM business partner .

located in Antwerp, Belgium and Madrid Spain

Expertise in RPG, SQL, PHP, HTML, Unity, nodejs, linux...

Working with IBM i and its predecessors for more than 40 year

IBM Champion since 2018 and CEAC member

Applications : CDQuery, CD-Account accountancy, CDVts and MES.

What others talk about, we do.

Our Case studies

CD INVEST
BI · AI · IBMi

JORI 1963

fibrocit

CRAS WOODGROUP

ORIS

DEKNUDT FRAMES • FOR • LIFE

Immo Bonehill

winsol

VAN MAELE WIJNEN

Steffimmo

CSM BVBA

Stonetales

Optimco verzekeren op mensenmaat

ID LOGISTICS

Diners Club INTERNATIONAL

AI and Its Importance in Today's Business Landscape

What is AI ?

Definition of Artificial Intelligence: "Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, especially computer systems. These processes include learning, reasoning, problem-solving, perception, and language understanding.“

Artificial Intelligence (AI)

= science of making computers do things that require intelligence when done by humans.

Above intelligent or Abysmal idiot ?

Why is AI important ?

Efficiency and Productivity:

AI can automate routine tasks, allowing employees to focus on more strategic activities. This leads to increased productivity and operational efficiency.

Data-Driven Decisions:

AI systems can analyze vast amounts of data quickly and accurately, providing insights that help in making informed decisions.

Why is AI important ?

Enhanced Customer Experience:

AI-driven solutions like chatbots and personalized recommendations improve customer engagement and satisfaction.

Innovation and Competitive Advantage:

Companies that leverage AI can innovate faster and more effectively, gaining a competitive edge in the market.

Types of AI Technologies

Machine Learning (ML):

Definition: A subset of AI that involves training algorithms to learn from and make predictions or decisions based on data.

Examples: Predictive analytics, recommendation systems, fraud detection.

Natural Language Processing (NLP):

Definition: A field of AI focused on the interaction between computers and humans through natural language. It enables machines to understand, interpret, and respond to human language.

Examples: Chatbots, sentiment analysis, language translation.

Types of AI Technologies

Computer Vision:

Definition: An area of AI that enables machines to interpret and make decisions based on visual inputs from the world.

Examples: Image recognition, facial recognition, autonomous vehicles.

Robotic Process Automation (RPA):

Definition: The use of software robots to automate highly repetitive and routine tasks normally performed by a human.

Examples: Data entry, transaction processing, compliance reporting.

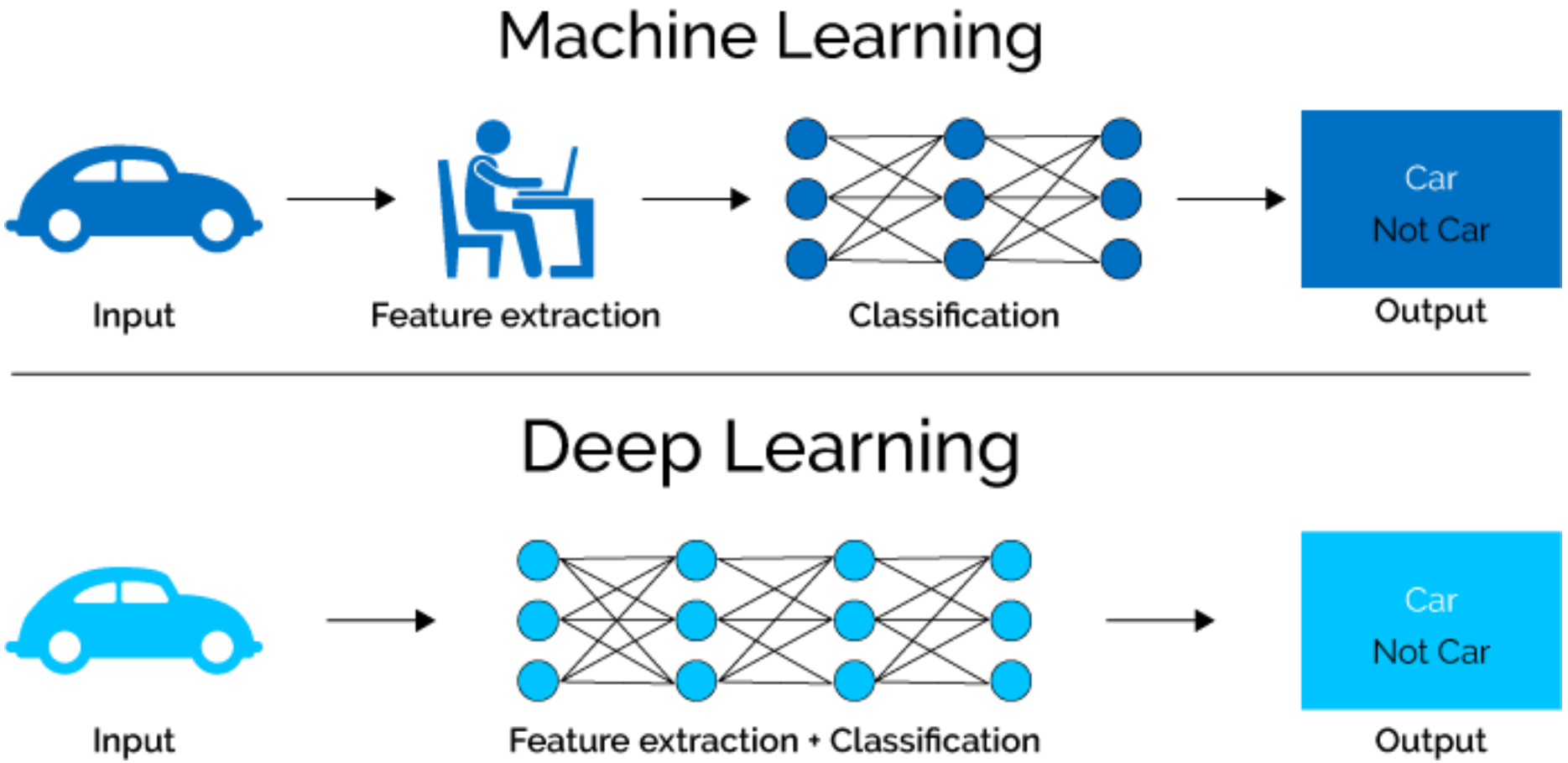
Types of AI Technologies

Deep Learning:

Definition: A subset of machine learning involving neural networks with many layers, capable of learning from large amounts of data.

Examples: Speech recognition, advanced image recognition, natural language understanding.

ML & DL


Machine Learning
Input
Feature extraction
Classification
Car
Not Car
Output
Deep Learning
Input
Feature extraction + Classification
Car
Not Car
Output

CLASSICAL MACHINE LEARNING

Data is pre-categorized or numerical

SUPERVISED

Predict a category

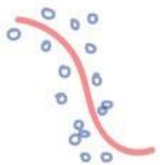
CLASSIFICATION

«Divide the socks by color»

Predict a number

REGRESSION

«Divide the ties by length»



Data is not labeled in any way

UNSUPERVISED

Divide by similarity

CLUSTERING

«Split up similar clothing into stacks»

Find hidden dependencies

DIMENSION REDUCTION (generalization)

«Make the best outfits from the given clothes»

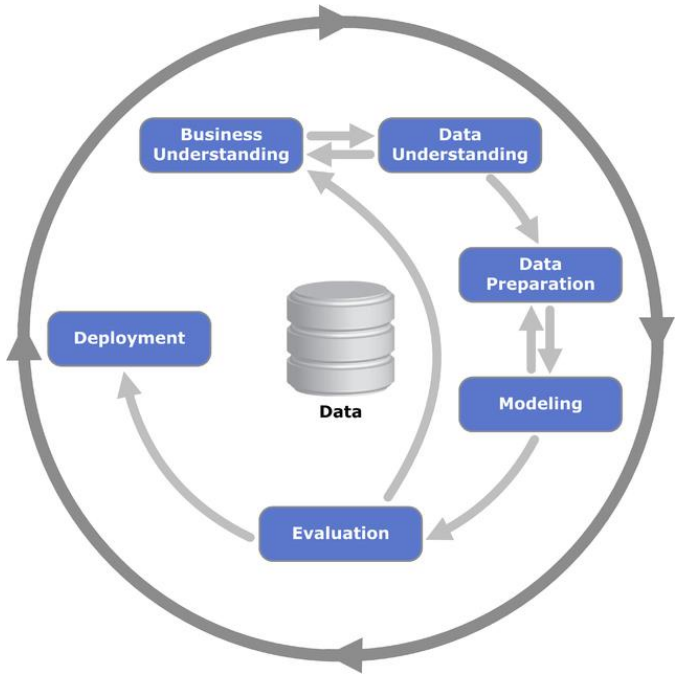
Identify sequences

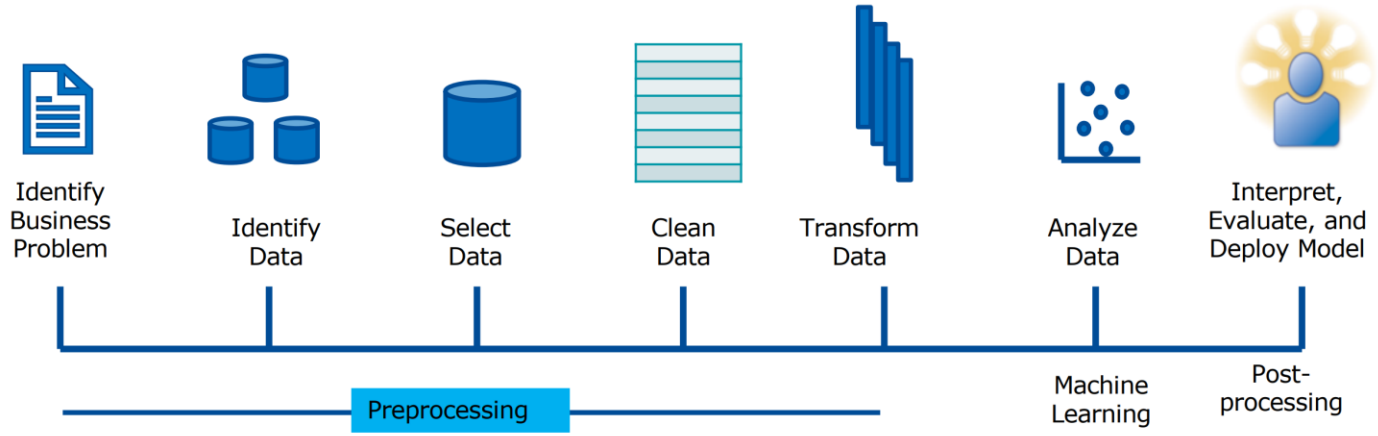
ASSOCIATION

«Find what clothes I often wear together»

What does an AI project look like?

- Cross-industry standard process for data mining – CRISP-DM
- Very popular analytics model that describes typical steps applied by data scientists





Importance of AI in Enterprise

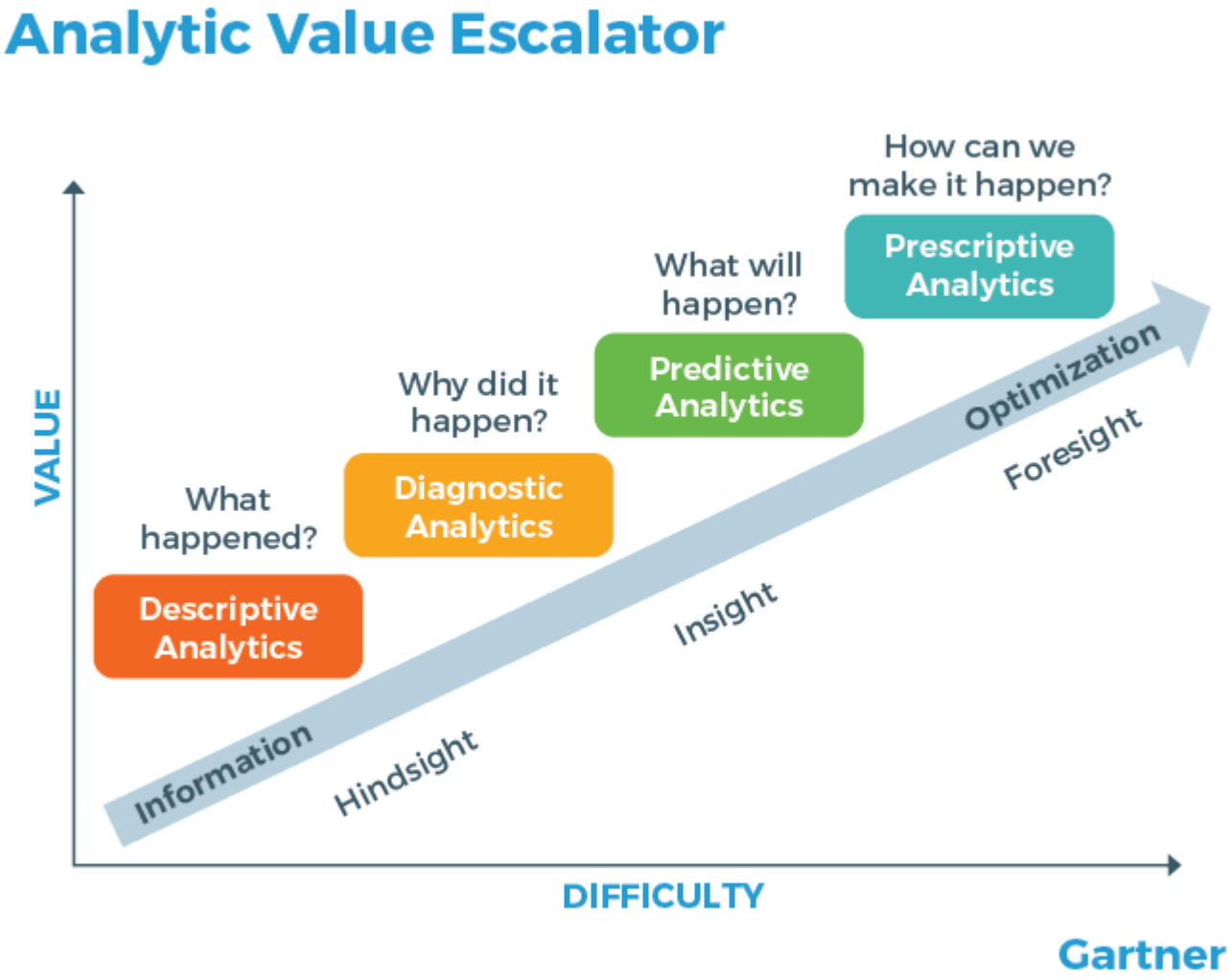
Efficiency and Automation

Data Insights and Decision Making

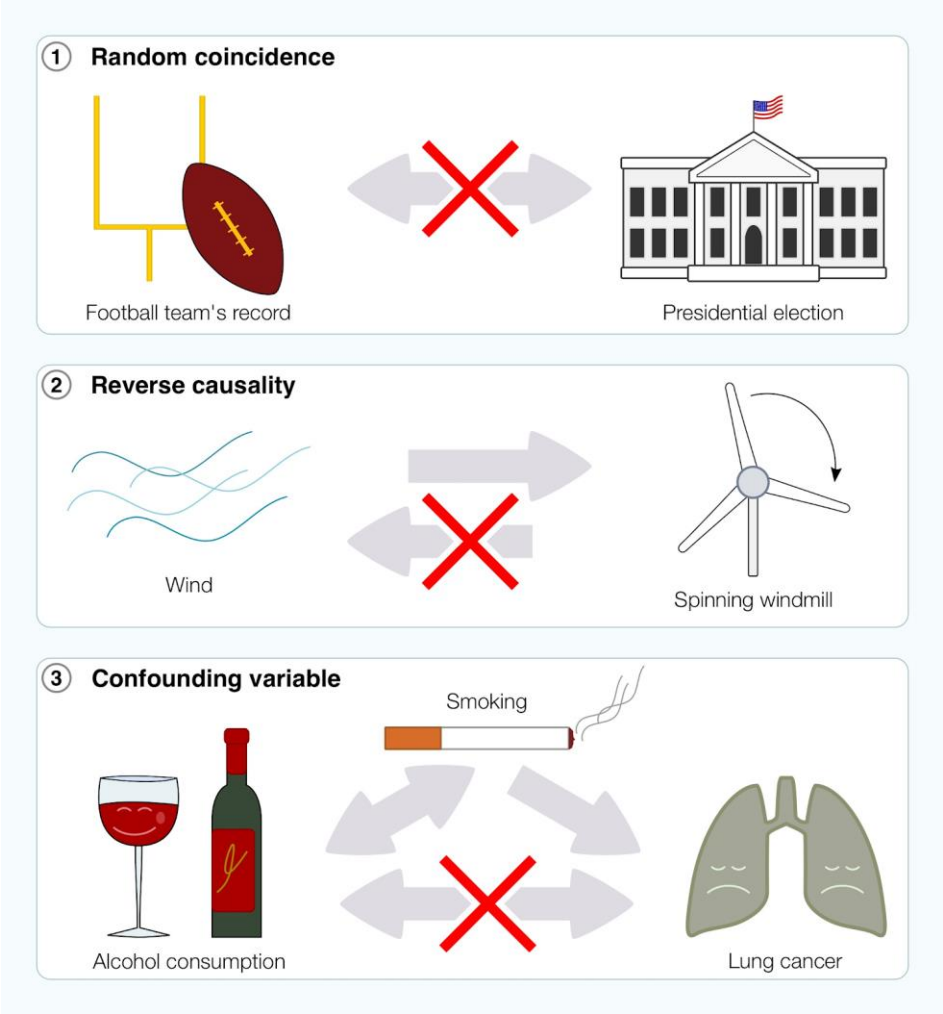
Personalization and Customer Engagement

Innovation and Competitive Edge

What does an AI project look like?



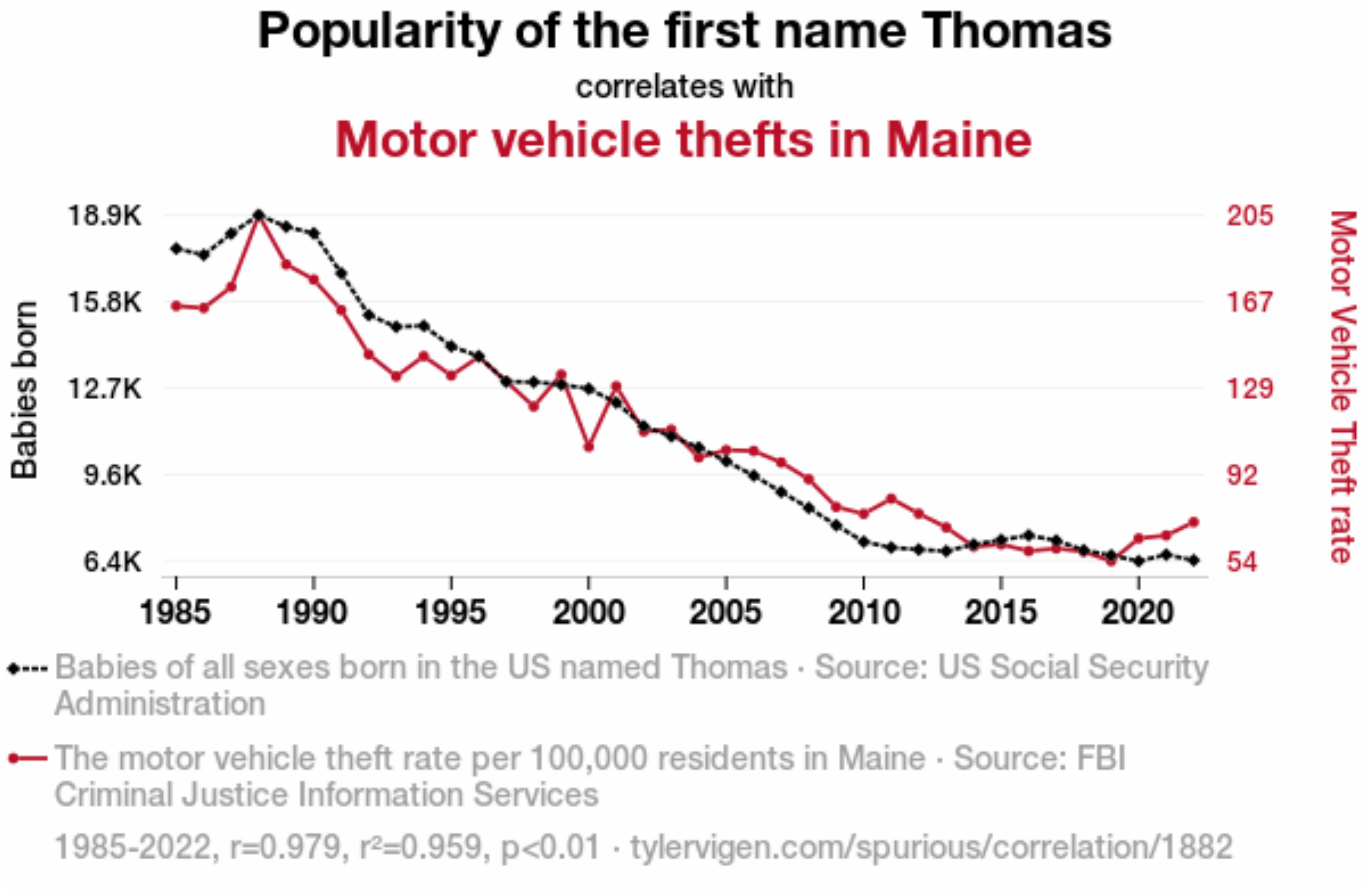
Correlation does not imply causation



AI does not want your job !

AI does not want your job !

Heads up


Popularity of the first name Thomas
correlates with
Motor vehicle thefts in Maine
18.9K
15.8K
12.7K
9.6K
6.4K
Babies born
205
167
129
92
54
Motor Vehicle Theft rate
1985
1990
1995
2000
2005
2010
2015
2020
Babies of all sexes born in the US named Thomas · Source: US Social Security Administration
The motor vehicle theft rate per 100,000 residents in Maine · Source: FBI Criminal Justice Information Services
1985-2022, r=0.979, r²=0.959, p<0.01 · tylervigen.com/spurious/correlation/1882

How it Started

I can perform regression analysis on data.

How we made it better

I can recognize patterns in data & generalize

How we made it practical for real world

I can learn and generate written content.

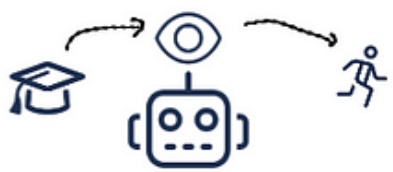
How we made it feel like a magic

I can perceive and recreate visual images, reason in natural lang

How we started leveraging to real world use cases

I can comprehend queries and reply by orchestrating AI tools/agents.

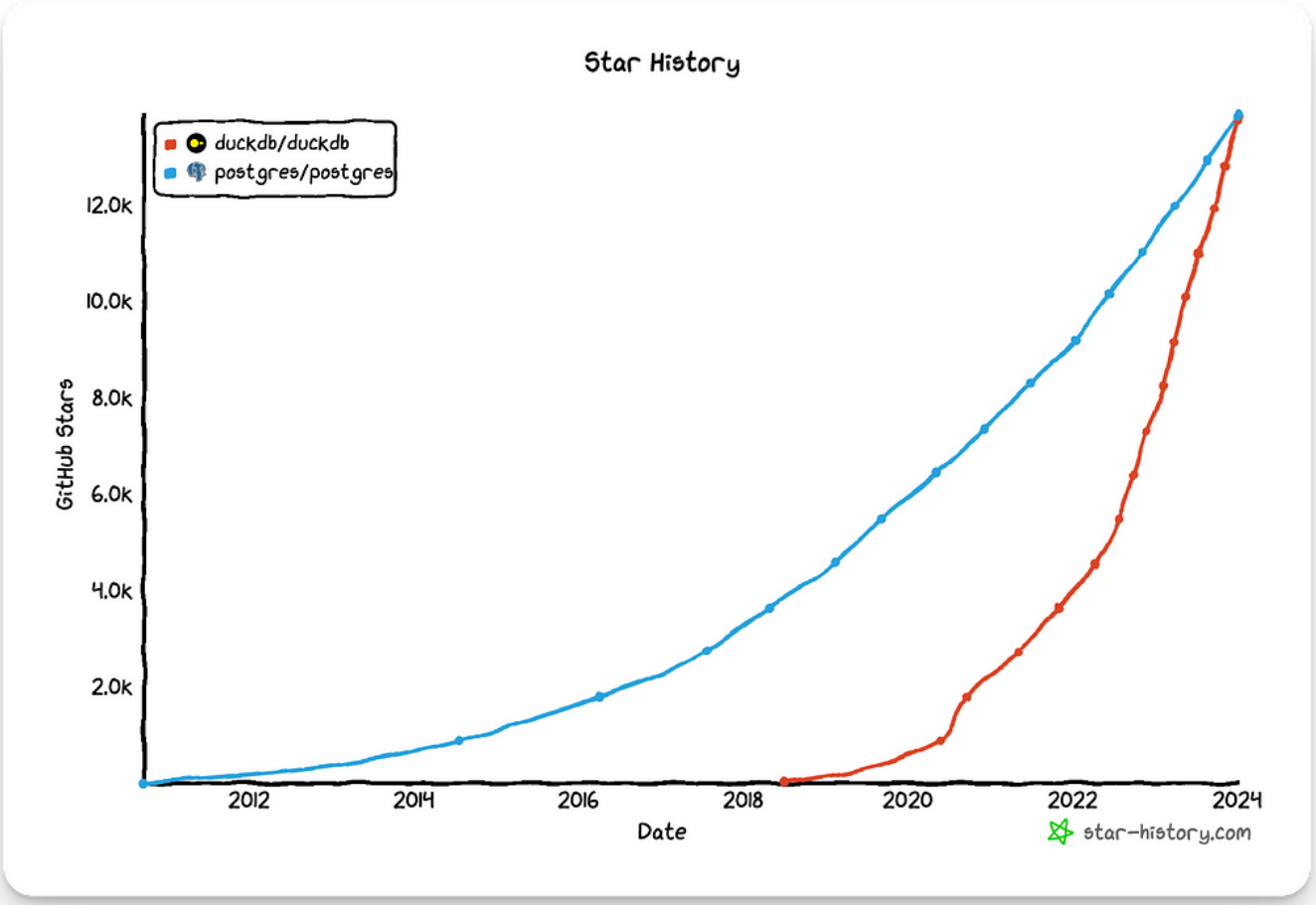
How we will make AI understand our world



Spatial Intelligence

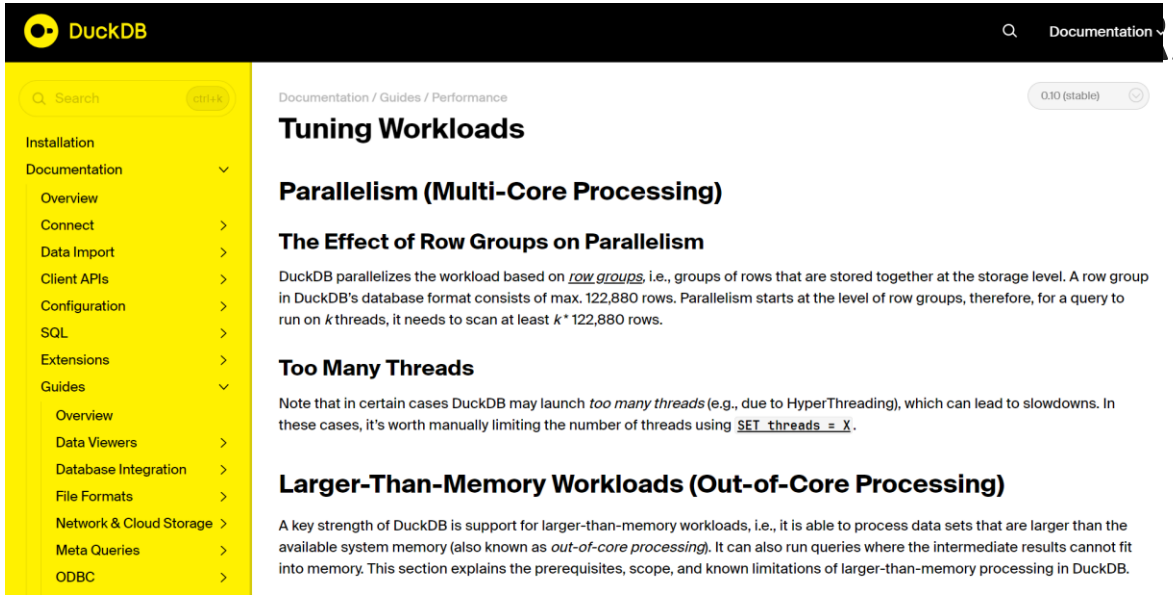
I can visually perceive objects/scenes, predict physical behaviors, and take embodied action (spatial intelligence) -
e.g. seeing a fish pot about to fall off a table triggers an urge to catch it before it hits the ground.

Why AI on IBM i ? – Single level Storage on DB !



Why AI on IBM i ? – Single level Storage on DB !

Stability and Efficiency: DuckDB is designed to handle workloads [beyond memory limits] (albeit with some limitations). This is particularly relevant in scenarios where the analyzed datasets are AM but small enough to fit on



The Rise of AI

Advancements in deep learning and neural network architectures have fueled recent breakthroughs in AI.

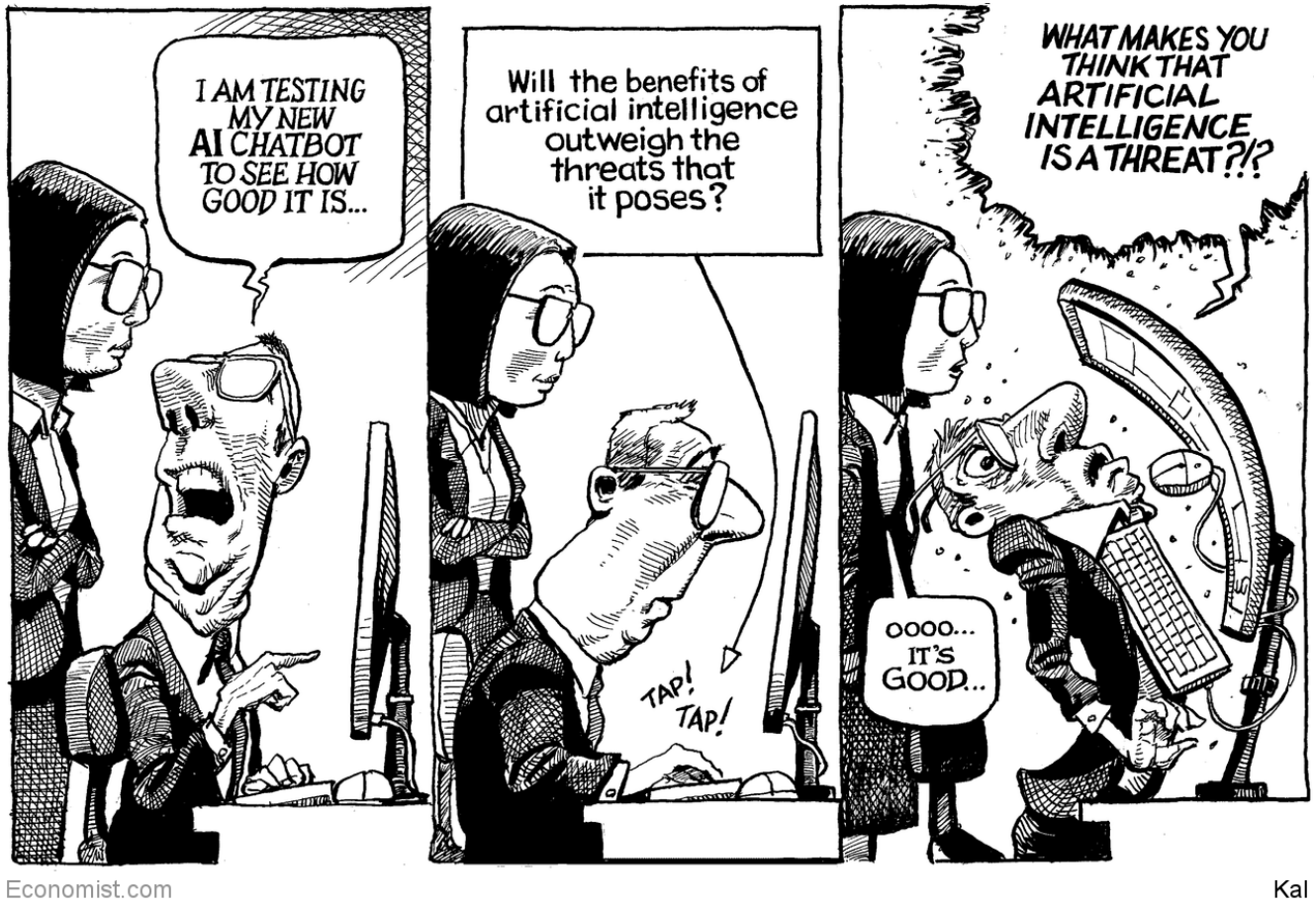
Key milestones:

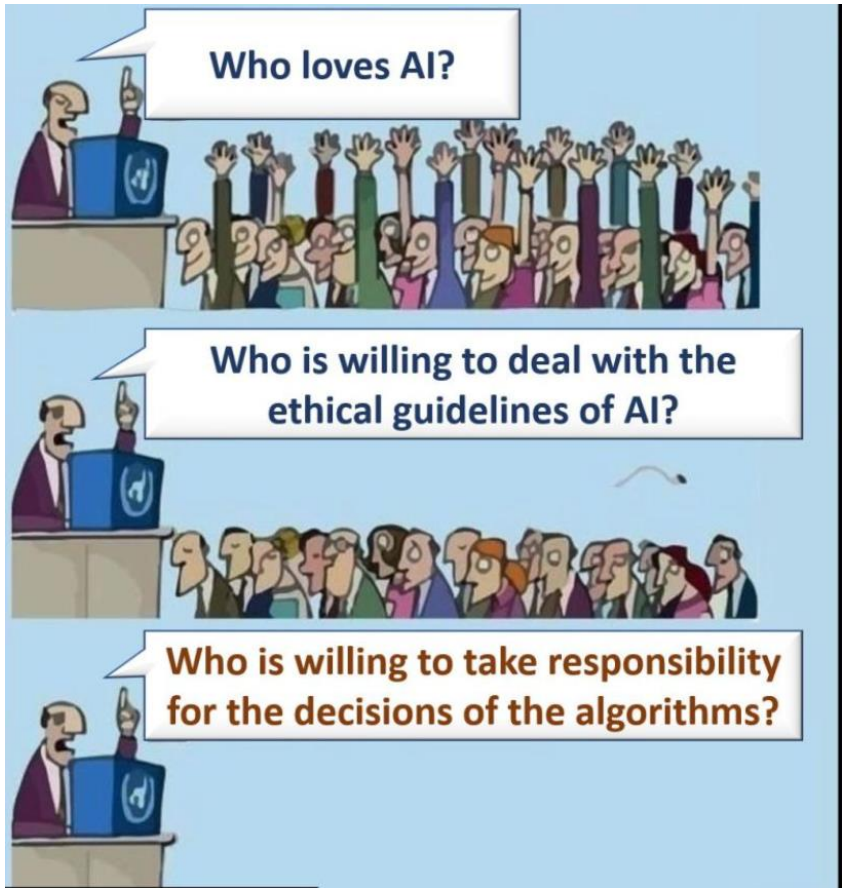
- ImageNet competition
- Emergence of self-driving cars
- AlphaGo's victory over human champions
- GPT-'s natural language understanding
- ….

Ethical Considerations

- Ethical implications:
    - Bias
    - Privacy
    - Accountability
    - Job displacement
    - Explainable AI

Ethical Considerations





Challenges

Soundbytes

Game commentary in snack-sized mouthfuls

"I want AI to do my laundry and dishes so that I can do art and writing, not for AI to do my art and writing so that I can do my laundry and dishes."

Author and videogame enthusiast **Joanna Maciejewska** nails it (although bathroom cleaning goes ahead of laundry and dishes)

"I'm sure I deserve

AI in action

- OCR applications / automated processes
- Fraud detection
- Geomarketing
- Recommender systems
- Forecasting
- Travelling Salesmen
- …..
- AI-driven solutions are reshaping industries and improving efficiency

Challenges and Opportunities

- Challenges:
  - Data quality issues
  - Talent shortages
  - Regulatory hurdles
  - Public skepticism
- Opportunities:
  - Collaborative initiatives

AI Applications in Enterprise

Customer Service

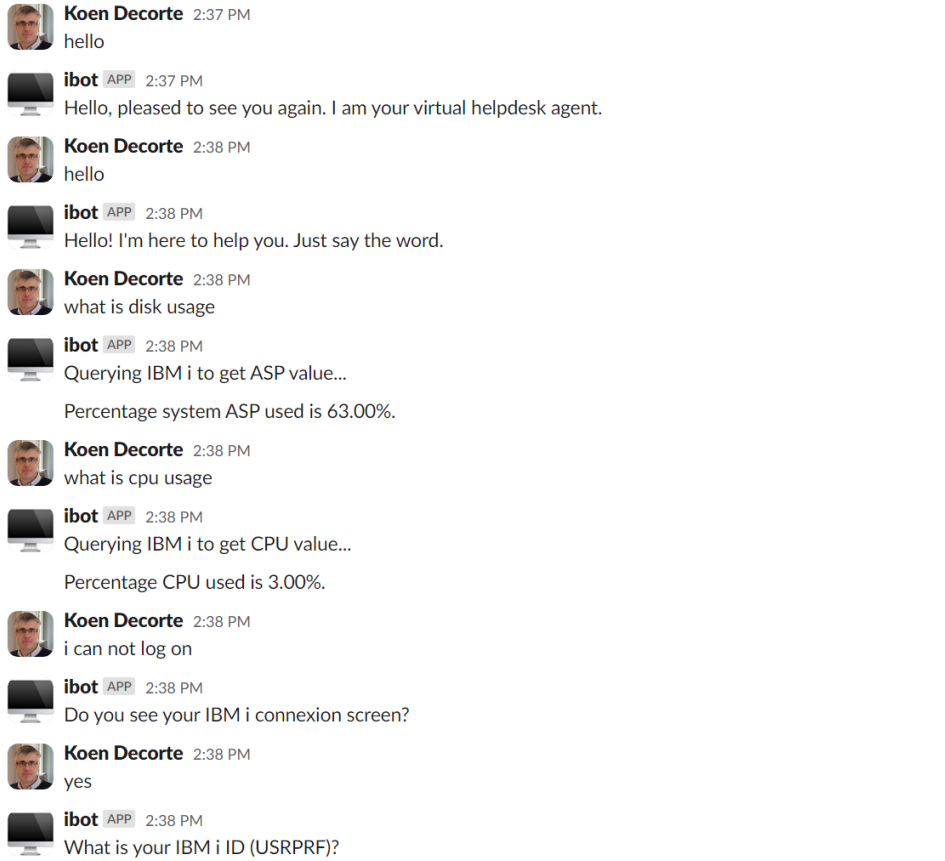
Chatbots and Virtual Assistants

Function: AI-powered chatbots and virtual assistants handle customer inquiries, provide support, and resolve issues in real-time.

Benefits: 24/7 availability, instant responses, cost savings, and improved customer satisfaction.

Example: A telecom company using a chatbot to assist customers with troubleshooting and billing inquiries.

System Chatbot example



Marketing

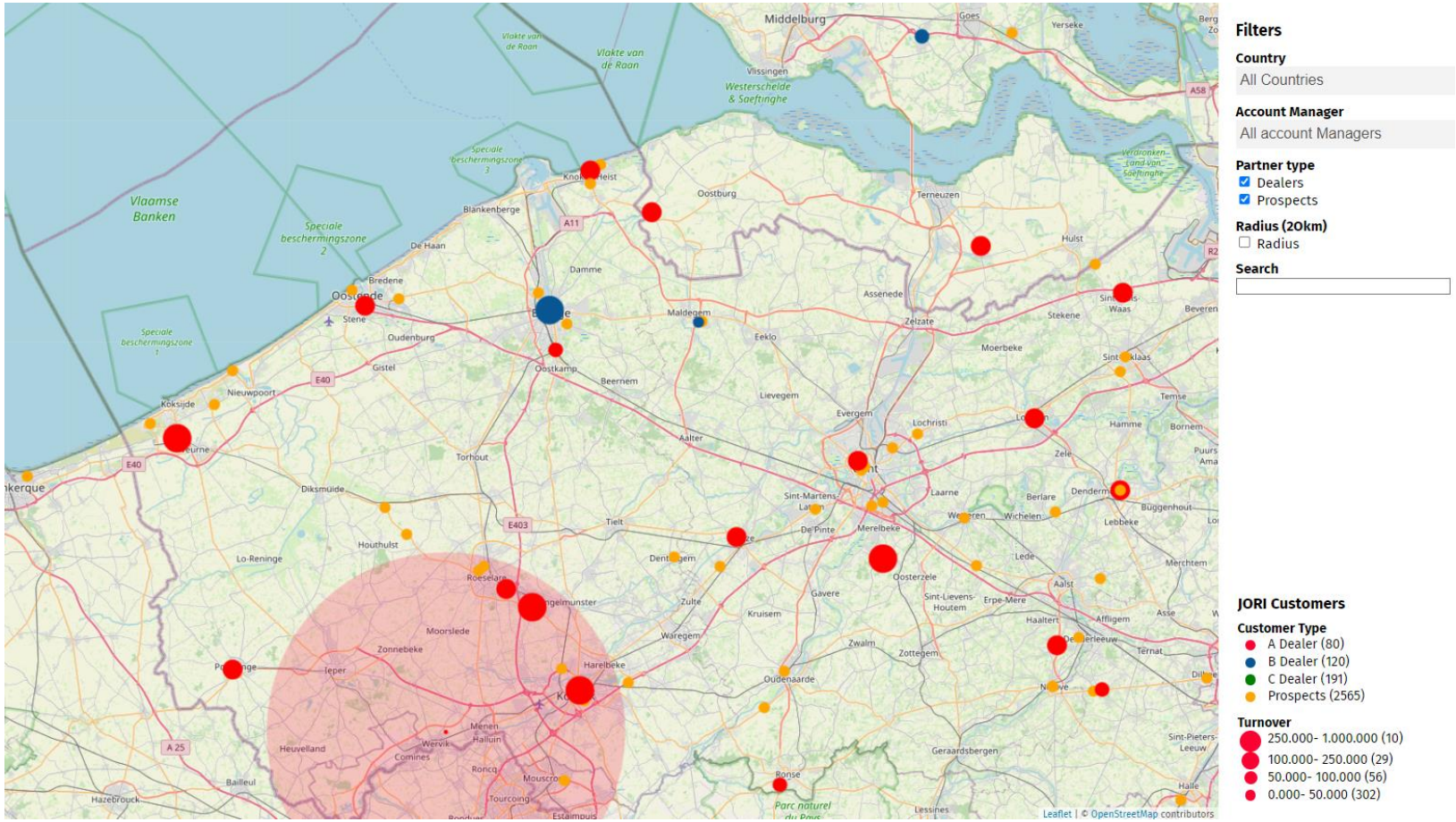
Predictive Analytics

Function: AI analyzes historical data to predict future customer behaviors, trends, and outcomes.

Benefits: Optimized marketing campaigns, better targeting, higher conversion rates.

Example: An e-commerce platform using predictive analytics to recommend products to customers based on their browsing and purchase history.

Geomarketing



Filters

Country

All Countries

Account Manager

All account Managers

Partner type

- [x] Dealers
- [x] Prospects

Radius (20km)

- [ ] Radius

Search

JORI Customers

Customer Type

- A Dealer (80)
- B Dealer (120)
- C Dealer (191)
- Prospects (2565)

Turnover

- 250.000- 1.000.000 (10)
- 100.000- 250.000 (29)
- 50.000- 100.000 (56)
- 0.000- 50.000 (302)

Marketing

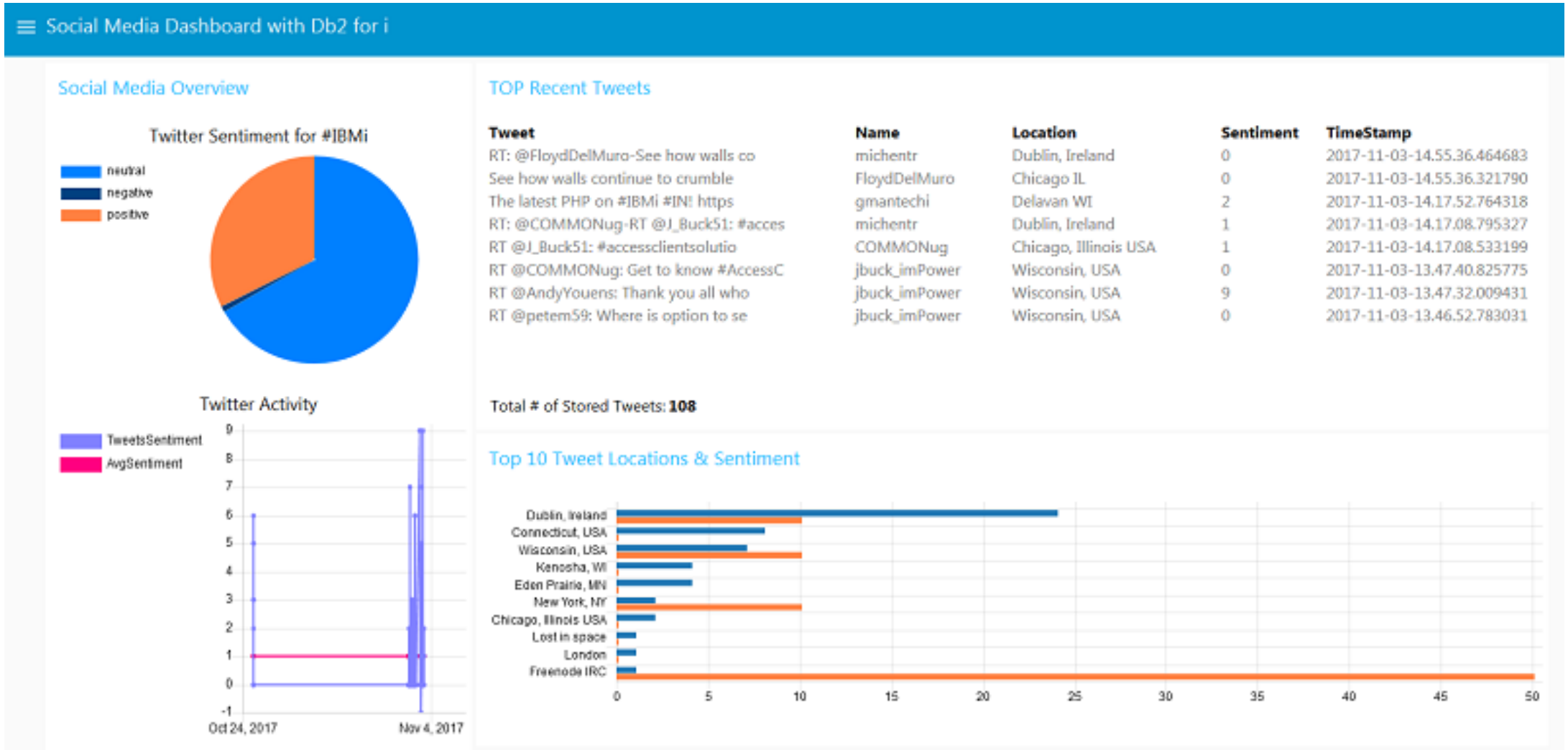
Personalization:

Function: AI creates personalized content and offers for individual customers based on their preferences and behavior.

Benefits: Enhanced customer experience, increased engagement, and loyalty.

Example: A streaming service using AI to personalize content recommendations for viewers.

Sentiment analysis



Operations

Supply Chain Optimization:

Function: AI optimizes supply chain processes by predicting demand, managing inventory, and identifying inefficiencies.

Benefits: Reduced costs, minimized waste, improved efficiency.

Example: A manufacturing company using AI to forecast demand and optimize production schedules.

Operations

Predictive Maintenance:

Function: AI predicts equipment failures and maintenance needs before they occur.

Benefits: Reduced downtime, lower maintenance costs, extended equipment life.

Example: An airline using AI to predict and prevent aircraft component failures, ensuring timely maintenance.


ORMA

E-mail - Michel Albertijn - Outlo | CRAS WMS Interface | javascript - How to test if a string

Niet beveiligd | 10.172.11.106:10001/crplan/wmsinterface.html

CRAS WOODSHOP

WMS interface

Interface Type: | WMS Status: | Between dates: | WMS Key: | ASW ECSN: | Search Data | Reset Search

Interface Type	WMS Key	ASW ECSN	Date Created	Date Processed	Server	Status	Data	Respo
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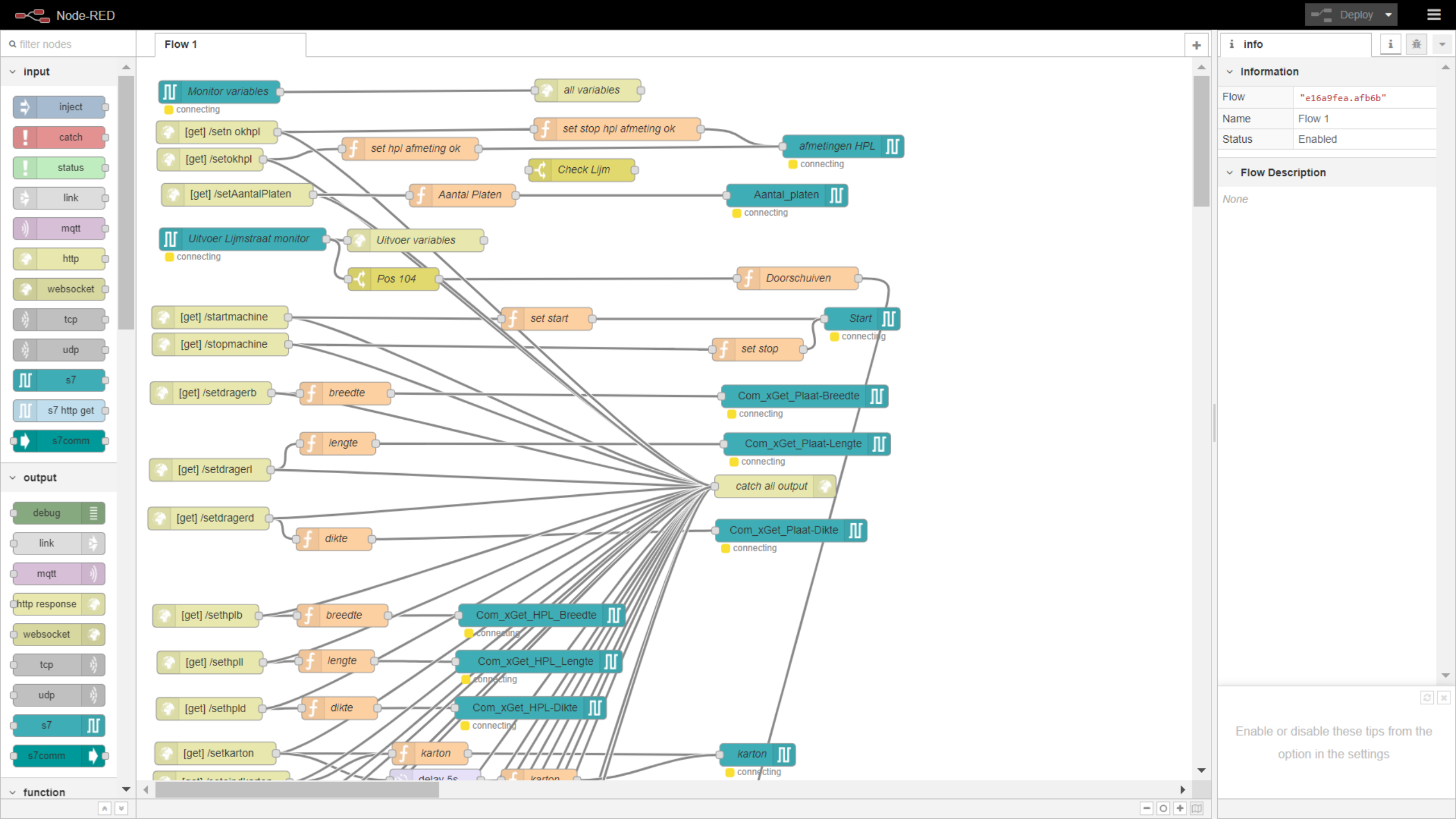
Node-RED
Deploy
filter nodes
Flow 1
info
input
inject
catch
status
link
mqtt
http
websocket
tcp
udp
s7
s7 http get
s7comm
output
debug
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http response
websocket
tcp
udp
s7
s7comm
function
Monitor variables
connecting
all variables
[get] /setn okhpl
set stop hpl afmeting ok
afmetingen HPL
connecting
[get] /setokhpl
set hpl afmeting ok
Check Lijm
[get] /setAantalPlaten
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connecting
Uitvoer Lijmstraat monitor
connecting
Uitvoer variables
Pos 104
Doorschuiven
[get] /startmachine
set start
Start
connecting
[get] /stopmachine
set stop
[get] /setdragerb
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Com_xGet_Plaat-Breedte
connecting
lengte
Com_xGet_Plaat-Lengte
connecting
[get] /setdragerl
catch all output
[get] /setdragerd
dikte
Com_xGet_Plaat-Dikte
connecting
[get] /sethplb
breedte
Com_xGet_HPL_Breedte
connecting
[get] /sethpll
lengte
Com_xGet_HPL_Lengte
connecting
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dikte
Com_xGet_HPL-Dikte
connecting
[get] /setkarton
karton
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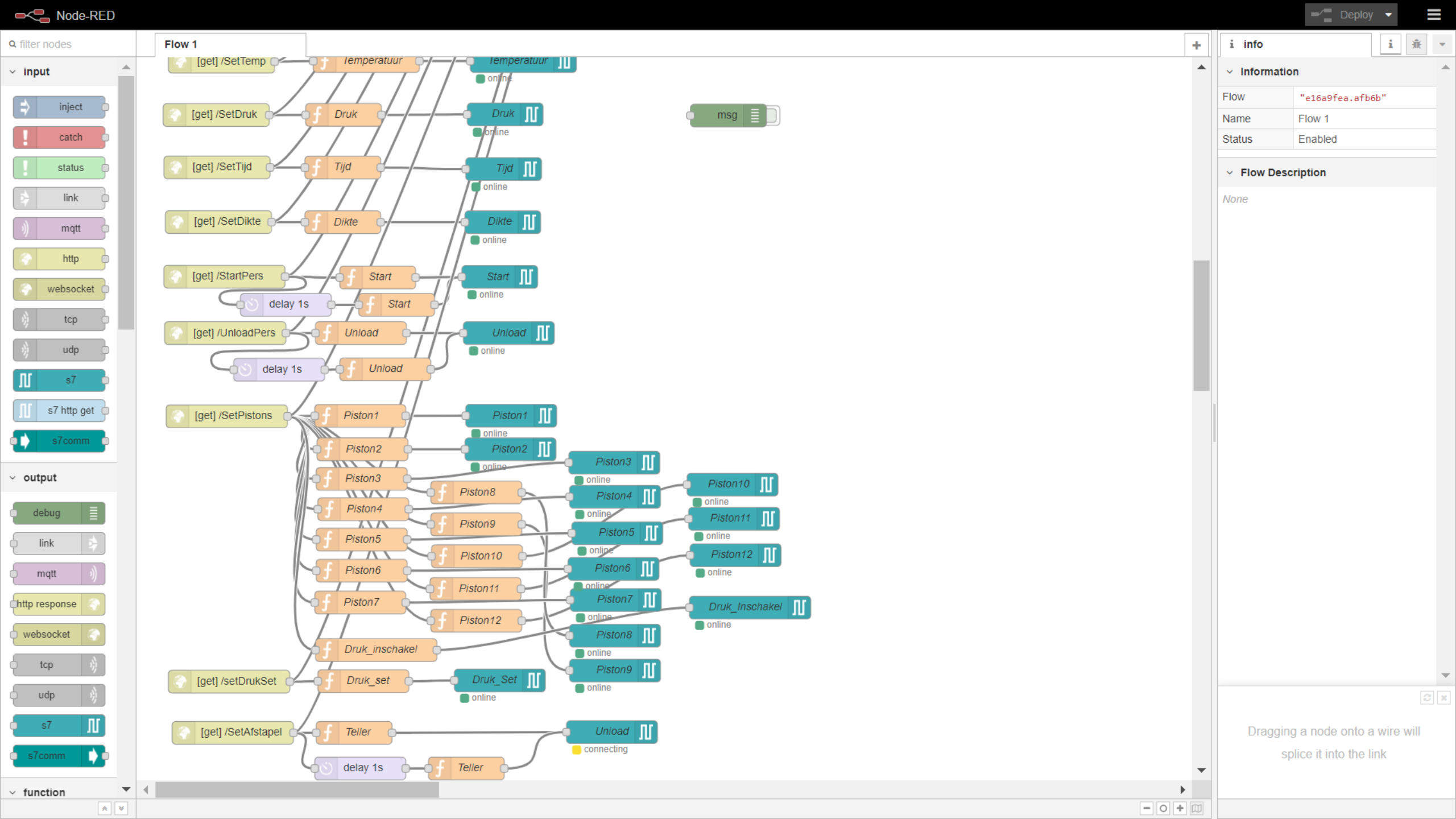
connecting
Information
Flow
"e16a9fea.afb6b"
Name
Flow 1
Status
Enabled
Flow Description
None
Enable or disable these tips from the option in the settings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udp
s7
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[get] /SetDruk
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[get] /SetDikte
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[get] /StartPers
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delay 1s
Start
[get] /UnloadPers
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online
delay 1s
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Piston7
Piston12
Piston8
online
Druk_inschakel
Piston9
online
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Druk_set
Druk_Set
online
[get] /SetAfstapel
Teller
Unload
connecting
delay 1s
Teller
info
Information
Flow
"e16a9fea.afb6b"
Name
Flow 1
Status
Enabled
Flow Description
None
Dragging a node onto a wire will
splice it into the link

Human Resources

Recruitment:

Function: AI screens resumes, conducts initial interviews, and identifies the best candidates.

Benefits: Faster hiring process, improved candidate matching, reduced bias.

Example: A tech company using AI to streamline the recruitment process and identify top talent.

Human Resources

Employee Engagement:

Function: AI analyzes employee feedback and engagement metrics to provide insights and recommendations.

Benefits: Enhanced employee satisfaction, lower turnover, improved productivity.

Example: An organization using AI to analyze employee survey data and develop targeted engagement strategies.

Finance

Fraud Detection:

Function: AI detects fraudulent activities and anomalies in financial transactions.

Benefits: Enhanced security, reduced financial losses, real-time fraud detection.

Example: A bank using AI to monitor transactions and flag suspicious activities for further investigation.

Finance

Risk Management:

Function: AI assesses risks and provides insights for better decision-making.

Benefits: Improved risk assessment, proactive management, and compliance.

Example: An insurance company using AI to evaluate risks and price policies accurately.

Dashboard | Aankoopfacturen

Ingave aankoopfacturen

Einde ingave | Bevestigen | PDF | Convert Pdf to Jso

Datum ingave: 11.09.2023

Journaal: AF - AANKOOPFACTUREN DocumentNr: 2300202

Leverancier: 48348 - DKV NIEDERLASSUNG DUESSELDORF - DUESSELDORF

Factuurnummer: 1234567 Datum: 11.09.2023 Vervaldatum: 11.09.2023

Blokkeren: ☑ Betaald: ☐ Valutadatum: 11.09.2023

Te betalen bedrag: 2100 EUR Btw: 4 - 20% Land: FR

Totaal zonder btw: 2100

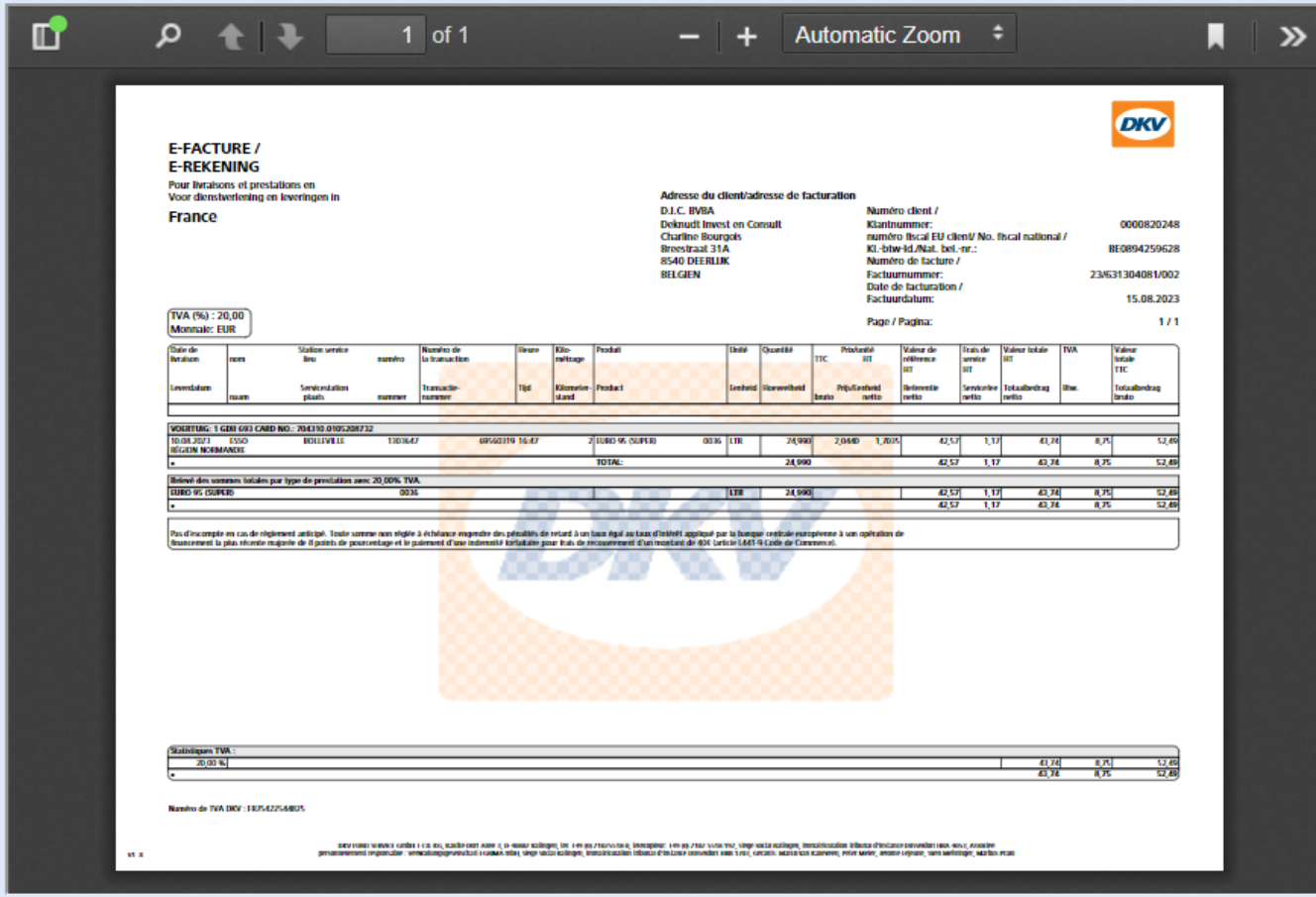
Btw niet aftrekbaar: 420 Rekening: 411020 - TERUG TE VORDEREN BTW FRANKRIJK

Disconto: 0 Vervaldatum: 11.09.2023

Buiten maatstaf: 0

Kredietbeperking: 0

Te betalen leeggoed: 0



Debet: **EUR 840,00** Credit: **EUR 2.100,00** **Totaal debet niet gelijk aan totaal credit**

K/L/R	Rekening	Rekening omschrijving	Kostenplaats	Kostenplaats omschrijving	Bedrag EUR	D/C	Btw vak	Omschrijving	Personeel	Personeel omschrijving
L	440000	Leveranciers			2.100,00	C				
R	411020	Terug te vorderen btw Frankrijk			420,00	D		DKV NIEDERLASSUNG DUESSELDORF		
R	411003	Terug te vorderen btw België medecontractant			420,00	D		DKV NIEDERLASSUNG DUESSELDORF		

Recognize tekst - Watson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        "text": "62 [09]\n22",
        "words": [
            {
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                    "left": 322,
                    "top": 227,
                    "width": 49
                },
                "score": 0.5176,
                "word": "62"
            },
            {
                "line_number": 0,
```

Recognize tekst – Tesseract


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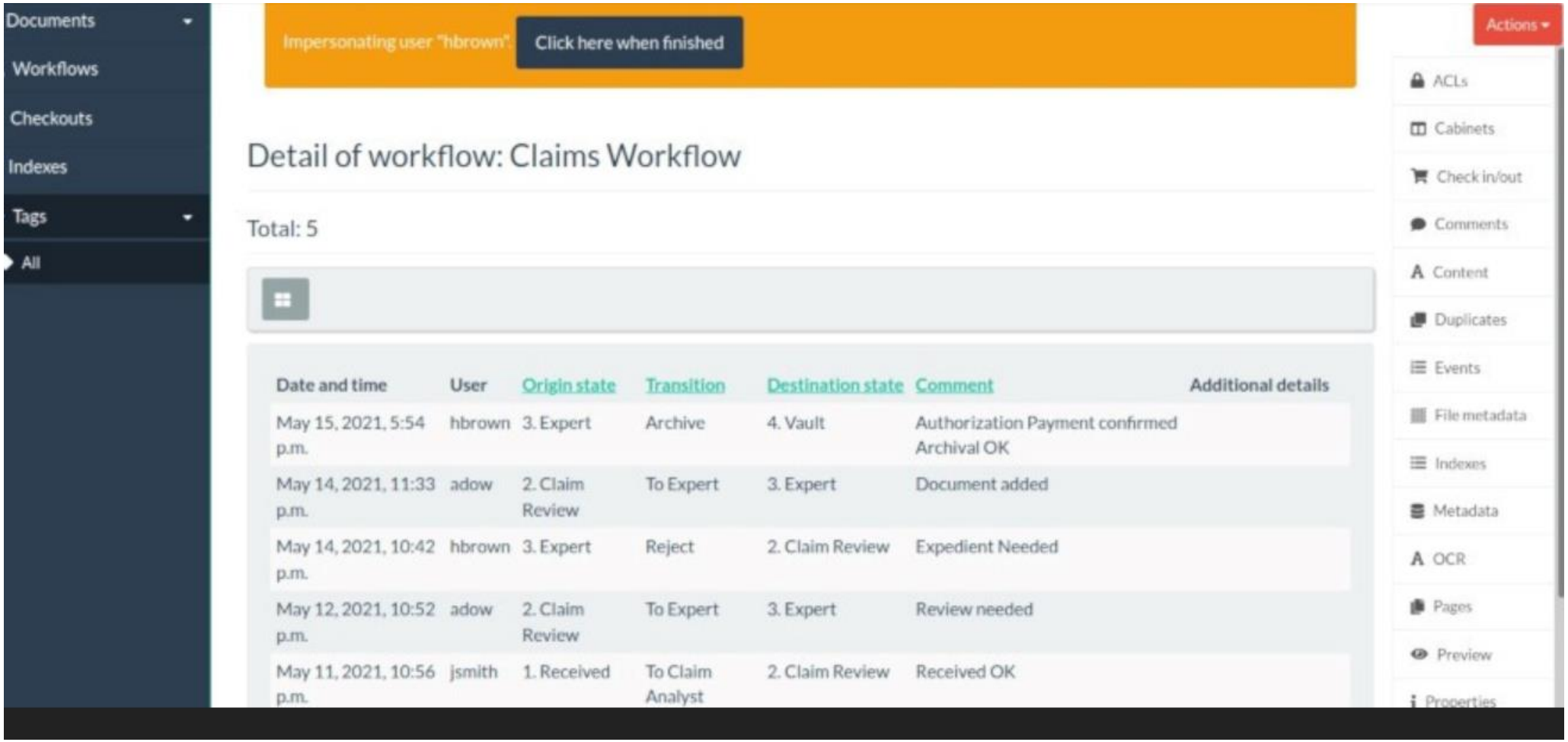
"textAnnotations": [
  {
    "locale": "en",
    "description": "YMLU 621093 9\n22U1\nCAUTION\n07/08/2017\n",
    "boundingPoly": {
      "vertices": [
```

Mayan EDMS


Mayan EDMS
System
User
Documents
Workflows
Cabinets
Checkouts
Indexes
Tags
All
Create new tag
Preview of: Claims Workflow
Actions
ACLs
Document types
Events
Preview
States
Subscriptions
Transitions
1. Received
2. Claim Review
3. Expert
4. Vault
To Claim Analyst
On exit
Rename
To Expert
Reject
On entry
On exit
Claim Review Entry
Claim Review Exit
Archive
On entry
On exit
Expert Entry
Expert Exit


Documents
Workflows
Checkouts
Indexes
Tags
All
Impersonating user "hbrown"
Click here when finished
Actions
ACLs
Cabinets
Check in/out
Comments
Content
Duplicates
Events
File metadata
Indexes
Metadata
OCR
Pages
Preview
Properties
Detail of workflow: Claims Workflow
Total: 5
Date and time
User
Origin state
Transition
Destination state
Comment
Additional details
May 15, 2021, 5:54 p.m.
hbrown
3. Expert
Archive
4. Vault
Authorization Payment confirmed Archival OK
May 14, 2021, 11:33 p.m.
adow
2. Claim Review
To Expert
3. Expert
Document added
May 14, 2021, 10:42 p.m.
hbrown
3. Expert
Reject
2. Claim Review
Expedient Needed
May 12, 2021, 10:52 p.m.
adow
2. Claim Review
To Expert
3. Expert
Review needed
May 11, 2021, 10:56 p.m.
jsmith
1. Received
To Claim Analyst
2. Claim Review
Received OK

Filtrer par agence

LISTE DES COMMANDES PASSÉES

Rechercher...

FILTRES

PDF	Agence	Code etablissement	Date commande	Num commande	Commentaire entete	Nb lignes	Date livraison	Code fournisseur	Origine	Heure commande	Mode transport
	070	07052	05/10/2024	07052-1465-1	POUR PROBLEME DE LIVRAISON ...	27	mercredi 09 octobre 2024	CHAPONNAY	API	16:06:44	L
	053	05370	10/10/2024	05370-2443-1	Contact obligatoire	16	mardi 15 octobre 2024	CHAPONNAY	API	16:06:45	L
	053	05300	08/10/2024	05300-15031-1		2	lundi 14 octobre 2024	CHAPONNAY	API	16:06:45	L
	053	05300	08/10/2024	05300-15031-2		4	jeudi 17 octobre 2024	CHAPONNAY	API	16:06:45	L
	053	05300	08/10/2024	05300-15031-3		7	lundi 21 octobre 2024	CHAPONNAY	API	16:06:45	L
	052	05203	08/10/2024	05203-1035-1		38	lundi 14 octobre 2024	CHAPONNAY	API	16:06:45	L
	025	02559	04/10/2024	02559-71-1		47	jeudi 10 octobre 2024	CHAPONNAY	API	16:06:45	L
	025	02558	10/10/2024	02558-124-1	Bonjour livraison entre 6h et 9h30 ...	3	lundi 14 octobre 2024	CHAPONNAY	API	16:06:45	L
	025	02509	16/10/2024	02509-5684-1		50	vendredi 18 octobre 2024	CHAPONNAY	API	16:06:45	L
	025	02509	02/10/2024	02509-5649-1		40	lundi 07 octobre 2024	CHAPONNAY	API	16:06:45	L
	025	02507	18/10/2024	02507-2978-1	Bonjour,	1	mardi 22 octobre 2024	CHAPONNAY	API	16:06:45	L
	024	02488	03/10/2024	02488-2918-1		32	lundi 07 octobre 2024	CHAPONNAY	API	16:06:45	L
	023	02383	22/10/2024	02383-1122-1		88	mercredi 23 octobre 2024	CHAPONNAY	API	16:06:45	L
	053	05300	02/10/2024	05300-14998-1		1	lundi 07 octobre 2024	CHAPONNAY	API	16:06:45	L
	053	05300	02/10/2024	05300-14998-2		5	jeudi 10 octobre 2024	CHAPONNAY	API	16:06:45	L
	053	05300	02/10/2024	05300-14998-3		13	lundi 14 octobre 2024	CHAPONNAY	API	16:06:45	L

Lignes par page : 25 1–25 sur 29

MODIFIER VIEW SPLIT

MODIFIER UNE COMMANDE

EXPORT

Num commande	Code etablissement	Code fournisseur	Origine	Nb lignes	Mode transport
02313-9044-1	02313	CHAPONNAY	API	1	L

Type commande	Origine commande	Version	Date commande	Date livraison	Heure commande
220	D	ACE	18/09/2024	DD/MM/YYYY	16:09:17

Commentaire entete

ifpen.69360@api-restauration.com

ADD RECORD

Actions	Num ligne	Code article	Libelle	Quantite
	1	30967	Crème bio gastr&pât.UHT 35% 1L (Union Européenne) (PRÉSIDENT	12

Commande N°: 07052-1465-1

Bon de Commande

05/10/2024

Commande N° 1465

Expediteur :

Code Region : R070
Code API : 07052
Code Client : 260068
SPIT SAS
150 avenue de Lyon
26500 BOURG LES VALENCE
Deborah Urze

BONJOUR
NOUVEAU NUMERO
04.75.42.11.87

POUR PROBLEME DE LIVRAISON
CONTACTER LE NOUVEAU GERANT AU :
06 09 18 46 31 DEBORAH

Destinataire :

PRO A PRO SUD CHAPONNAY
275 RUE ANDRE AMPERE
69970 CHAPONNAY CEDEX

Livraison au : mercredi 09 oct. 2024

CodeRef	Designation	Qte	Unité	Prix U.	Conso	S.Total
02795	[A] Abricots oreillons au naturel (Import) (JIC)	3,00	Boîte 4/4 de 475 Gr	2,369 €	11/10/2024	7,107 €
02220	[A] Ananas en tranches entières SL (Import)	2,00	Boîte 4/4 de 490 Gr	2,464 €	11/10/2024	4,928 €
160962	[A] Blé entier Perliblé CE² 5K (France) (VIVIEN PAILLE)	2,00	Sac de 5 Kg	11,890 €	11/10/2024	23,780 €
55410	[A] Bouillon volail.déshy.1K (50L) (KNORR PROFESSIO)	3,00	Boîte de 1 Kg	10,230 €	11/10/2024	30,690 €
101429	[A] Champignons à la grecque (France) (LOUIS MARTIN)	2,00	Boîte 5/1 de 4 Kg	20,216 €	11/10/2024	40,432 €
60439	[A] Croûtons cubiq.grillé.ail 500g (Import) (PASQUIER)	5,00	Sachet de 500 Gr	2,404 €	11/10/2024	12,020 €
02006	[A] Crème marron vanillée (O.F.) (UE) (VALADE EN CORRÈ)	2,00	Boîte 4/4 de 1000 Gr	6,098 €	11/10/2024	12,196 €
160003	[A] Curcuma moulu 400g (Import) (SAISSE)	1,00	Boîte de 400 Gr	3,707 €	11/10/2024	3,707 €
151796	[A] Curry doux 1K (Import) (SAISSE)	1,00	Sachet de 1000 Gr	6,957 €	11/10/2024	6,957 €
103544	[A] Daim brisures 1K (DAIM)	1,00	Sachet de 1 Kg	15,027 €	11/10/2024	15,027 €
34971	[A] Fonds brun lié 750g 37L (KNORR 1-2-3)	3,00	Boîte de 750 Gr	10,516 €	11/10/2024	31,548 €
151762	[A] Graines de pavot 1K (SAISSE)	2,00	Sac de 1 Kg	8,911 €	11/10/2024	17,822 €
53190	[A] Levure chimique 11g x6 (BELLE FRANCE)	6,00	Pièce de 11 Gr (1 Lot de 6 Pièce de 11 Gr)	0,074 €	11/10/2024	0,444 €
154439	[A] Maïzena 2,5K (MAIZENA)	1,00	Boîte de 2.5 Kg	11,867 €	11/10/2024	11,867 €
162775	[A] Morceaux coeurs palmier 2,495K (Import) (VRÉLA)	2,00	Boîte 3/1 de 1.56 Kg	6,646 €	11/10/2024	13,292 €

Cost-sensitive Learning

- Modern-day applications are often of a cost sensitive nature
- Example areas: healthcare, sales forecasting, customer churn problems, loan charge-off forecasting, real estate price prediction, inventory planning, …
- Solution -> cost-sensitive predictive techniques

- Decorte T., Raymaekers J., Verdonck T. (2023) Interpretable Cost-Sensitive Regression through One-Step Boosting, Decision Support Systems

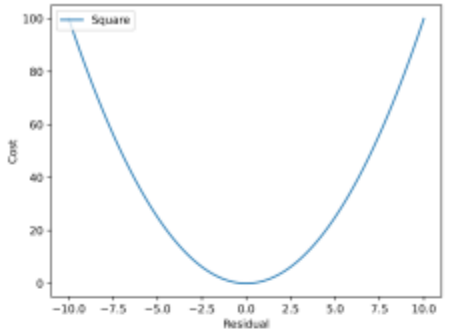
Cost-sensitive regression

- **Classification**
  - Misclassification costs

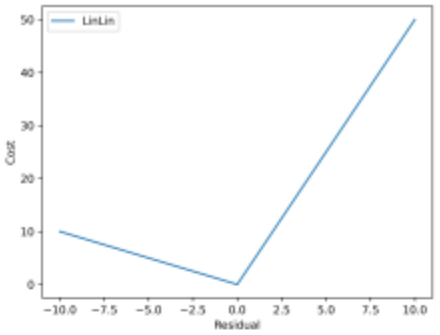
		True Class 1	True Class 2
Predicted Class	1	C_{11}	C_{12}
	2	C_{21}	C_{22}

Figure 1: Example cost matrix

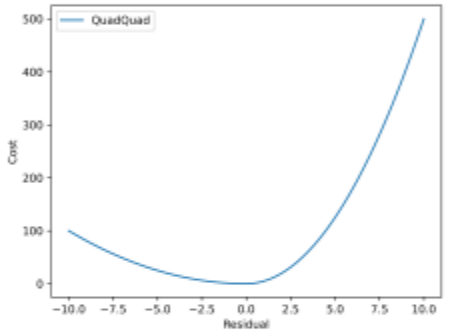
- **Regression**
  - Asymmetric costs between over- and underpredictions
  - Various cost functions illustrate the true costs based on prediction errors



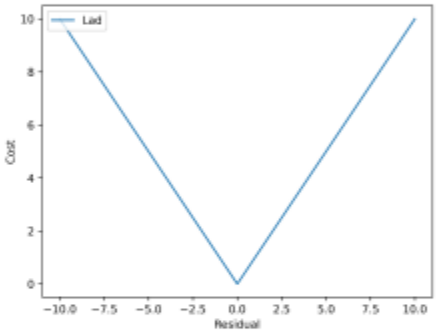
(a) Squared cost function



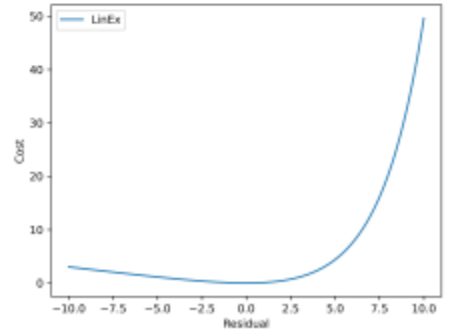
(b) Lin–Lin (Linear-Linear) cost function plotted with a = 5 and b = 1



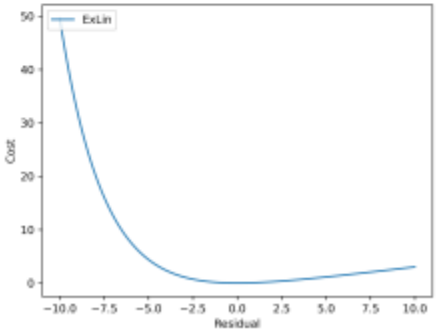
(c) Quad–Quad (Quadratic-Quadratic) cost function plotted with a = 5 and b = 1



(d) Lad (Least Absolute Deviation) cost function



(e) Lin–Ex (Linear-Exponential) cost function plotted with a = 0.4 and b = 1



(f) Ex–Lin (Exponential-Linear) cost function plotted with a = -0.4 and b = 1

Cost-sensitive regression

- Loan charge-off forecasting
- Set-up: Overpredicting loan charge-off will lead to extra funds locked up in reserves and hence a reduced earnings and also a hit in credit scoring with analysts (from not using the reserves as well as deducting earnings to the reserve fund). On the other hand underpredicting loan charge-off leads to a much larger hit in credit scoring and regulatory fines (and much worse).
- Goal: Obtain a cost-sensitive picture of the required amount of reserves required for the upcoming fiscal year

Cost-sensitive regression

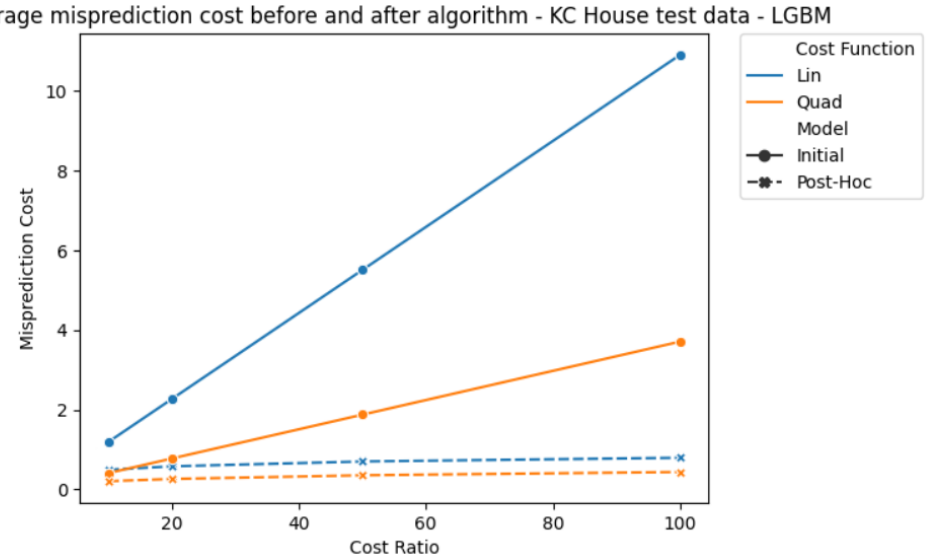
Results

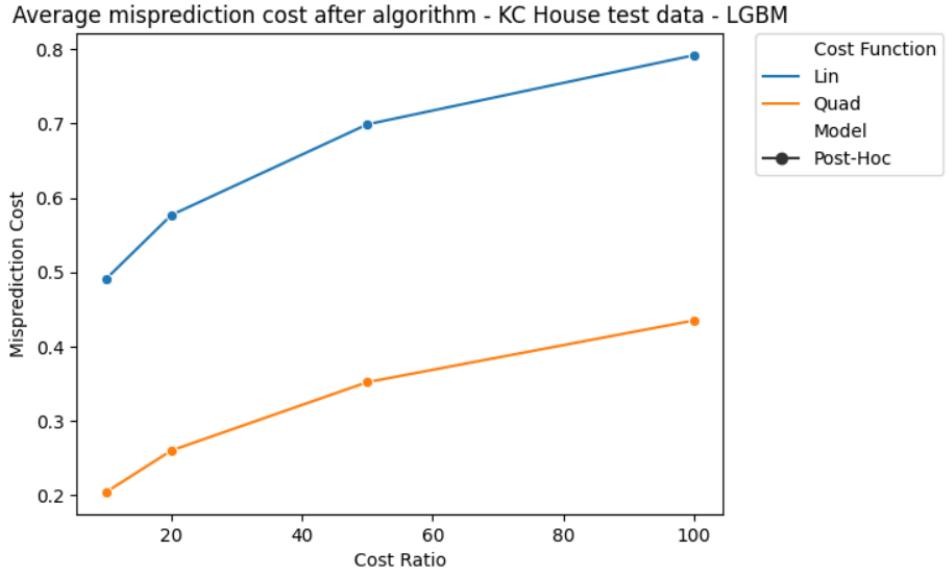
LightGBM regression (LGBM) - KC House Training Data

Cost Function	Cost Ratio	Initial Cost	Post-Hoc Cost	% Decrease
LinLin	1:10	1.081	0.435	59.8
	1:20	2.064	0.508	75.4
	1:50	5.013	0.604	87.9
	1:100	9.927	0.673	93.2
QuadQuad	1:10	0.333	0.162	51.4
	1:20	0.633	0.205	67.6
	1:50	1.534	0.272	82.3
	1:100	3.036	0.330	89.1
LinEx	2:10	61.780	7.204	88.0

LightGBM regression (LGBM) - KC House Testing Data

Cost Function	Cost Ratio	Initial Cost	Post-Hoc Cost	% Decrease
LinLin	1:10	1.190	0.491	58.8
	1:20	2.270	0.577	74.6
	1:50	5.510	0.699	87.3
	1:100	10.910	0.792	92.7
QuadQuad	1:10	0.407	0.204	50.1
	1:20	0.774	0.260	66.4
	1:50	1.875	0.352	81.2
	1:100	3.709	0.435	88.3
LinEx	2:10	182.214	13.490	92.6



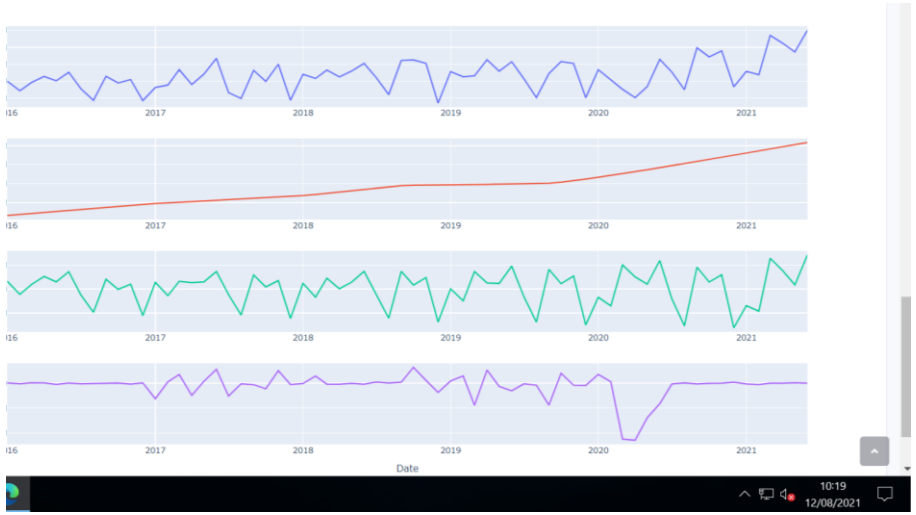


Cost-sensitive sales forecasting

- Leverage forecasting models
- Real time tracking of trends and decomposition of sales movements
- Commonly used for budgeting and optimization
- In combination with predictive inventory management

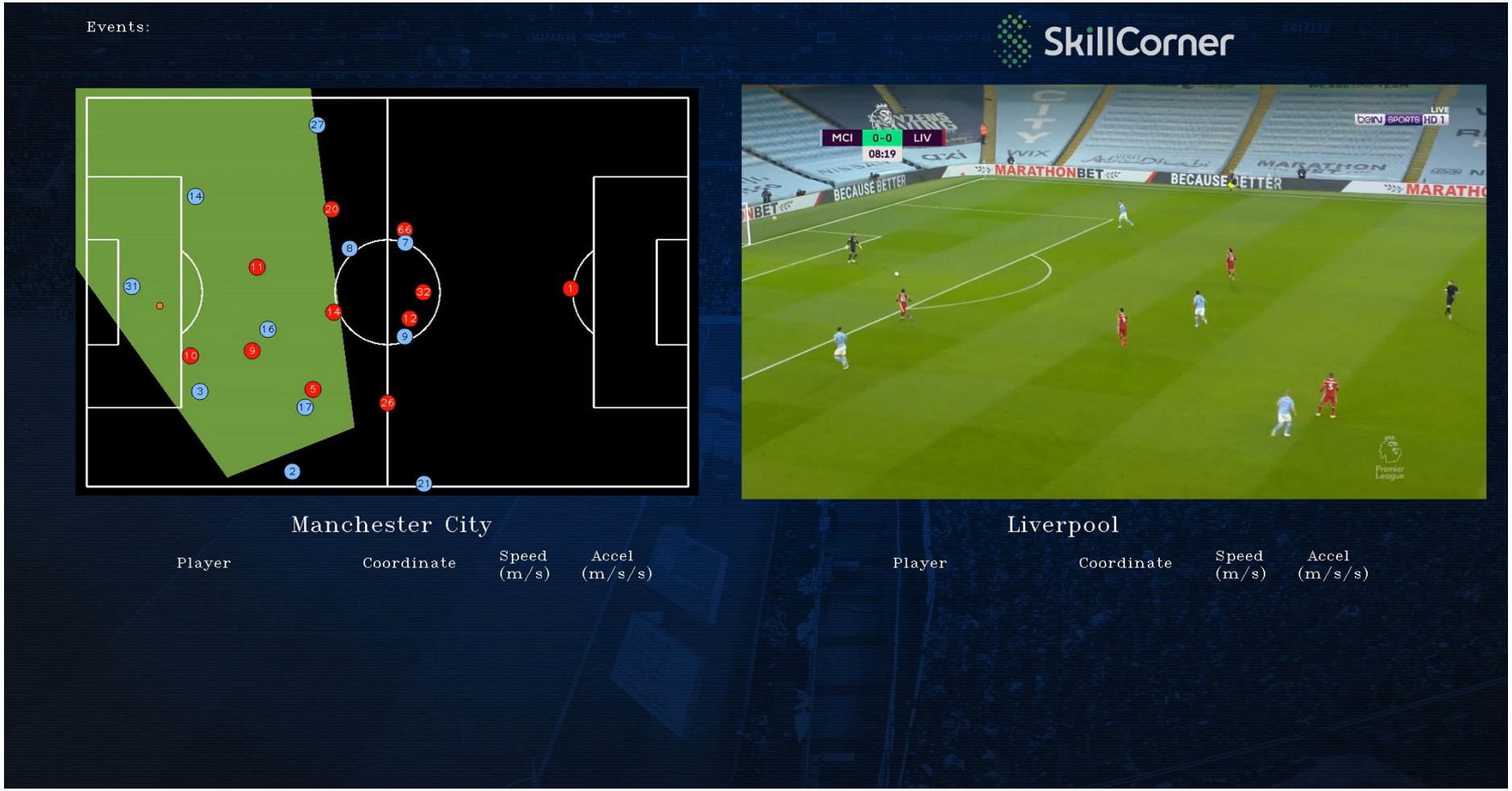
Cost-sensitive sales forecasting

- Purchasing problem due to long wait times at supplier + increase transparency throughout the firm using sales forecasting
- Solve purchasing problem and obtain strategic overview of sales evolution + decomposition of sales

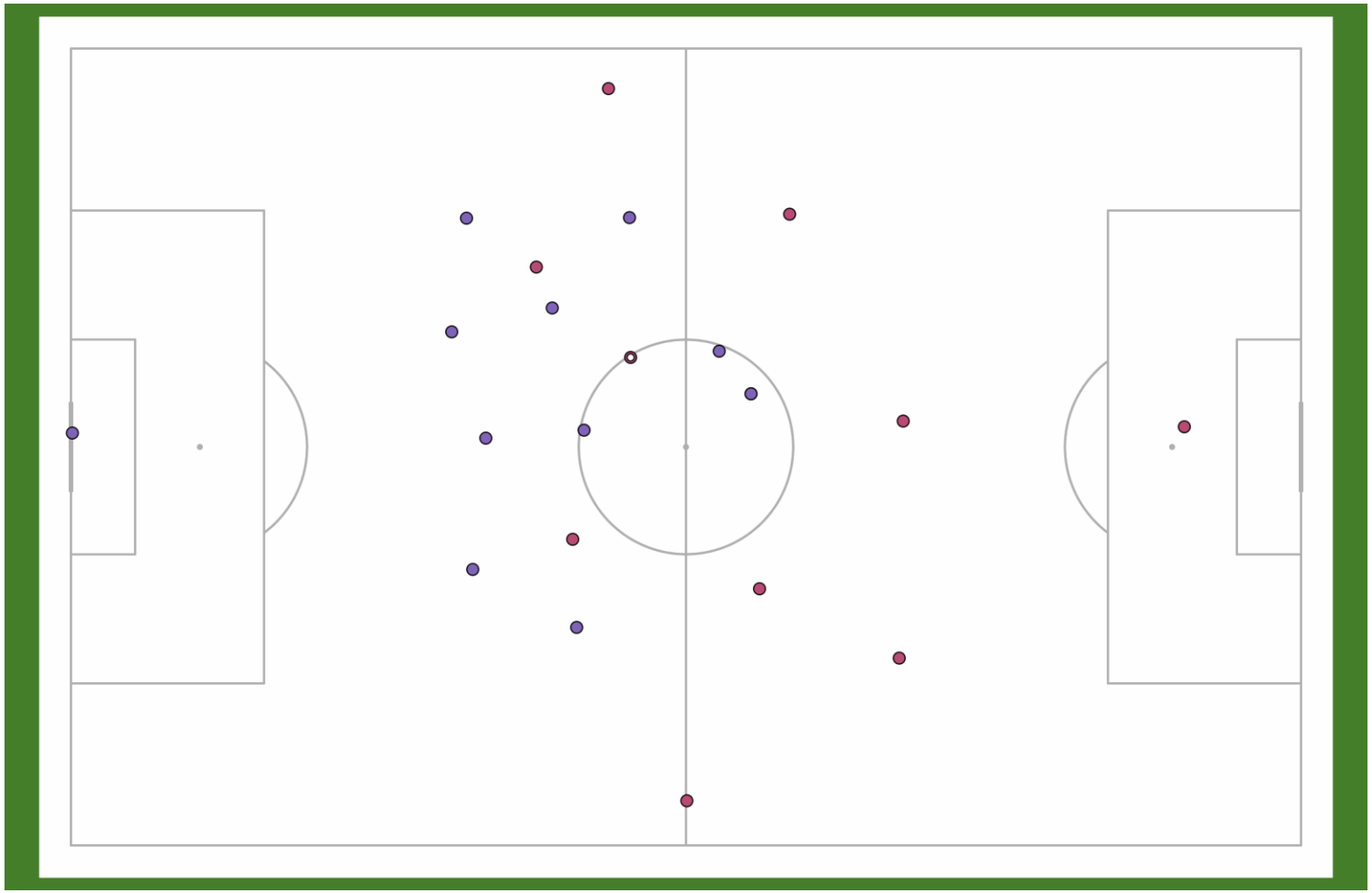


Spatio-temporal data analysis

How is spatio-temporal data captured?

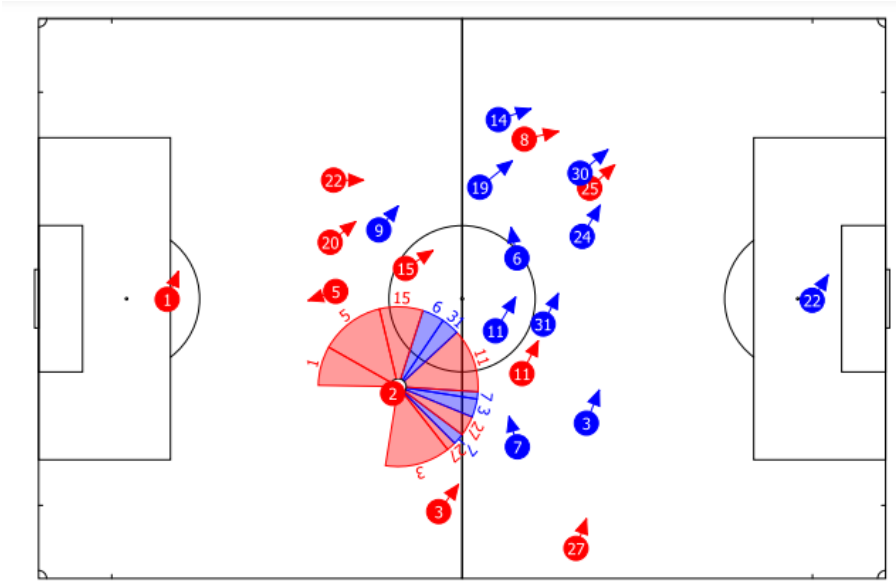


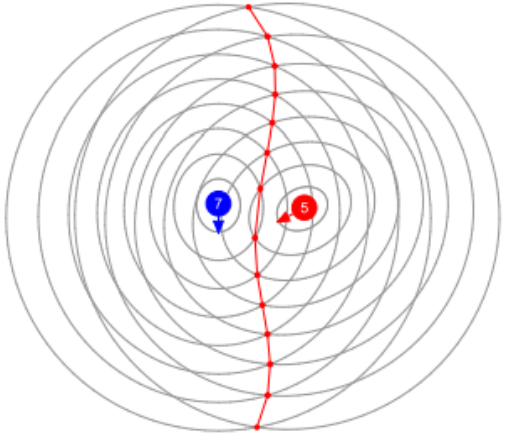
Spatio-temporal data analysis



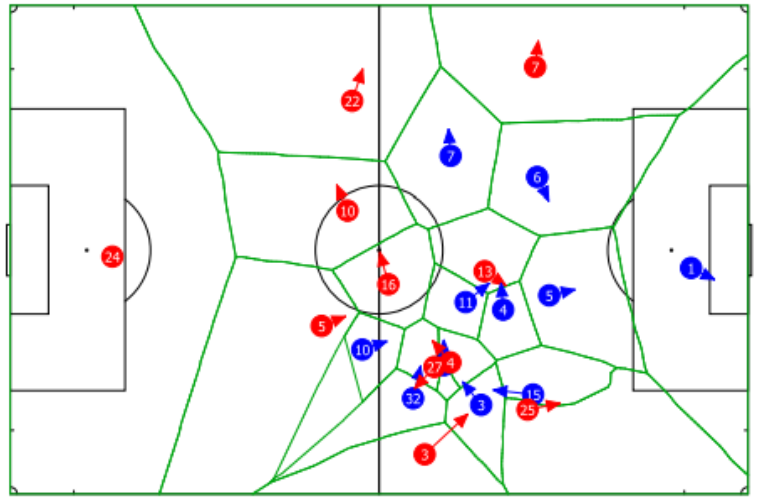
Spatio-temporal data analysis

$$m\frac{d}{dt}v = F - kv$$





(a)

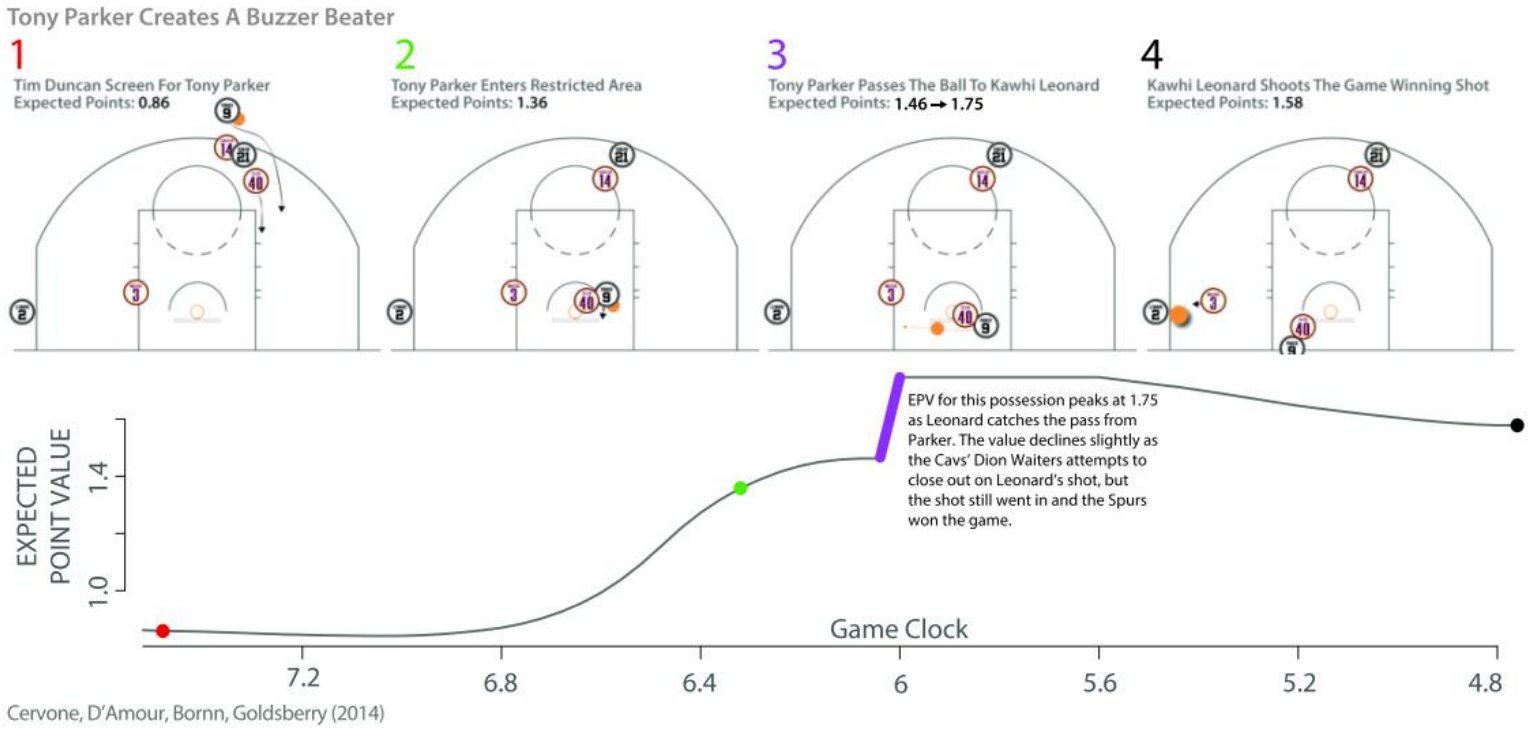


(b)

Performance metric

- EPV – expected possession value
- How many points the offense will score during a possession
- Conditional expectation
- Evaluate player actions across the match

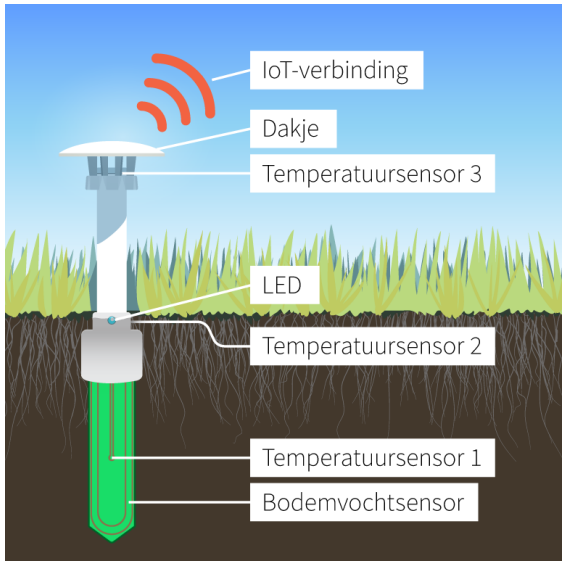
$$\text{EPVA} = \sum_{\text{touches}} \text{EPV}(t_{\text{end}}) - \text{EPV}_r(t_{\text{start}}), \text{ where } \{t_{\text{start}}, t_{\text{end}}\} \text{ bookend each touch.}$$



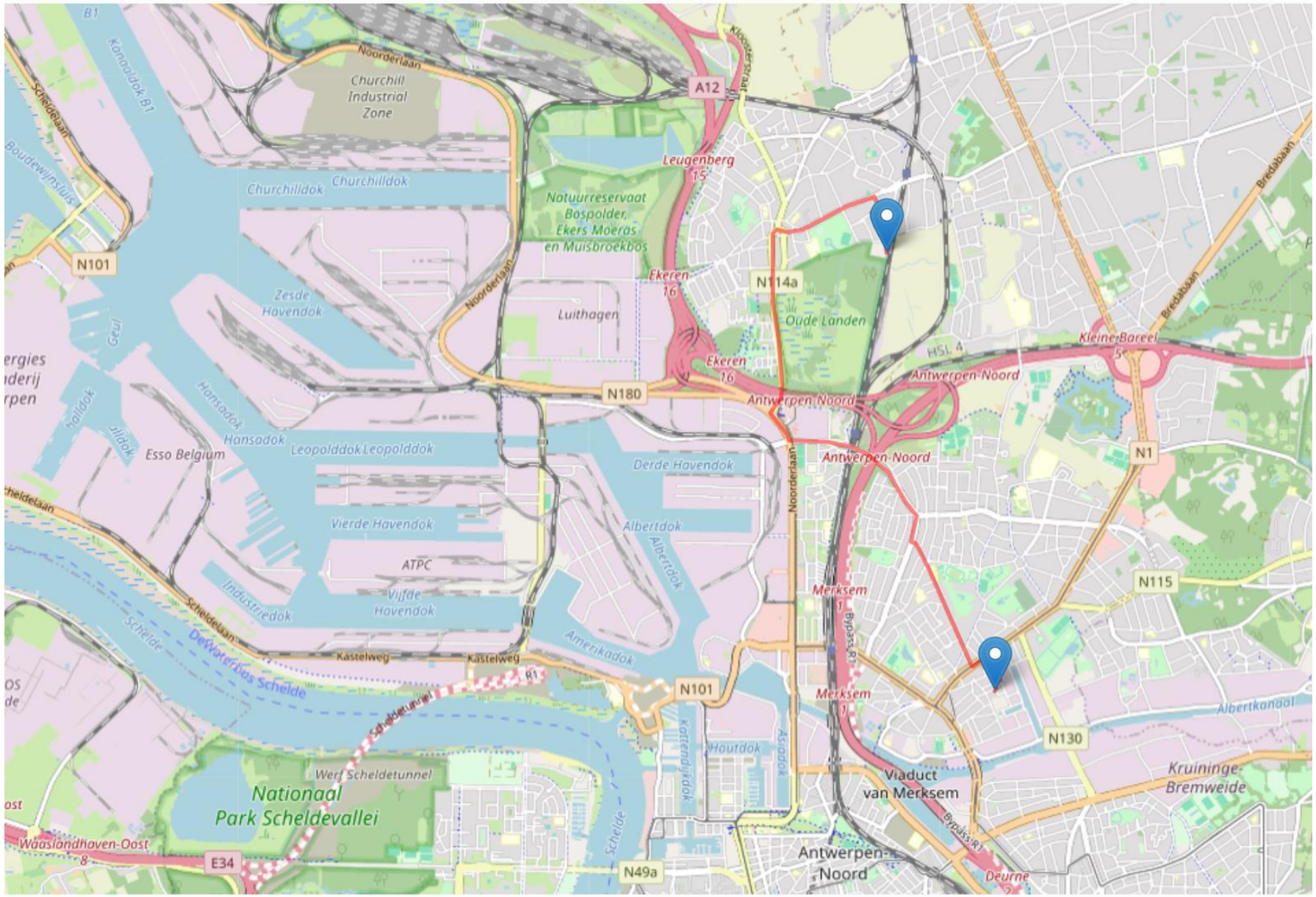
Picture: Cervone, D., D'Amour, A., Bornn, L., & Goldsberry, K. (2014, February). Pointwise: Predicting points and valuing decisions in real time with nba optical tracking data. In Proceedings of the 8th MIT Sloan Sports Analytics Conference, Boston, MA, USA (Vol. 28, p. 3).

Spatio-temporal data analysis

- CurieuzeNeuzen in de Tuin will generate an internationally unique dataset.
- The dataset will provide scientists with a much better understanding of the drought sensitivity of our gardens, parks, natural areas, and agricultural regions.
- CurieuzeNeuzen in de Tuin is part of the international SoilTemp project.
- The SoilTemp project aims to establish a global network of soil weather stations.
- The 5,000 measurement locations in the CurieuzeNeuzen project will immediately double the amount of data in the SoilTemp database.
- https://curieuzeneuzen.be/het-onderzoek/
- https://www.standaard.be/curieuzeneuzen/map/#8.5/51.07/4.1576



IBM i GEOSPATIAL ROUTE CALCULATOR



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        4
    ]
},
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    "duration": 60,
    "type": 0,
    "instruction": "Turn left onto Kattendijkdok-Oostkaai",
    "name": "Kattendijkdok-Oostkaai",
    "way_points": [
        4,
        13
    ]
},
{
    "distance": 439.4,
    "duration": 58.5,
    "type": 1,
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    "name": "Londenstraat",
    "way_points": [
        13,
        23
    ]
},
{
    "distance": 3359,
    "duration": 450.3,
    "type": 0,
    "instruction": "Turn left onto Rijnkaai",
    "name": "Rijnkaai",
    "way_points": [
        23,
        91
    ]
},
{
```


Instruction: Head northeast on Groot Hagelkruis

Distance: 116.8 meters

Duration: 28 seconds

Instruction: Turn right onto Steenstraat

Distance: 117.7 meters

Duration: 28.2 seconds

Instruction: Turn right onto Steenstraat, N114

Distance: 1593.2 meters

Duration: 188.5 seconds

Instruction: Turn left onto Noorderlaan, N180

Distance: 302.9 meters

Duration: 44.3 seconds

Instruction: Turn left

Distance: 1403.7 meters

Duration: 195.7 seconds

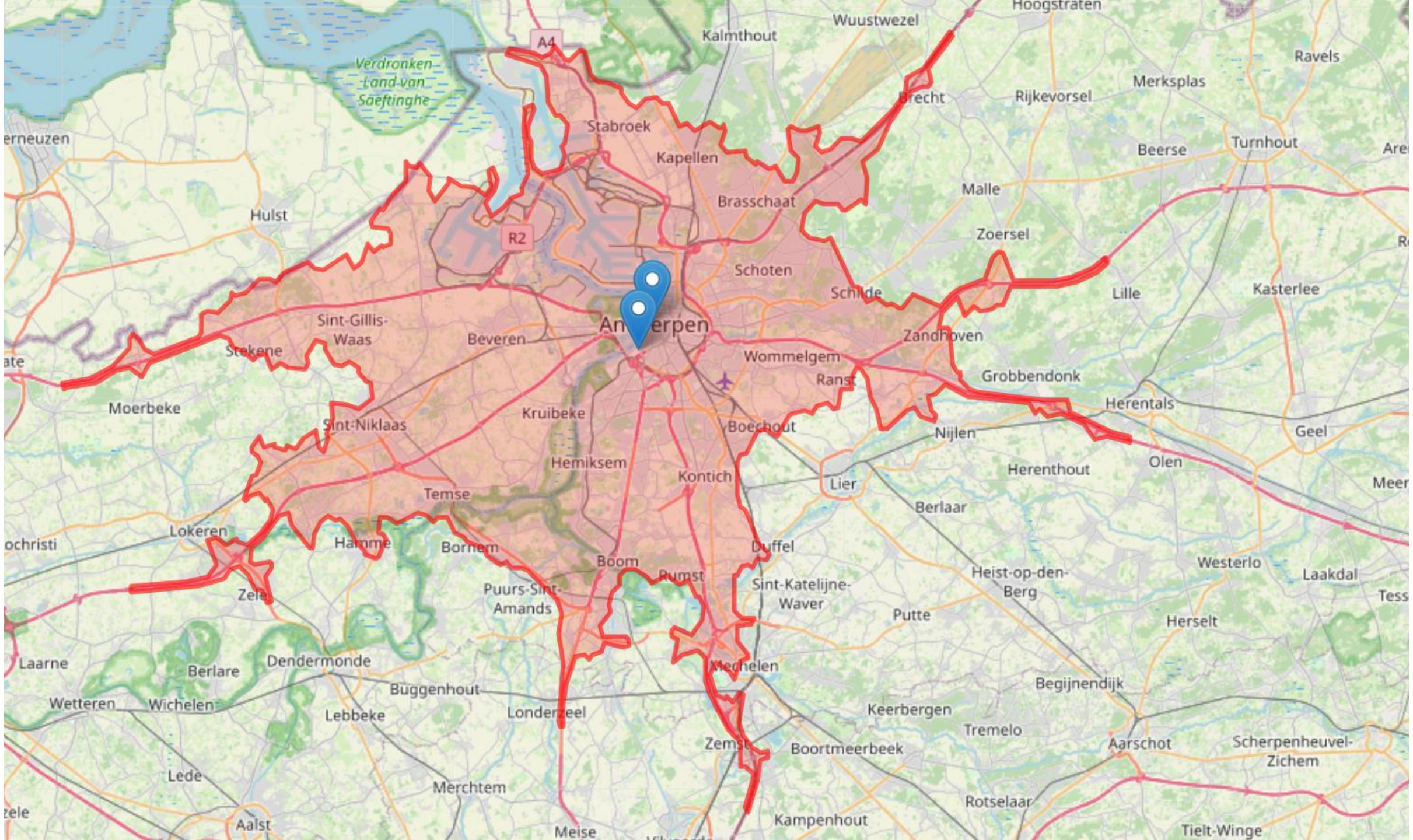
Instruction: Turn left onto Maantjessteenweg

Distance: 834.1 meters

Duration: 70.5 seconds

Isochrones

- Reachability has become a crucial component for many organizations from all different kinds of domains. Isochrones which will help you determine which areas objects are able reach in given times or distances.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R2
Kalmthout
Wuustwezel
Hoogstraten
Ravels
Merksplas
Rijkevorsel
Brecht
Stabroek
Kapellen
Brasschaat
Beerse
Turnhout
Malle
Zoersel
Hulst
Schoten
Schilde
Lille
Kasterlee
Sint-Gillis-Waas
Stekene
Beveren
Zandhoven
Wommelgem
Ranst
Grobbendonk
Herentals
Moerbeke
Sint-Niklaas
Kruibeke
Boechout
Nijlen
Geel
Hemiksem
Kontich
Olen
Herenthout
Lier
Temse
Berlaar
Lokeren
Hamme
Bornem
Duffel
Boom
Rumst
Westerlo
Laakdal
Heist-op-den-Berg
Puurs-Sint-Amands
Sint-Katelijne-Waver
Putte
Herselt
Zele
Laarne
Berlare
Dendermonde
Mechelen
Begijnendijk
Wetteren
Wichelen
Buggenhout
Lebbeke
Londerzeel
Keerbergen
Tremelo
Zemst
Boortmeerbeek
Aarschot
Scherpenheuvel-Zichem
Lede
Merchtem
Rotselaar
Aalst
Meise
Kampenhout
Tielt-Winge

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POIs

- You can search for categories of points of interest around a point, path or even within a given polygon and consume the rich meta information returned for your needs.

- https://github.com/GIScience/openpoiservice

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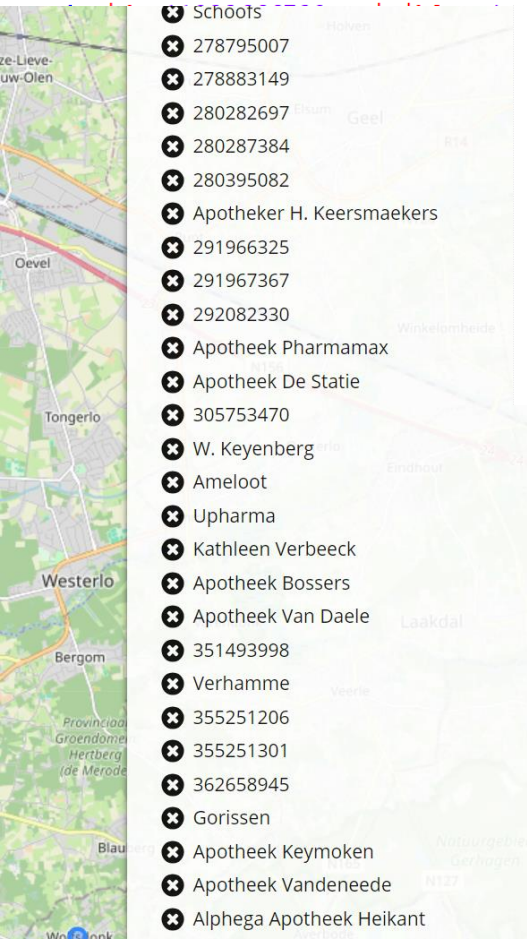

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- 278883149
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- 291966325
- 291967367
- 292082330
- Apotheek Pharmamax
- Apotheek De Statie
- 305753470
- W. Keyenberg
- Ameloot
- Upharma
- Kathleen Verbeeck
- Apotheek Bossers
- Apotheek Van Daele
- 351493998
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- Apotheek Keymoken
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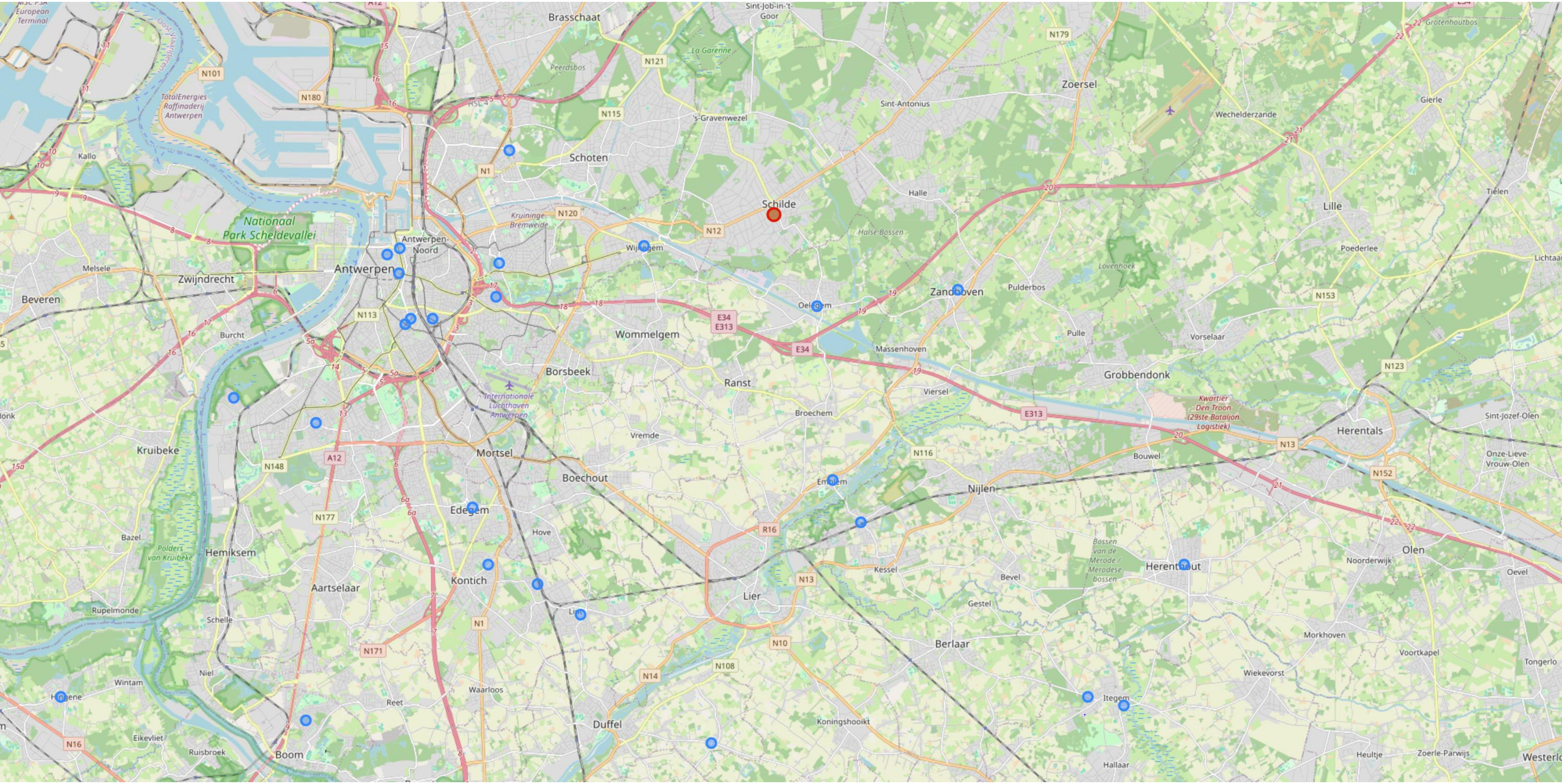


Brasschaat
Sint-Job-in-'t-Goor
Zoersel
Sint-Antonius
Wechelderzande
Gierle
Schoten
's-Gravenwezel
Schilde
Halle
Lille
Tielen
Poederlee
Lichtaart
Kallo
Nationaal Park Scheldevallei
Antwerpen-Noord
Antwerpen
Melsele
Zwijndrecht
Beveren
Wijnegem
Oelegem
Zandhoven
Pulderbos
Pulle
Vorselaar
Burcht
Wommelgem
Massenhoven
Grobbendonk
Borsbeek
Ranst
Viersel
Broechem
Internationale Luchthaven Antwerpen
Kruibeke
Vremde
Mortsel
Boechout
Herentals
Sint-Jozef-Olen
Onze-Lieve-Vrouw-Olen
Bouwel
Emblem
Nijlen
Edegem
Hove
Bazel
Hemiksem
Aartselaar
Kontich
Kessel
Bevel
Herenthout
Noorderwijk
Olen
Oevel
Lier
Gestel
Rupelmonde
Schelle
Berlaar
Morkhoven
Voortkapel
Tongerlo
Niel
Wintam
Hingene
Reet
Waarloos
Wiekevorst
Itegem
Duffel
Koningshooikt
Eikevliet
Ruisbroek
Boom
Hallaar
Heultje
Zoerle-Parwijs
Westerlo
La Garenne
Peerdsbos
Halse Bossen
Lovenhoek
Kruiningen Bremweide
TotalEnergies Raffinaderij Antwerpen
MSC PSA European Terminal
Kwartier Den Troon (29ste Bataljon Logistiek)
Bossen van de Merode / Merodese bossen
Polders van Kruibeke
Grotenhoutbos
N101
N180
N121
N115
N179
N1
N120
N12
N113
E34
E313
N153
N123
N13
N152
N116
N148
A12
N177
R16
N13
N171
N10
N14
N108
N16

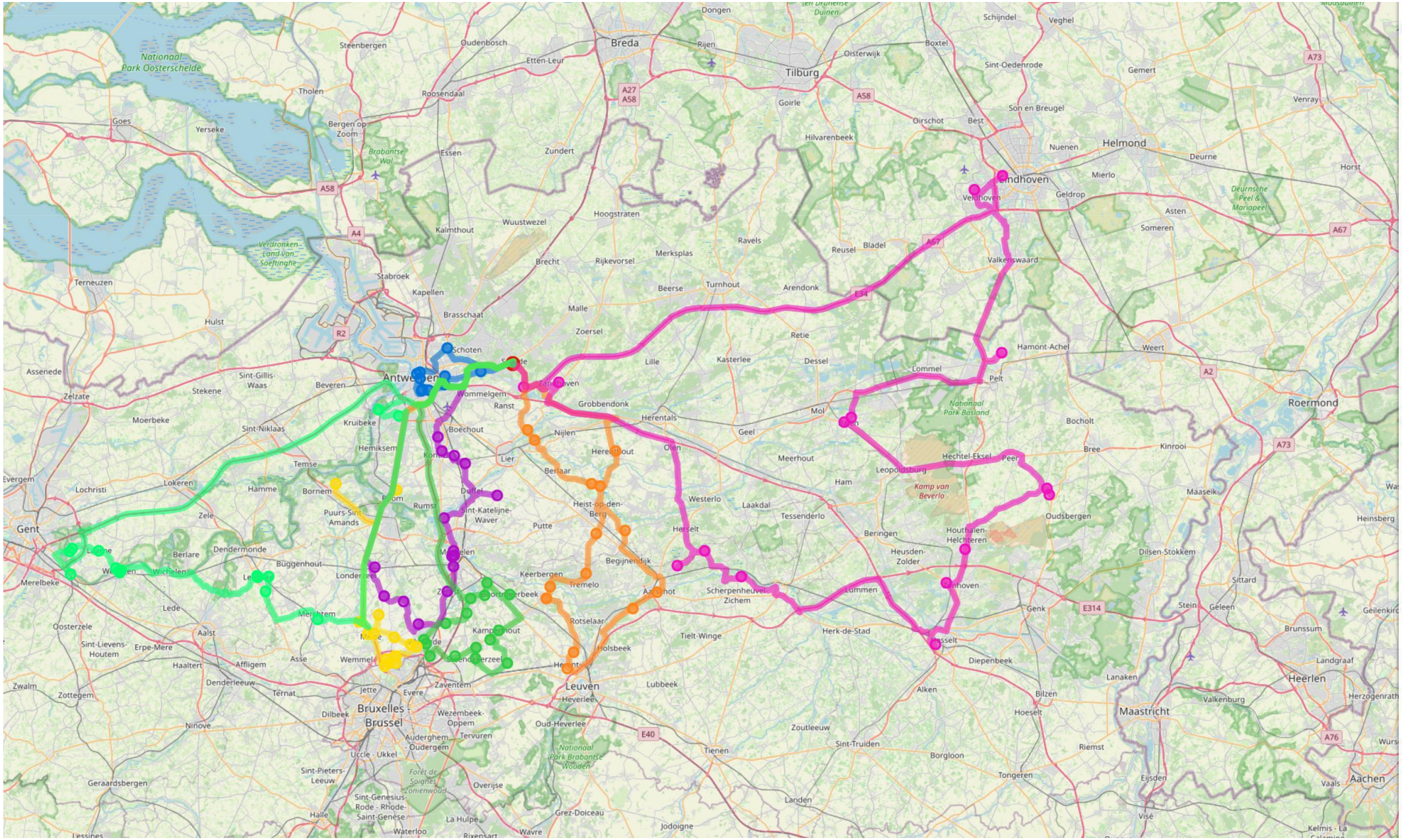
```
1 SELECT
2   NODEID,
3   NODEVISIBLE,
4   NODEVERSION,
5   QSYS2.ST_ASTEXT(NODEPOINT)
6 FROM CDLIGHT.OSMNODES;
7
8
```

NODEID	VISIBLE NODEVISIBLE	VERSION NODEVERSION	00004
127977864	true	4	POINT (4.553736 51.231606)
127977871	true	4	POINT (4.567771 51.235670999999996)
127977873	true	10	POINT (4.574221 51.237519)
243670933	true	7	POINT (4.573567 51.234032)
246834665	true	5	POINT (4.556564 51.232423)
246834718	true	9	POINT (4.548624 51.23976)
246834719	true	11	POINT (4.551877 51.238606999999995)
246834721	true	5	POINT (4.552597 51.237164)
246834722	true	4	POINT (4.553826 51.234783)
246834723	true	7	POINT (4.554424 51.233844999999995)
246834724	true	2	POINT (4.554666 51.233756)
246834725	true	3	POINT (4.555461 51.233934999999995)
246834726	true	3	POINT (4.555664 51.233933)
246834727	true	2	POINT (4.5557739999999995 51.233914999999996)
246834728	true	2	POINT (4.556007 51.23379)

NODEID	KEY TAGKEY	VALUE TAGVALUE
243670933	direction	both
243670933	surface	paving stones
243670933	traffic calming	table
246834665	highway	traffic signals
246834665	traffic signals	blink mode
246834665	traffic signals:direction	forward
246834719	network:type	node network
246834719	rcn ref	80
246834723	network:type	node network
246834723	rwn ref	48
246834833	direction	backward
246834833	highway	stop
255406352	direction	both
255406352	network:type	node network
255406352	rwn ref	57
255406352	surface	paving stones
255406352	traffic calming	table
255602843	highway	traffic signals
255602843	traffic signals:direction	backward
369988615	amenity	fuel
369988615	brand	Esso
369988615	brand:wikidata	Q867662
369988615	brand:wikipedia	en:Esso
369988615	check date	2022-09-01
369988615	compressed air	yes
369988615	name	Express
369988615	operator	Esso

Optimization

- Traveling Salesmen and other Vehicle Routing Problems are no problem for our optimization endpoint. Based on the excellent Vroom project this service provides you with optimal routes while considering your specific vehicle and time constraints.


Vehicle 1
Clone >>
15, Nieuwstraat, Schilde
15, Nieuwstraat, Schilde
Vehicle 2
Clone >>
15, Nieuwstraat, Schilde
15, Nieuwstraat, Schilde
Vehicle 3
Clone >>
15, Nieuwstraat, Schilde
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Vehicle 4
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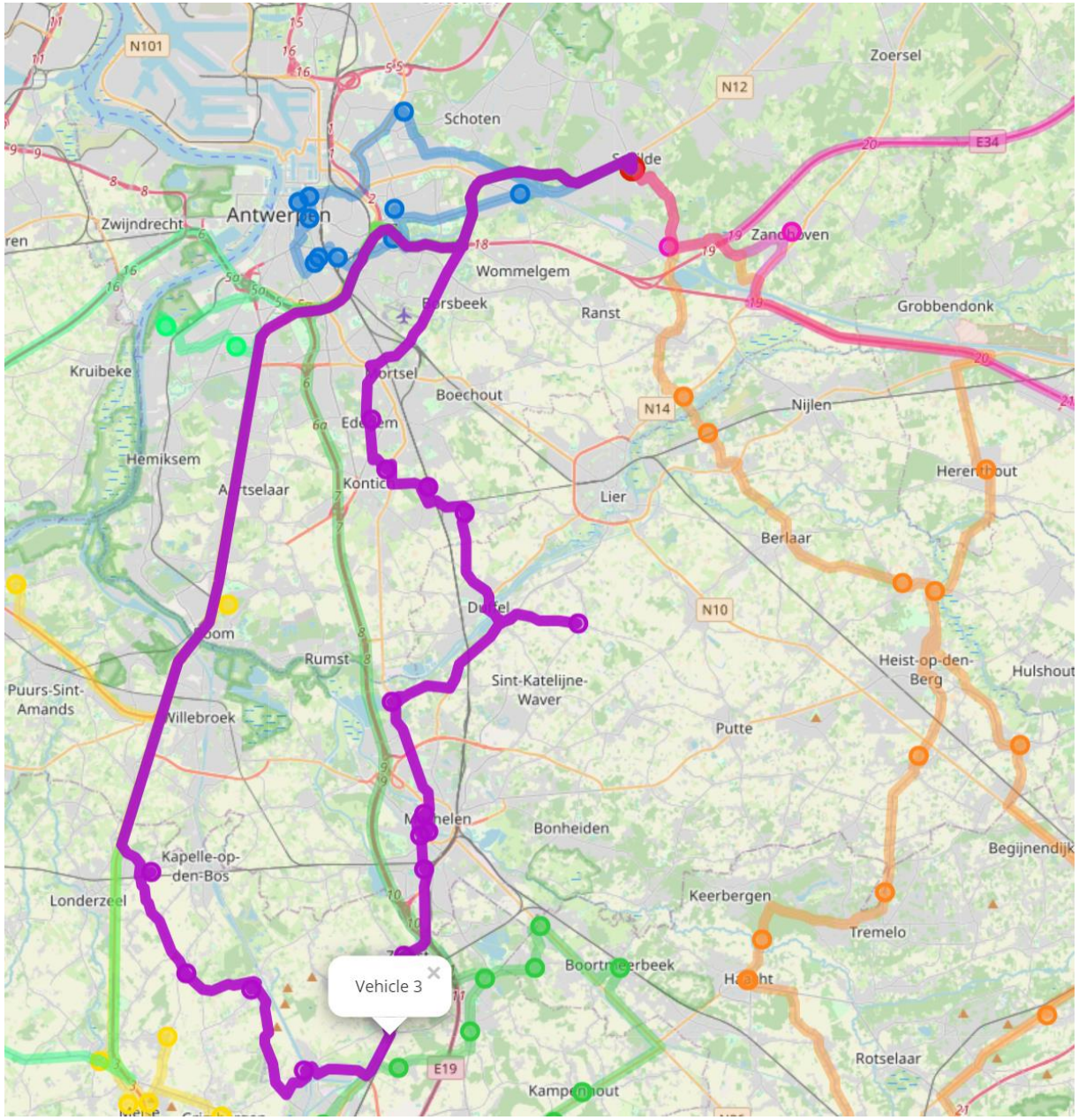
Vehicle 7
Clone >>
15, Nieuwstraat, Schilde
15, Nieuwstraat, Schilde
Vehicle 8
Clone >>
15, Nieuwstraat, Schilde
15, Nieuwstraat, Schilde
Add locations
- by clicking on the map
- using OpenStreetMap tag
amenity
pharmacy
More
values for amenity.
Add
Vehicle 1
1 Apotheek Meeussen
2 De Beul
3 Ter Rivieren
4 Zwitserse Apotheek
5 Apotheek Bek
6 Kruispunt Apotheek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N12
Schoten
E34
Antwerpen
Zwijndrecht
Wommelgem
Ranst
Grobbendonk
Kruibeke
Boechout
N14
Nijlen
Hemiksem
Lier
Berlaar
N10
Rumst
Heist-op-den-Berg
Hulshout
Puurs-Sint-Amands
Sint-Katelijne-Waver
Villebroek
Putte
Bonheiden
Kapelle-op-den-Bos
Keerbergen
Tremelo
Vehicle 3
E19
Rotselaar

Ethical Considerations

Bias and Fairness in AI

Issue:

AI systems can inadvertently perpetuate or even amplify existing biases present in the training data. This can lead to unfair treatment of certain groups.

Examples:

Discriminatory hiring practices if AI systems are trained on biased recruitment data.

Biased credit scoring models that disadvantage certain demographics.

Mitigation Strategies:

Use diverse and representative datasets for training AI models.

Regularly audit AI systems for bias and implement corrective measures.

Implement fairness-aware algorithms designed to minimize bias.

Transparency and Explainability

Issue:

AI systems, particularly those using complex models like deep learning, can be "black boxes" that make decisions without clear explanations.

Examples:

Customers and regulators demand transparency in AI-driven decisions, such as loan approvals or medical diagnoses.

Mitigation Strategies:

Develop explainable AI models that provide insights into how decisions are made.

Implement transparency protocols and documentation for AI systems.

Educate stakeholders on how AI systems work and the rationale behind their decisions.

Data Privacy and Security

Issue:

AI systems often require large amounts of personal data, raising concerns about data privacy and security.

Examples:

Unauthorized data access and breaches can lead to sensitive information being exposed.

Misuse of personal data for purposes beyond the original intent.

Mitigation Strategies:

Implement robust data encryption and security measures to protect data.

Ensure compliance with data protection regulations like GDPR.

Adopt privacy-preserving AI techniques, such as differential privacy and federated learning.

Job Displacement and Workforce Impact

Issue:

AI-driven automation can lead to job displacement and changes in the workforce landscape.

Examples:

Automation of routine tasks in industries such as manufacturing and customer service can lead to job losses.

New job roles and skills are required, leading to a skills gap.

Mitigation Strategies:

Invest in reskilling and upskilling programs for employees.

Encourage a culture of continuous learning and adaptation within the organization.

Focus on AI-human collaboration, where AI augments human capabilities rather than replacing them.

Accountability and Governance

Issue:

Determining accountability for AI-driven decisions can be challenging, particularly when AI systems operate autonomously.

Examples:

Legal and ethical questions arise when AI systems make incorrect or harmful decisions.

Lack of clear governance frameworks for AI deployment and oversight.

Mitigation Strategies:

Establish clear governance frameworks and accountability structures for AI systems.

Develop and enforce ethical guidelines and policies for AI usage.

Implement monitoring and auditing processes to ensure compliance with ethical standards.

EU AI Act

https://artificialintelligenceact.eu/ai-act-explorer/

EU AI Act

The AI Act Explorer

The European Union has introduced new legislation on artificial intelligence: The EU AI Act. It lays the foundations for the regulation of AI in the EU.

Our AI Act Explorer enables you to explore the contents of the Act in an intuitive way, or search for parts that are most relevant to you. It contains the full Final Draft of the Artificial Intelligence Act as of 19 April 2024. Here you can learn how policymaking in the European Union works.

Navigating the AI Act

Looking for a **quick overview**? Here is a brief summary of the legal text.

Want to know **which parts of the AI Act apply to you**? Use our Compliance Checker.

Looking for something specific?

Search within the Act | Search

Table of Contents

The EU AI Act consists of 12 main titles. Each title contains a set of Articles.

- Chapter I: General Provisions +
- Chapter II: Prohibited Artificial Intelligence Practices +
- Chapter III: High-Risk AI System +
- Chapter IV: Transparency Obligations for Providers and Deployers of Certain AI Systems and GPAI Models +
- Chapter V: General Purpose AI Models +

Annexes

Annexes provide supplementary information alongside the Regulation.

- Annex I: List of Union Harmonisation Legislation
- Annex II: List of Criminal Offences
- Annex III: High-Risk AI Systems
- Annex IV: Technical Documentation
- Annex V: EU Declaration of Conformity
- Annex VI: Conformity Assessment Procedure Based on Internal Control

Recitals

Recitals provide context about how an article should be interpreted or implemented.

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72

Managing Ethical Challenges

Developing Ethical Guidelines and Policies

Create a Framework

Develop comprehensive ethical guidelines that outline the principles and standards for AI development and deployment.

Involve diverse stakeholders, including legal, compliance, and ethical experts, in the creation of these guidelines.

Document Policies

Clearly document policies related to data usage, bias mitigation, transparency, and accountability.

Ensure these policies are communicated and accessible to all employees involved in AI projects.

Ensuring Diverse and Unbiased Data

Data Collection

Collect data from diverse sources to ensure that it is representative of different demographics and scenarios.

Regularly update datasets to reflect current and diverse real-world conditions.

Bias Detection and Mitigation

Implement tools and techniques to detect and mitigate bias in datasets and AI models.

Regularly audit AI systems to identify and address any biases that may arise.

Implementing Transparency Measures

Explainable AI

Use explainable AI techniques to ensure that AI decisions can be understood and interpreted by humans.

Provide clear and concise explanations for AI-driven decisions to stakeholders, including customers and regulators.

Open Communication

Maintain open channels of communication with stakeholders about how AI systems operate and the data they use.

Foster a culture of transparency by regularly sharing information about AI projects and their impact.

Continuous Monitoring and Auditing

Regular Audits

Conduct regular audits of AI systems to ensure they comply with ethical guidelines and policies.

Use both internal and external auditors to provide an objective assessment of AI systems.

Performance Monitoring

Continuously monitor AI systems for performance and ethical compliance.

Implement real-time monitoring tools to detect and address issues promptly.

Promoting AI Literacy within the Organization

Training Programs

Develop and implement training programs to educate employees about AI technologies, their potential impacts, and ethical considerations.

Ensure that training includes practical examples and case studies to illustrate key concepts.

Encouraging Ethical Mindset

Foster an organizational culture that prioritizes ethical considerations in AI development and deployment.

Encourage employees to raise concerns and suggest improvements related to AI ethics.

Establishing Accountability and Governance

Clear Roles and Responsibilities

Define clear roles and responsibilities for AI ethics, including appointing ethics officers or committees.

Ensure that accountability structures are in place to oversee AI projects and address ethical issues.

Governance Frameworks

Implement governance frameworks that provide oversight and guidance for AI initiatives.

Regularly review and update these frameworks to keep pace with technological advancements and regulatory changes.

Next Steps

Continuous Innovation

AI technology is rapidly evolving, offering new opportunities for innovation and growth. Enterprises must stay informed about the latest advancements and be prepared to adapt.

The integration of AI will transform the workforce, requiring continuous learning and adaptation. Investing in employee training and development will be key to thriving in an AI-driven future.

Collaboration between businesses, technology providers, and regulatory bodies will be essential to maximize AI's benefits while addressing ethical and societal concerns.

Begin Your AI Journey

Start exploring how AI can be integrated into your business strategy. Identify potential areas for AI implementation and assess their feasibility and impact.

Make a commitment to ethical AI practices. Develop policies, guidelines, and frameworks that prioritize fairness, transparency, and accountability.

Begin Your AI Journey

Invest in the necessary talent and infrastructure to support AI initiatives. Build a team of skilled AI professionals and ensure your technology stack can handle AI workloads.

Encourage a culture of innovation within your organization. Support experimentation and continuous improvement to stay ahead in the rapidly changing AI landscape.

Questions & Answers

Thank you!

Contact Information

- Web: https://www.cdinvest.eu/
- Email: info@cdinvest.be

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BI · AI · IBMi