



ARTIFICIAL INTELLIGENCE APPLICATIONS IN TRADE AND CUSTOMS

PORTO 04.09.205



- 1. Introduction**
- 2. Discriminative AI**
- 3. Generative AI**
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ARTIFICIAL INTELLIGENCE, MACHINE LEARNING, DEEP LEARNING, GENERATIVE AI



Artificial Intelligence (AI)

Machines mimic human intelligence and behaviors

Machine Learning (ML)

Rooted in statistical learning and methods

Not explicitly programmed, but in general **learns from data**

Deep Learning (DL)

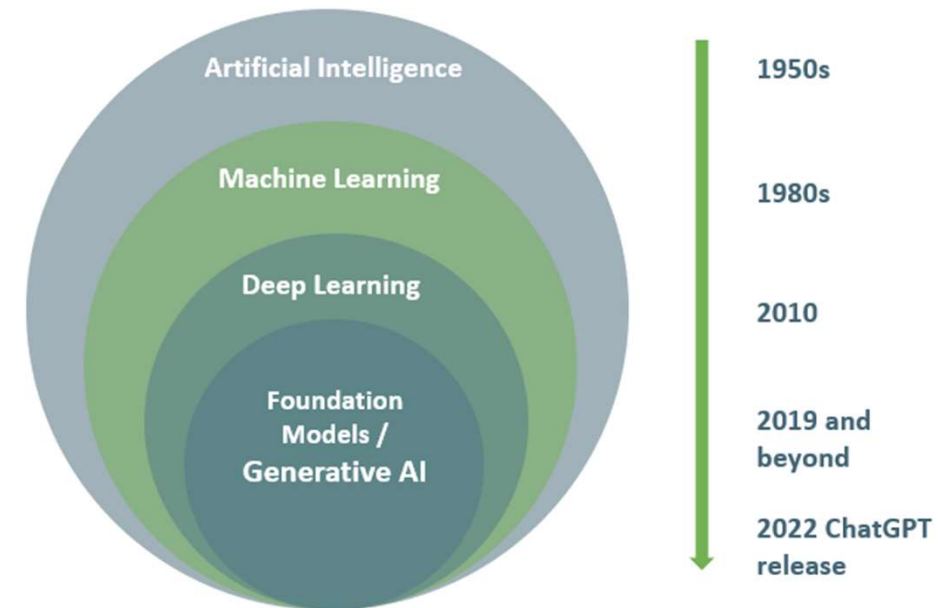
Utilizing and learning from large amount of data

Uses large deep neural networks with billions of parameters

Is computational challenging

Generative AI (GenAI)

Generates new content the foundation for **Agentic AI** systems



INTRODUCTION

Discriminative AI

Purpose: Classifies and categorizes existing data

Learns to **distinguish between** different categories

Predicts labels or classifications

Examples: "Is this shipment high-risk?" or "What's the correct tariff code?"

Generative AI

Purpose: Creates new content and solutions

Creates new content or data

Generates text, images, or structured outputs

Examples: "Generate a customs declaration" or "Create trade documentation"

While discriminative AI excels at classification tasks, generative AI opens new possibilities for content creation and intelligent assistance in trade operations.

DISCRIMINATIVE AI



DISCRIMINATIVE AI - TRAINING

Data: labeled examples (e.g., HS code → product description pairs). Data quality and domain labeling effort.

Training: minimize classification error on a clear objective.

Clear Goal: fixed task (e.g., “Tariff Number?” yes/no).

Task: mapping $X \rightarrow y$ (risk score, HS code, embargo flag).



DISCRIMINATIVE AI - APPLICATIONS

Clear Objectives

Binary Classification: Compliant vs non-compliant shipments

Multi-class Classification: Tariff Classification

Document Classification: Invoice, bill of lading, certificate types

Anomaly Detection: Unusual patterns in trade data



DISCRIMINATIVE AI - AI CLASSIFIER



mic

CCS Classifier

DEV

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👤 development

Home

Classification of Goods

Bulk Data Import

Mapping Rules

Classification of Goods

Goods

🔍 Goods Name

Filter ...

🔍

Classify

✎

🗑

🔄

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281 - 300 of 19533

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▶

☐	Goods Name ↑	Tariff Number ↑	Priority	Due Date ↑	Status
☐	 PI912A052-1M01000E0A-6022		↓ 90 - Low	06/09/2023	Open
☐	 ME212A00Y-1ME2000E0A-2038		↓ 90 - Low	06/09/2023	Open
☐	 BB112A00R-1MSC000U0A-9885		↓ 90 - Low	06/09/2023	Open

Record

DISCRIMINATIVE AI



Benefits

- Speed and Efficiency
- Cost-Effective
- Deterministic and Reliable
- Pattern Recognition
- Handles Complex Data

Downsides

- Task Specificity
- Explainability Challenges
- Data Requirements
- Overfitting
- Maintenance

GENERATIVE AI



GENERATIVE AI

Produces **structured** or **free-form** outputs (text, JSON, SQL, code).

Can **explain**, **summarize**, **extract**, **reason** and **instruct**

Works well with unstructured data

Change behaviour via **prompts** rather than re-training

ChatGPT 5

Wie kann ich dir helfen?

+ Stelle irgendeine Frage

GENERATIVE AI - TOKENS

What are Tokens

Small pieces of words that AI models read and write - not individual characters

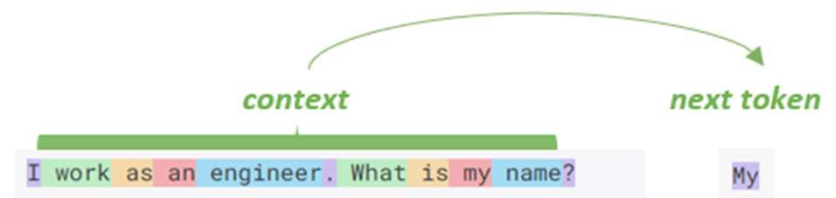
Context Window

The tokens a model processes per request

original text - "My name is Tom."

tokens - ["My", " name", " is", " Tom", ".", ""]

token ids - [3666,1438,318,4186,13]



**Optimal usage of the context window is critical.
Longer Prompts lead to higher latency and cost**

GENERATIVE AI - TRAINING

Foundation Training

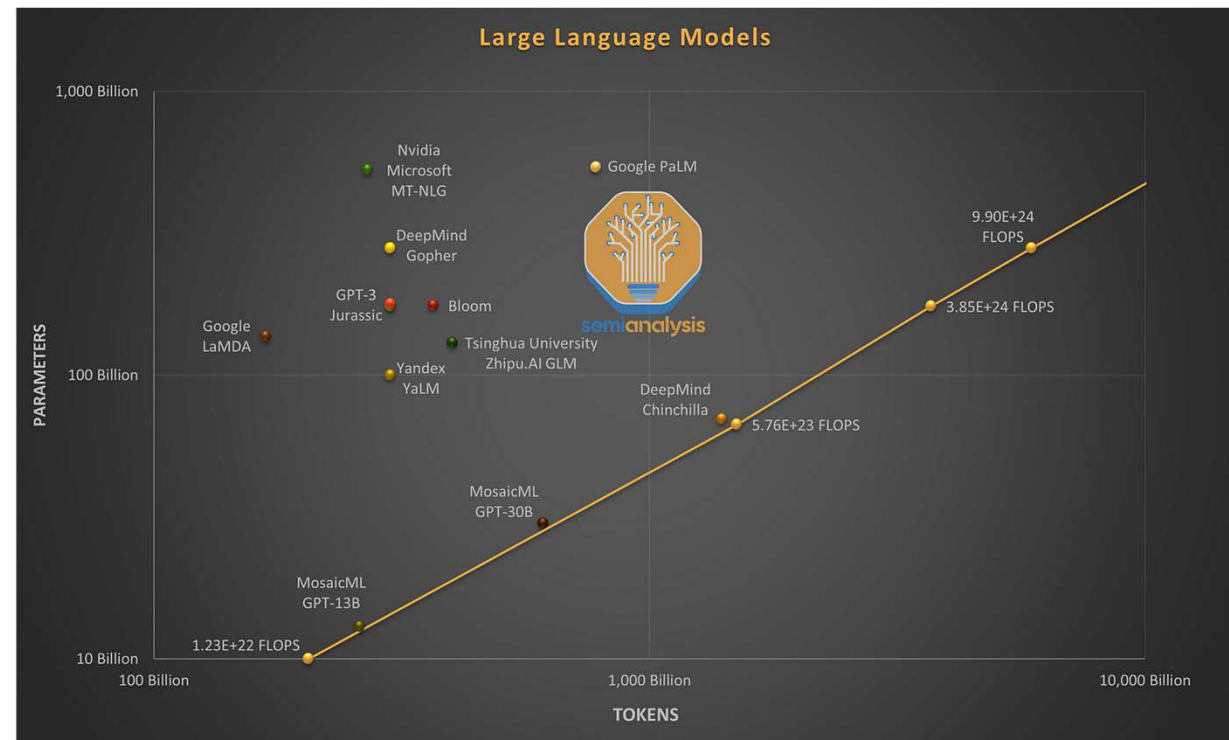
Massive Text Corpora: Books, articles, web content, academic papers

Code Repositories: Programming languages, software documentation

Structured Knowledge: Wikipedia, encyclopaedias, reference materials

Conversational Data: Q&A pairs, dialogue examples

Generative models are first trained to learn from huge amounts of unlabeled data. By predicting parts of the input data, models learn useful representations



GENERATIVE AI - CAPABILITIES



Natural Language Understanding

Comprehends complex trade regulations, legal text, and technical documentation with nuanced understanding

Content Creation

Generates reports, summaries, documentation, and correspondence tailored to specific contexts

Complex Reasoning

Analyses multi-step problems, connects disparate information, and provides logical conclusions

Conversational Interface

Provides expert-level assistance through natural dialogue, answering questions and guiding users

Multilingual Support

Processes and generates content in multiple languages for global trade operations

Adaptability

Adjusts responses based on context, user expertise level, and specific requirements

GENERATIVE AI - PROVIDERS

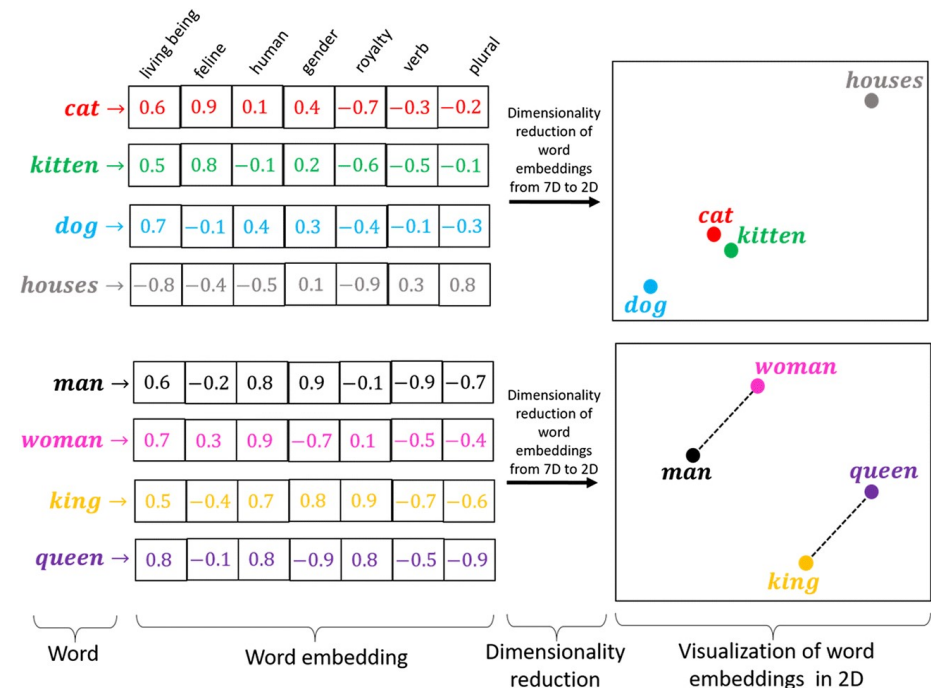
Provider	Flagship Model	Context Window	Size
OpenAI (US)	GPT-5	400k	1.8T (estimated)
Anthropic (US)	Claude 4	1M	75B
Google (US)	Gemini 2.5	1M	1.5T (estimated)
Meta (US)	Llama 4	1M	400B
Mistral AI (EU)	Mistral Large 2	128k	123B
DeepSeek (China)	DeepSeek R1	128k	671B

GENERATIVE AI - EMBEDDINGS

Definition

Vector representations of text that capture semantic meaning, enabling intelligent search and similarity matching

Example: "**Import duty**" and "**customs tariff**" have similar embeddings because they're semantically related



Allows for semantic search across text data

GENERATIVE AI – SEMATIC SEARCH



miC | CUSTOMS TARIFF

DE IMPORT

Home

Nomenklatursuche

Nomenklatursuche

DE IMPORT

Suchen ...

2025-08-26

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Code	Beschreibung
> 15	TIERISCHE, PFLANZLICHE ODER MIKROBIELLE FETTE UND ÖLE UND ERZEUGNISSE IHRER SPALTUNG; GENUSSBARE VERARBEITETE FETTE; WACHSE TIERISCHEN ODER PFLANZLICHEN URSPRUNGS
> 16	ZUBEREITUNGEN VON FLEISCH, FISCHEN, KREBSTIEREN, WEICHTIEREN, ANDEREN WIRBELLOSEN WASSERTIEREN ODER VON INSEKTEN
> 17	ZUCKER UND ZUCKERWAREN
> 18	KAKAO UND ZUBEREITUNGEN AUS KAKAO
> 19	ZUBEREITUNGEN AUS GETREIDE, MEHL, STÄRKE ODER MILCH; BACKWAREN
> 20	ZUBEREITUNGEN VON GEMÜSE, FRÜCHTEN, NÜSSEN ODER ANDEREN PFLANZENTEILEN
> 21	VERSCHIEDENE LEBENSMITTELZUBEREITUNGEN
> 22	GETRÄNKE, ALKOHOLHALTIGE FLÜSSIGKEITEN UND ESSIG
> 23	RÜCKSTÄNDE UND ABFÄLLE DER LEBENSMITTELINDUSTRIE; ZUBEREITETES FUTTER
> 24	TABAK UND VERARBEITETE TABAKERSATZSTOFFE; ERZEUGNISSE, AUCH NIKOTINHALTIG, DIE ZUR INHALATION OHNE VERBRENNUNG BESTIMMT SIND; ANDERE NIKOTINHALTIGE ERZEUGNISSE, DIE ZUR NIKOTINAUFNAHME IN DEN MENSCHLICHEN KÖRPER BESTIMMT SIND
> 25	SALZ; SCHWEFEL; STEINE UND ERDEN; GIPS, KALK UND ZEMENT
> 26	ERZE SOWIE SCHLACKEN UND ASCHEN
> 27	MINERALISCHE BRENNSTOFFE, MINERALÖLE UND ERZEUGNISSE IHRER DESTILLATION; BITUMINÖSE STOFFE; MINERALWACHSE
> 28	ANORGANISCHE CHEMISCHE ERZEUGNISSE; ANORGANISCHE ODER ORGANISCHE VERBINDUNGEN VON EDELMETALLEN, VON SELTENERDMETALLEN, VON RADIOAKTIVEN ELEMENTEN ODER VON ISOTOPEN
> 29	ORGANISCHE CHEMISCHE ERZEUGNISSE
> 30	PHARMAZEUTISCHE ERZEUGNISSE
> 31	DÜNGEMITTEL
> 32	GERB- UND FARBSTOFFAUSZÜGE; TANNINE UND IHRE DERIVATE; FARBSTOFFE, PIGMENTE UND ANDERE FARBMITTEL; ANSTRICHFARBEN UND LACKE; KITTE; TINTEN
> 33	ÄTHERISCHE ÖLE UND RESINOIDE; ZUBEREITETE RIECH-, KÖRPERPFLEGE- ODER SCHÖNHEITSMITTEL [TN701]
> 34	SEIFEN, ORGANISCHE GRENZFLÄCHENAKTIVE STOFFE, ZUBEREITETE WASCHMITTEL, ZUBEREITETE SCHMIERMITTEL, KÜNSTLICHE WACHSE, ZUBEREITETE WACHSE, SCHUHCREME, SCHEUERPULVER UND DERGLEICHEN, KERZEN UND ÄHNLICHE ERZEUGNISSE, MODELLIERMASSEN, "DENTALWACHS" UND ZUBEREITUNGEN FÜR ZAHNÄRZTLICHE ZWECKE AUF DER GRUNDLAGE VON GIPS [TN701]
> 35	EIWEISSSTOFFE; MODIFIZIERTE STÄRKE; KLEBSTOFFE; ENZYME [TN701]
> 36	PULVER UND SPRENGSTOFFE; PYROTECHNISCHE ARTIKEL; ZÜNDHÖLZER; ZÜNDMETALL-LEGIERUNGEN; LEICHT ENTZÜNDLICHE STOFFE [TN701]
> 37	ERZEUGNISSE ZU FOTOGRAFISCHEN ODER KINEMATOGRAFISCHEN ZWECKEN [TN701]

GENERATIVE AI - STRUCTURED OUTPUT



JSON mode → **syntactically valid JSON** every time

Structured Outputs **guarantee schema compliance**

Function/tool calling lets models act as reliable API orchestrators

Reduces hallucination risk; supports agent integration with systems

Crucial for **enterprise-grade workflows** and regulatory compliance

```
class Invoice(BaseModel):
    """Pydantic model for invoice."""

    invoiceNumber: str = Field(..., description="Invoice number")
    invoiceDate: str = Field(..., description="Invoice date (ISO 8601 format)")
    currency: str = Field(..., description="3-letter ISO currency code")
    invoiceAmount: float = Field(..., description="Total amount of line item values")
    vatAmount: float = Field(..., description="Total amount of taxes")
    totalAmount: float = Field(..., description="Total of invoice amount and taxes")
```

```
{
  "invoiceNumber": "60030988",
  "invoiceDate": "2024-04-16",
  "currency": "EUR",
  "invoiceAmount": 71,
  "vatAmount": 14.2,
  "totalAmount": 85.2
}
```

The Power of AI Reasoning Time

Recent breakthroughs show that giving AI models time to **"think"** dramatically improves performance - often more than simply making models larger or training them longer.

Step-by-step reasoning: Instead of rushing to an answer, AI breaks down complex problems into logical steps

Self-reflection: Models can review and improve their own outputs

Iterative refinement: AI can reconsider and adjust its reasoning based on new information

Example

A simple LLM asked: **"What's 17×23 ?"** might just guess based on text patterns.

“Thinking”

Step 1: $17 \times 20 = 340$

Step 2: $17 \times 3 = 51$

Step 3: $340 + 51 = 391$

→ Answer: 391 (correct).

GENERATIVE AI – FUNCTION CALLING



AI can interact with external systems, databases, and APIs to perform real-world actions

LLM gets list of tools to choose from:

```
def multiply(a, b):  
    """Multiplies two numbers."""  
    return a * b  
  
def divide(a, b):  
    """Divides two numbers."""  
    return a / b
```

Example

A simple LLM asked: **"What's 17×23 ?"** might just guess based on text patterns.

“Function Calling”

Step 1: Provide LLM with calculation tools

Step 2: Call toll multiply(17, 23)

Step 3: Deterministic Calculator returns 391

→ Answer: 391 (correct).

GENERATIVE AI - PROMPTS

A specific instruction to the Generative AI model to generate the desired output.

System message typically define the tone and general context of the conversation

User message defines the instruction – are dynamically generated and only certain parts of the instruction can be defined by an end-user.

Calculator Tool Example

System Prompt

You are a helpful calculator assistant that can perform mathematical operations using specialized tools. You have access to the following tools:

- **multiply**: Multiplies two numbers together
- **divide**: Divides one number by another (handles division by zero errors)

When a user asks for calculations, use the appropriate tools and show your work clearly.

Example Conversation

User: Can you calculate 15×8 and then divide that result by 4?

Assistant: I'll help you with that calculation! Let me break it down into steps:

First, I'll multiply 15×8 :

Call tool **multiply** with parameters: { "a": 15, "b": 8 }

Tool Result: 120

Now, I'll take that result and divide it by 4:

Call tool **divide** with parameters: { "dividend": 120, "divisor": 4 }

Tool Result: 30

Benefits

Creativity

Versatility and Flexibility

Advanced Understanding

Inherent Knowledge

Downsides

High Computational Cost

Not deterministic

Quality and Reliability Issues

Ethical and Legal Challenges

Security and Safety

AGENTS



Definition

AI entities that can perceive their environment, make decisions, and take actions to achieve specific goals in trade and customs operations

Agents don't just answer questions - they complete complex tasks and achieve objectives independently

Generative AI

Responds to specific queries
Provides information or analysis
Requires human direction for each task
Limited to single interactions

Agents

Autonomous goal achievement
Multi-step task completion
Independent decision making
Continuous operation and learning

AGENTS - WORKFLOW

“An AI agent perceives, reasons, plans *and* acts autonomously to achieve a goal, deciding when to invoke tools.”

Goes beyond “chatbot”: maintains state, decomposes tasks, executes actions

The Perceive-Think-Act Loop

1. Perceive — take user goal + environment signals
2. Think — plan, reflect, pick next step
3. Act — call a tool / API / another agent
4. Learn — update memory, iterate



Lifecycle

1. Environmental Monitoring
2. Goal Setting
3. Planning
4. Action Execution
5. Performance Evaluation
6. Continuous Learning

Example

Supplier Invoice to customs declaration.

Monitoring: Invoice Arrival

Goal: Declare Invoice to Customs

Planning: Extract relevant Information, determine HS code Classification, ...

Act: OCR, Tariff Classification, ...

Evaluation: Declaration valid/invalid

Learn: Adjust based on Customs Feedback

AGENTS – CORE PRINCIPALS

- **Autonomy:** The system should decide on tasks without human prompts.
- **Reactivity + Proactivity:** The agent must respond to inputs but also initiate actions.
- **Modularity:** Different functions (e.g., memory, planning, execution) should be decoupled and extensible.
- **Reflection:** Agents should evaluate outcomes and adjust behaviour.
- **Tool Use:** Integration with external APIs, databases, or search engines is often critical.

Benefits

Automate multi-step workflows (research → draft → test)

Scales from co-pilot to autonomous *operator*

Downsides

Hallucinated tool calls → guard with JSON schema / retries

Hard evaluation: success = task done, not just good text

Governance & safety: rate limits, human checkpoints



APPLICATIONS

mic

Launchpad

MIC

Maximilian SANDBERGER

Filter ...

QATEST

MDK Applications

PASSAR

MANTEST Environments

Analytics

Docs

Tools

Tools (MIC internal)

Launchpads

QATEST

QATEST (DB Connection: qatestdb.mic.miccust.dev:1521/qatest)

GUI

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AKS Docu

Grafana Logs

QATEST101 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest101) - Regular Support: 16.04.2026, Sustaining Support: 16.07.2026

QATEST100 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest100) - Regular Support: 22.01.2026, Sustaining Support: 22.04.2027

QATEST95 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest95) - Regular Support: 02.10.2025, Sustaining Support: 02.01.2026

QATEST94 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest94) - Regular Support: 03.07.2025, Sustaining Support: 10.10.2025

QATEST93 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest93) - Regular Support: 03.04.2025, Sustaining Support: 10.07.2025

QATEST92 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest92) - Regular Support: 10.01.2025, Sustaining Support: 31.12.2025

QATEST-PREVIEW (DB Connection: qatestdb.mic.miccust.dev:1521/qatest)

MDK Applications

AI CLASSIFIER

CUSTOMS TARIFF

TRADE PARTNER NE...

SUPPLIER PORTAL

embedded-edis

embedded-edis-liberty

thanos

FRUCC Gateway

FIUTU Gateway

TARFF COPILOT



 | CUSTOMS TARIFF

DE IMPORT

Home

Tariff Search

Home

TARIFF SCHEDULE



- Country: Germany
- Schedule: DE IMPORT
- Description: Customs Tariff

CONTENT SOURCES

- Providers: EZT
- Language: DE
- Last Update: 2024

TARIFF CODES

84	71	30	00	000
HS6			NATIONAL	

- Length: 11 Digits

TERMS & CONDITIONS

Tariff Copilot can make mistakes.
Always verify your classifications.

[Terms](#)

[Privacy Policy \(external link\)](#)

OFFICIAL LINKS

- [German EZT-Online](#)
- [EU TARIC Consultation](#)

Launchpad | MIC

Maximilian SANDBERGER

Q

Filtern ...

QATEST

MDK Applications

OCS-CALC

PASSAR

MANTEST Environments

Analytics

Docs

DPSPERF

Tools

Tools (MIC internal)

Tools AI

Launchpads

QATEST

MDK Applications

QATEST (DB Connection: qatestdb.mic.miccust.dev:1521/qatest)

GUI

GUI CUST

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EDIS FILING

HERMES

AKS Docu

Grafana Logs

QATEST102 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest102) - Regular Support: 16.07.2026, Sustaining Support: 16.10.2026

QATEST101 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest101) - Regular Support: 16.04.2026, Sustaining Support: 16.07.2026

QATEST100 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest100) - Regular Support: 22.01.2026, Sustaining Support: 22.04.2027

QATEST95 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest95) - Regular Support: 02.10.2025, Sustaining Support: 02.01.2026

QATEST94 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest94) - Regular Support: 03.07.2025, Sustaining Support: 10.10.2025

QATEST93 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest93) - Regular Support: 03.04.2025, Sustaining Support: 12.09.2025

QATEST92 (DB Connection: qatestreldb.mic.miccust.dev:1521/qatest92) - Regular Support: 10.01.2025, Sustaining Support: 31.12.2025

QATEST-PREVIEW (DB Connection: qatestdb.mic.miccust.dev:1521/qatest)

QATEST

MDK Applications

02.09.2025

32

CUSTOMS AGENT



 ai-test@miccustomssolutions.at

Antworten | Allen antworten | Weiterleiten |  |  |  | ...

An:  SANDBERGER Maximilian

Do, 2025-07-03 15:42

 20250703_134034_lagerhaus_1....
157 KB

 20250703_134034_helpi.pdf
448 KB

2 Anlagen (604 KB) |  Alle auf OneDrive – MIC Datenverarbeitung GmbH speichern. |  Alle Anlagen speichern

Dear SANDBERGER Maximilian maximilian.sandberger@mic-cust.com,

MIC Customs Agent – Action Summary

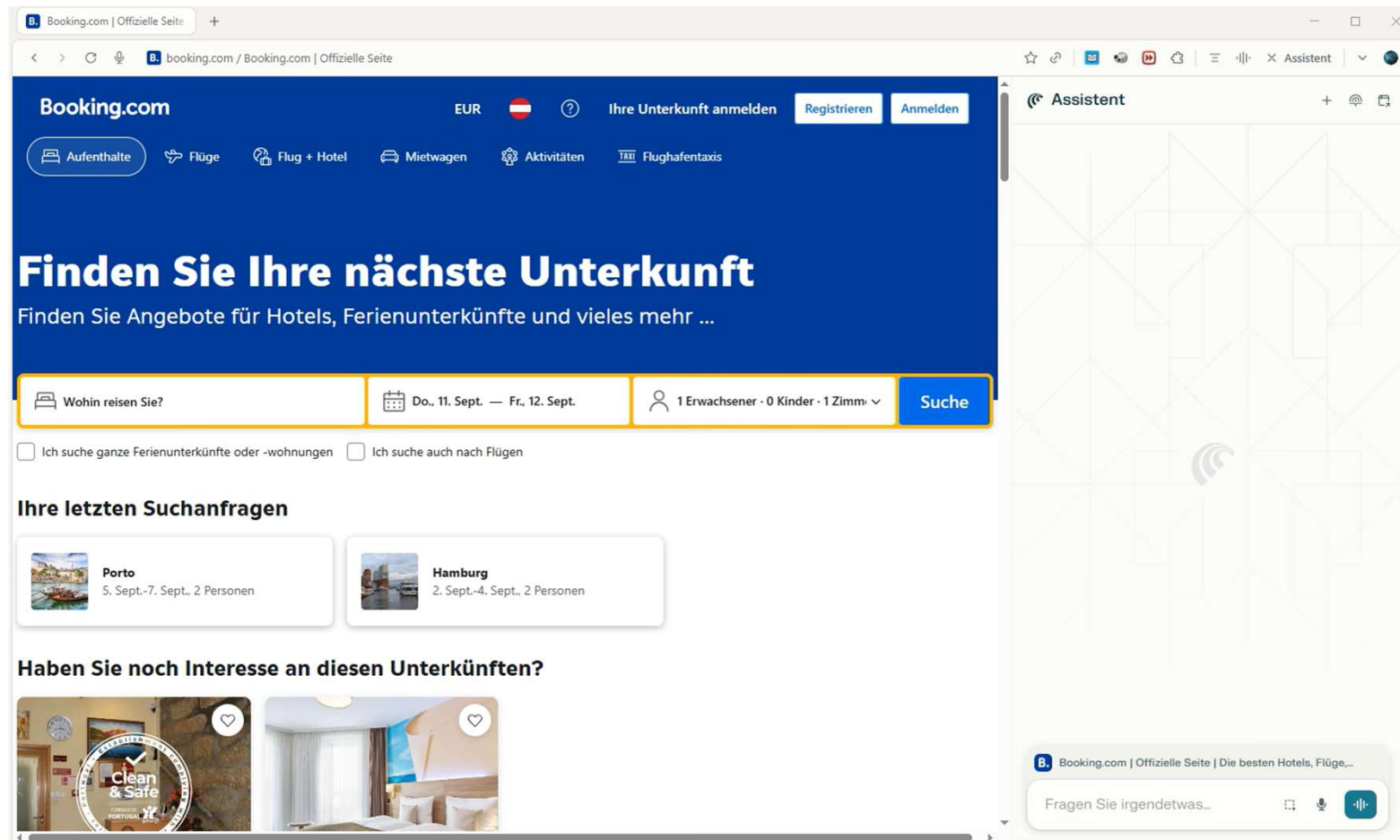
Here's what was done according to your instructions and standard customs workflow:

1. **Extraction:** Both PDF attachments (20250703_134034_lagerhaus_1.pdf and 20250703_134034_helpi.pdf) were processed. Invoice data from each document was extracted.
2. **Unique ID Generation:** For each document, unique invoice numbers and shipment IDs were generated, prefixed by the file name as requested: - Lagerhaus: Invoice #20250703_134034_lagerhaus_1_invoice20250703_1341, Shipment ID #20250703_134034_lagerhaus_1_shipment20250703_1341 - Helpi: Invoice #20250703_134034_helpi_invoice20250703_1341, Shipment ID #20250703_134034_helpi_shipment20250703_1341
3. **Company/Plant Update:** Company changed to "C4" and plant set to "SW" for both invoices as per instructions.
4. **Tariff Number Handling:** - "BAUMGART MAERZEN 20X0,5" classified as 2203 0009 00. - "LED-FLUTLICHTSTRAHLER ..." classified as 9405 4239 90. - "EINSATZ KISTE_+FLASCHE 20X0,5L", "FRACHTKOSTEN ÖSTERREICH", and "Karton Karton 1" could not be definitively classified due to missing product characteristics (glass color, crate material, type/nature of service, or box specifics). They remain with empty tariff numbers. Please provide additional details if possible for more precise classification.
5. **Loading to Workbuffer:** Both updated invoices (including unique IDs, company/plant changes, and available tariff numbers) were loaded successfully.
6. **Transparency:** All actions are outlined above. Classification of some articles could not be finished due to missing detail—this was noted and can be revisited if more description is available.

If any of the classifications for "crate and bottle", "freight cost", or "carton" need to be finalized, please let me know the relevant details (e.g., glass color, crate material, type of transport/service, box specifics).

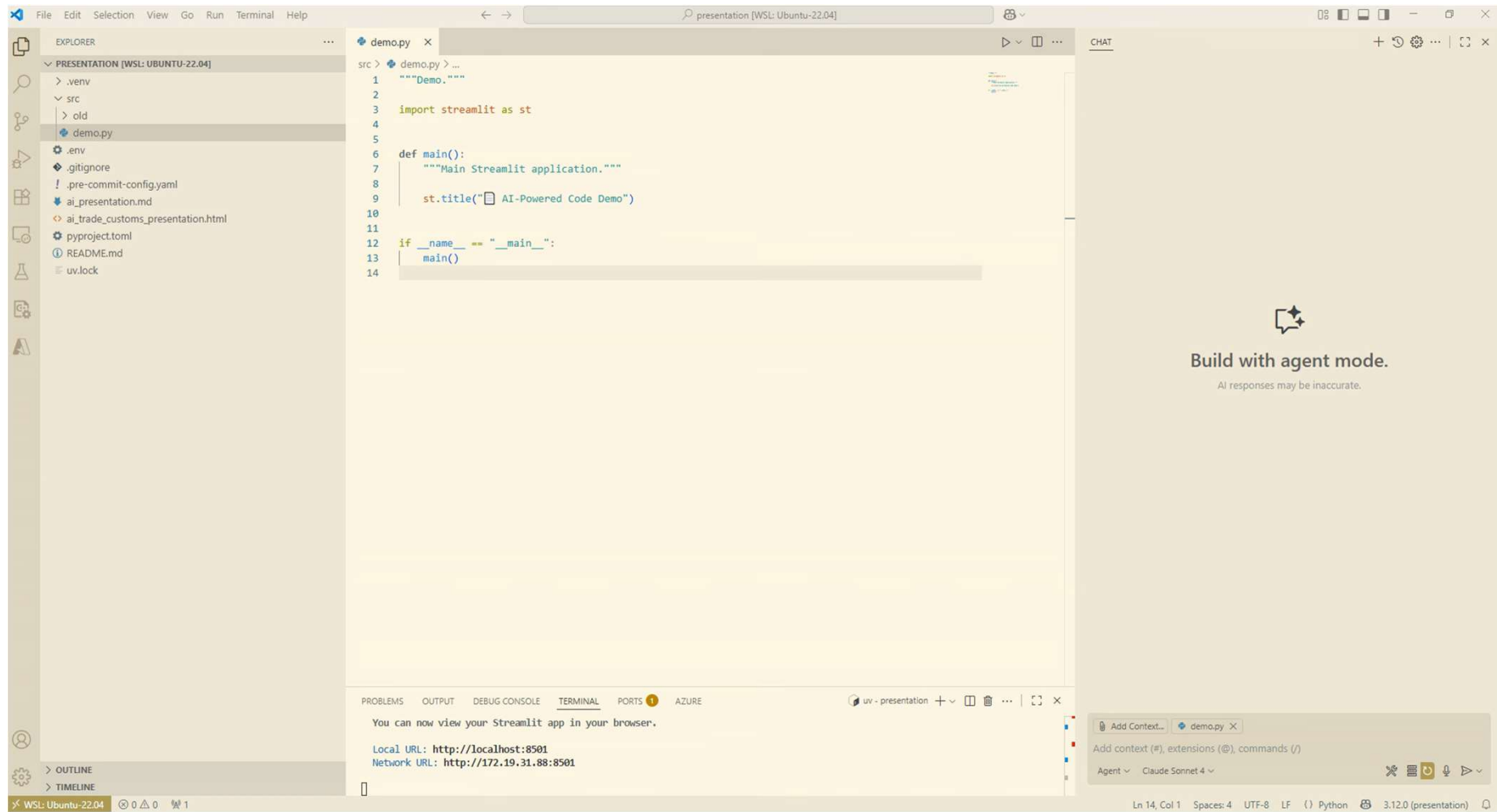
Ready for further instructions or clarifications.

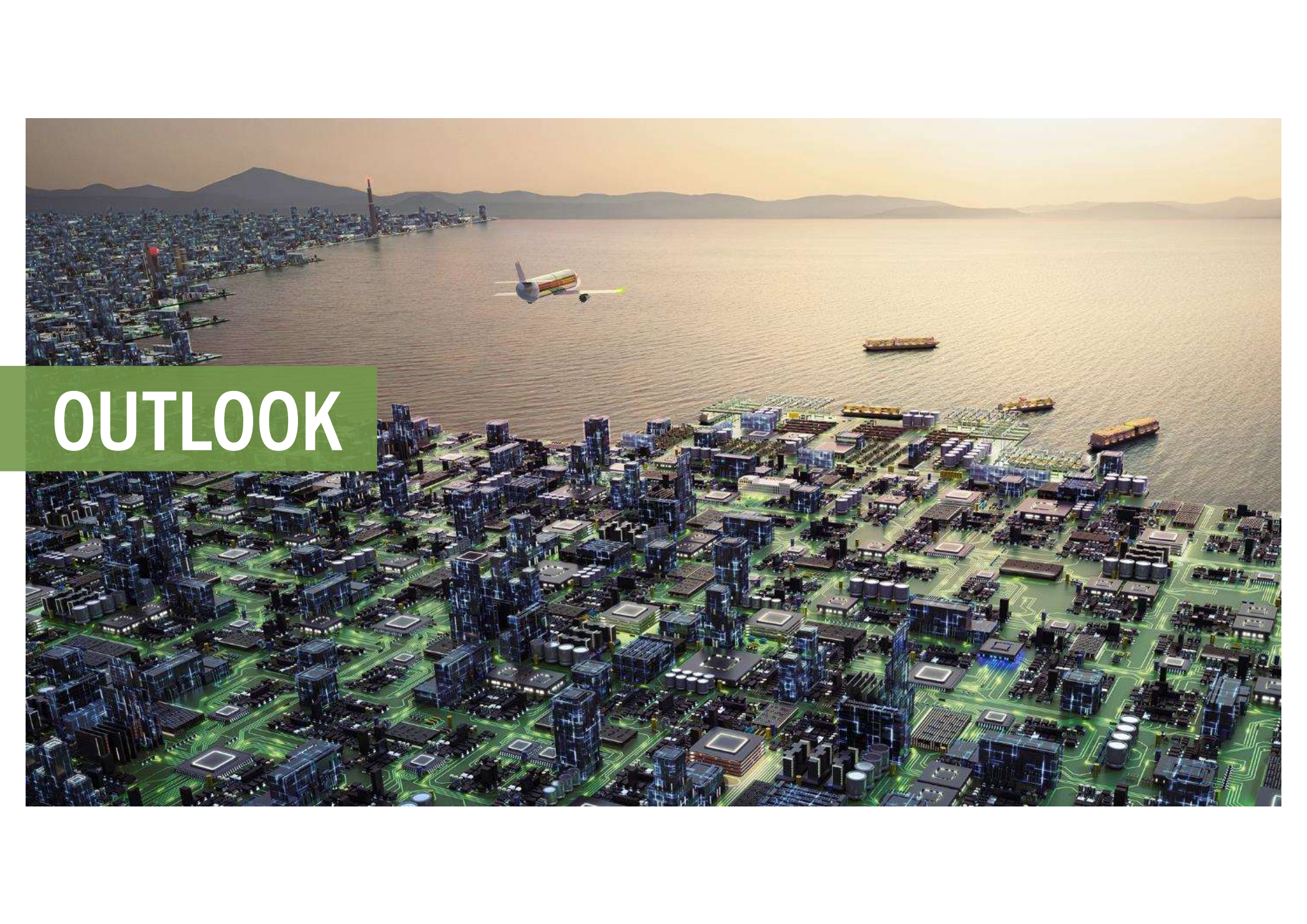
Best regards, Your MIC AI Agent



The screenshot shows the Booking.com homepage in a web browser. The header includes the Booking.com logo, currency (EUR), a help icon, and links for 'Ihre Unterkunft anmelden', 'Registrieren', and 'Anmelden'. Below the header is a navigation bar with icons for 'Aufenthalte', 'Flüge', 'Flug + Hotel', 'Mietwagen', 'Aktivitäten', and 'Flughafentaxis'. The main section features a large blue banner with the text 'Finden Sie Ihre nächste Unterkunft' and 'Finden Sie Angebote für Hotels, Ferienunterkünfte und vieles mehr ...'. Below this is a search bar with a placeholder 'Wohin reisen Sie?', a date range 'Do., 11. Sept. — Fr., 12. Sept.', a guest count '1 Erwachsener · 0 Kinder · 1 Zimmer', and a 'Suche' button. There are two checkboxes: 'Ich suche ganze Ferienunterkünfte oder -wohnungen' and 'Ich suche auch nach Flügen'. Below the search bar is a section titled 'Ihre letzten Suchanfragen' with two cards: 'Porto' (5. Sept.-7. Sept., 2 Personen) and 'Hamburg' (2. Sept.-4. Sept., 2 Personen). At the bottom, there is a section titled 'Haben Sie noch Interesse an diesen Unterkünften?' with two hotel images, each with a heart icon. On the right side of the page, there is a sidebar with a header 'Assistent' and a large area with a geometric pattern. At the bottom of the sidebar, there is a search bar with the text 'Fragen Sie irgendetwas...' and icons for search, voice search, and a microphone.

GITHUB COPILOT





OUTLOOK

KEY TAKEAWAYS



Discriminative AI

Classification Problems

Real Time

Deterministic Outputs

Well defined stable data

Generative AI

Creative Content Creation

Natural Language Interface

Automation

Enhanced Productivity

Process

Advances Rapidly

Models become better and cheaper

Systems will integrate AI

1. Start with simple Use Cases

2. Focus on Implementation

3. Prepare for the Future

**MOST IMPORTANT THING
USE IT! – IT IS HERE TO STAY**



mic