

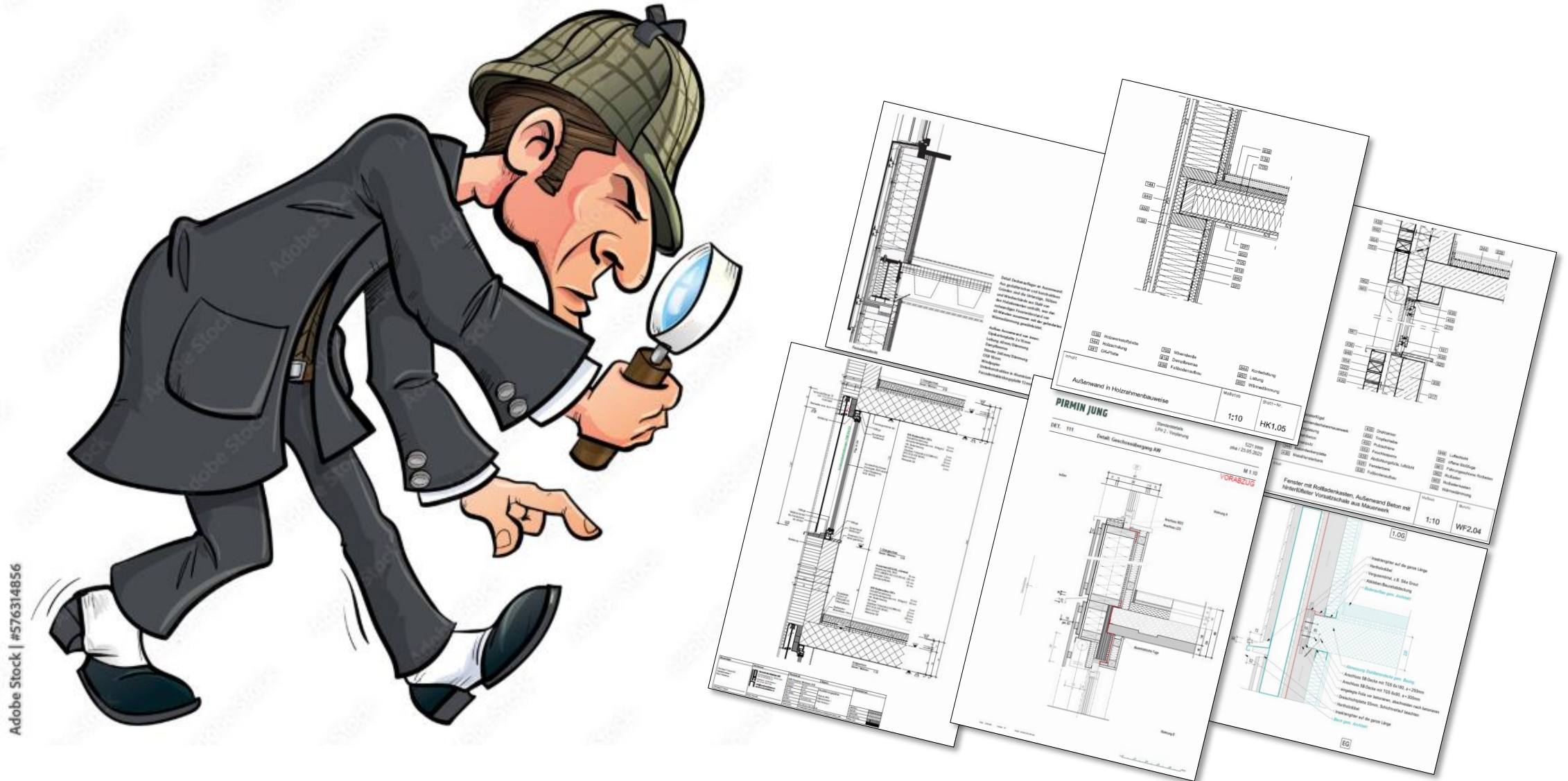
# **KnowledgeBased – SmartSearching Construction Knowledge**

**Smart Search Challenge | AEC Hackathon Zurich Edition 2025**

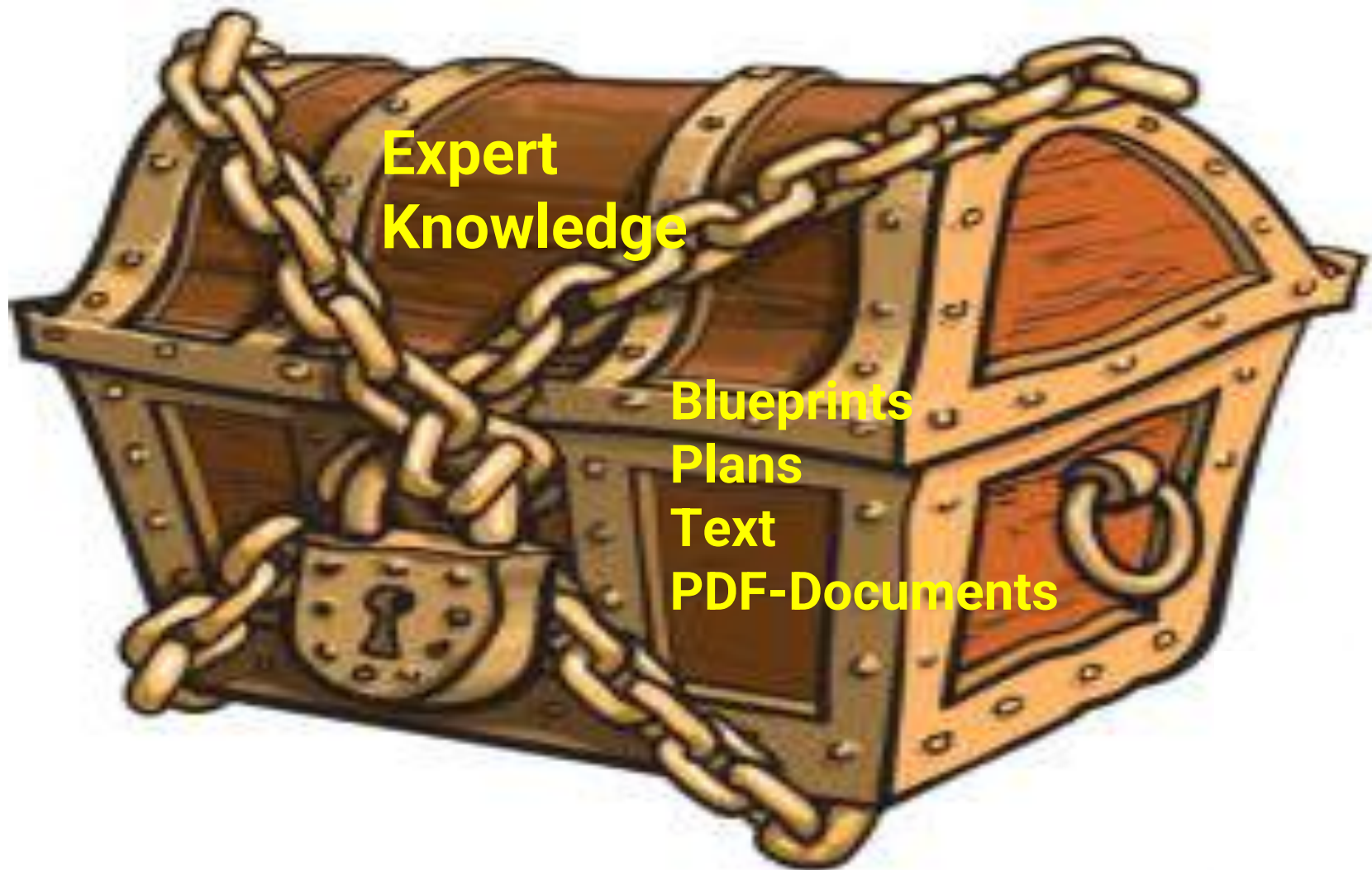
**Construction Industry keeps  
producing Prototypes because...**

**...most of Construction Knowledge  
is hidden in Graphical  
Representations**

# ...depending on experts to interpret it...



# ...impossible to search

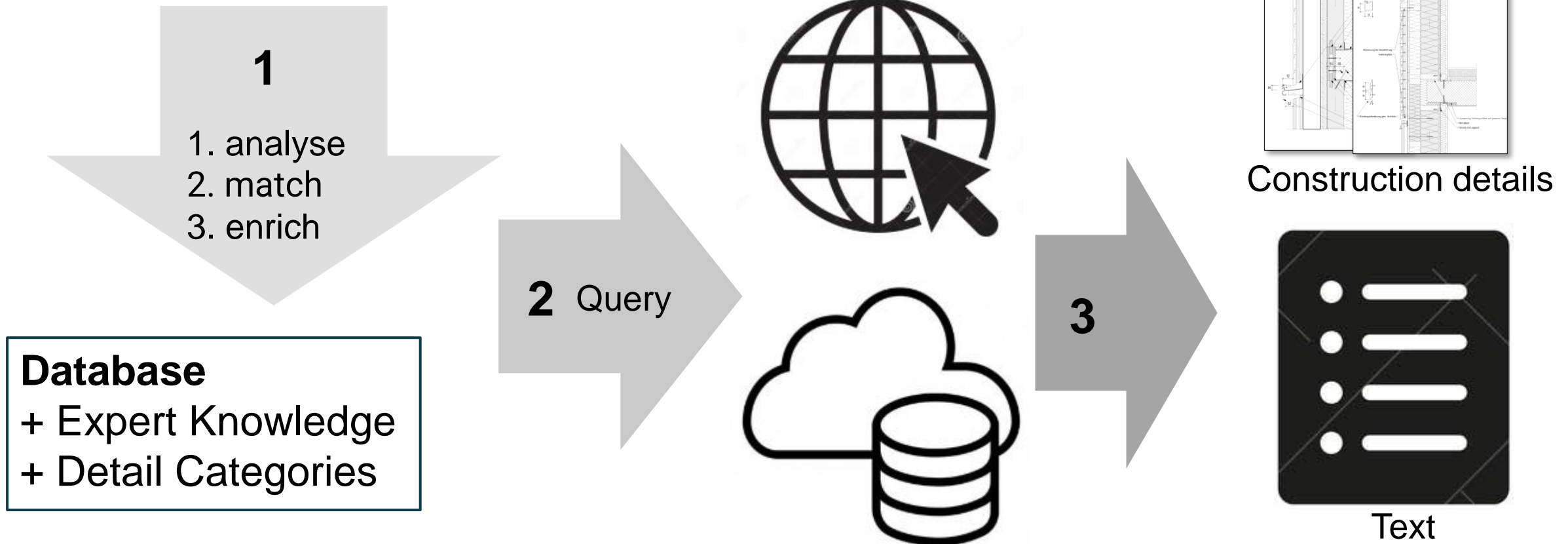


**Our Approach:  
Combining LLM with Expert and  
graphic-based Knowledge to learn  
from the Past and build for the  
Future**

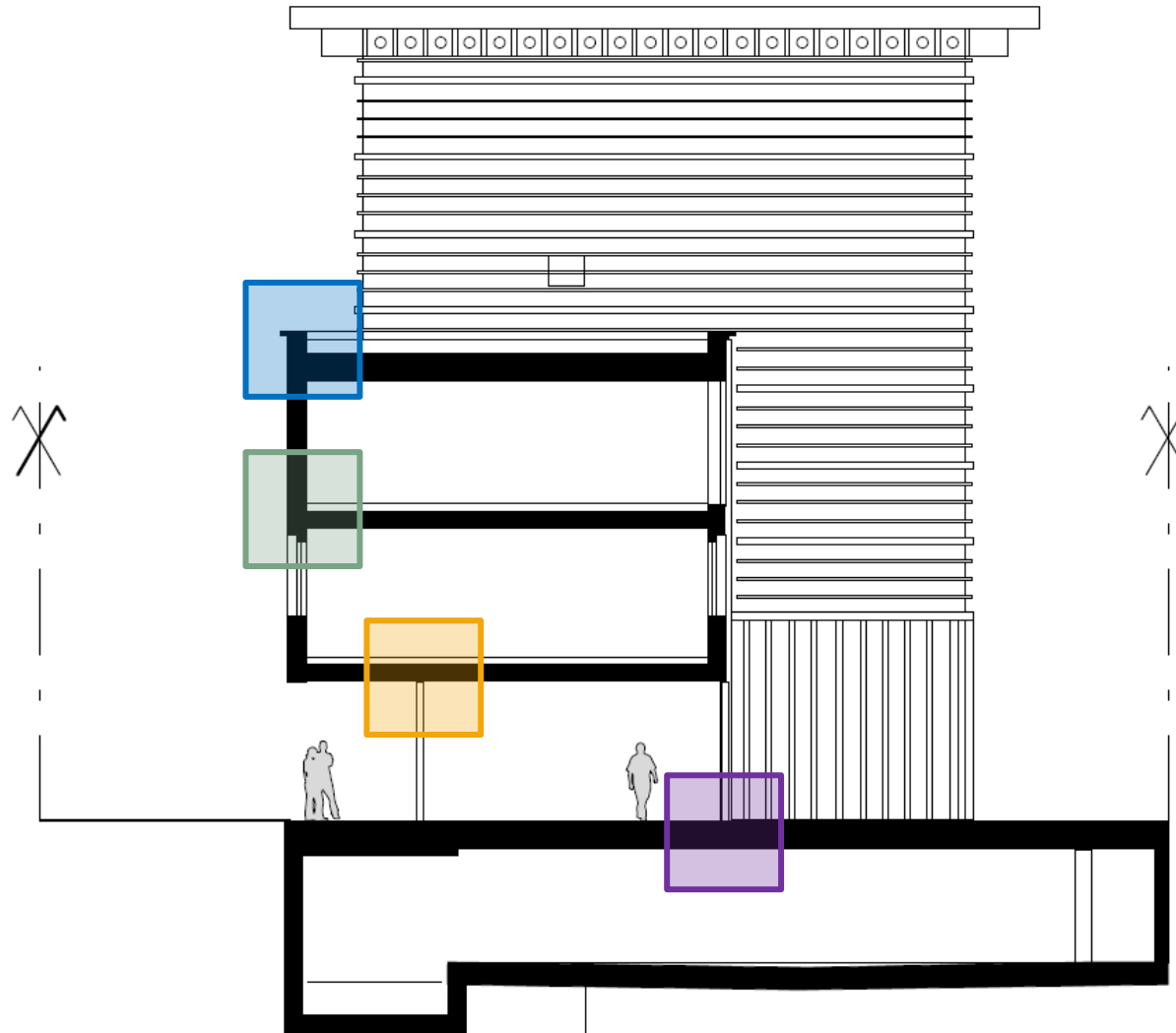
# The Goal: SmartSearching Construction Knowledge

## Input

graphic- or text-based Prompt

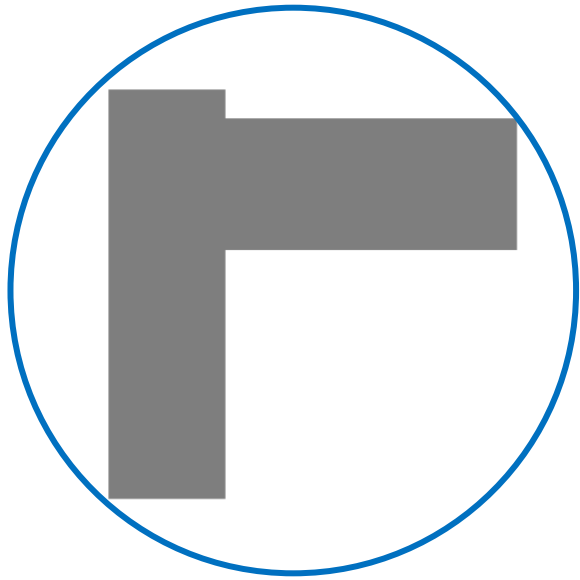


# From typical Construction Details...





# ...to Connection Typologies as Categories



**Dachrand**



**Geschossübergang**



**Trennwand**



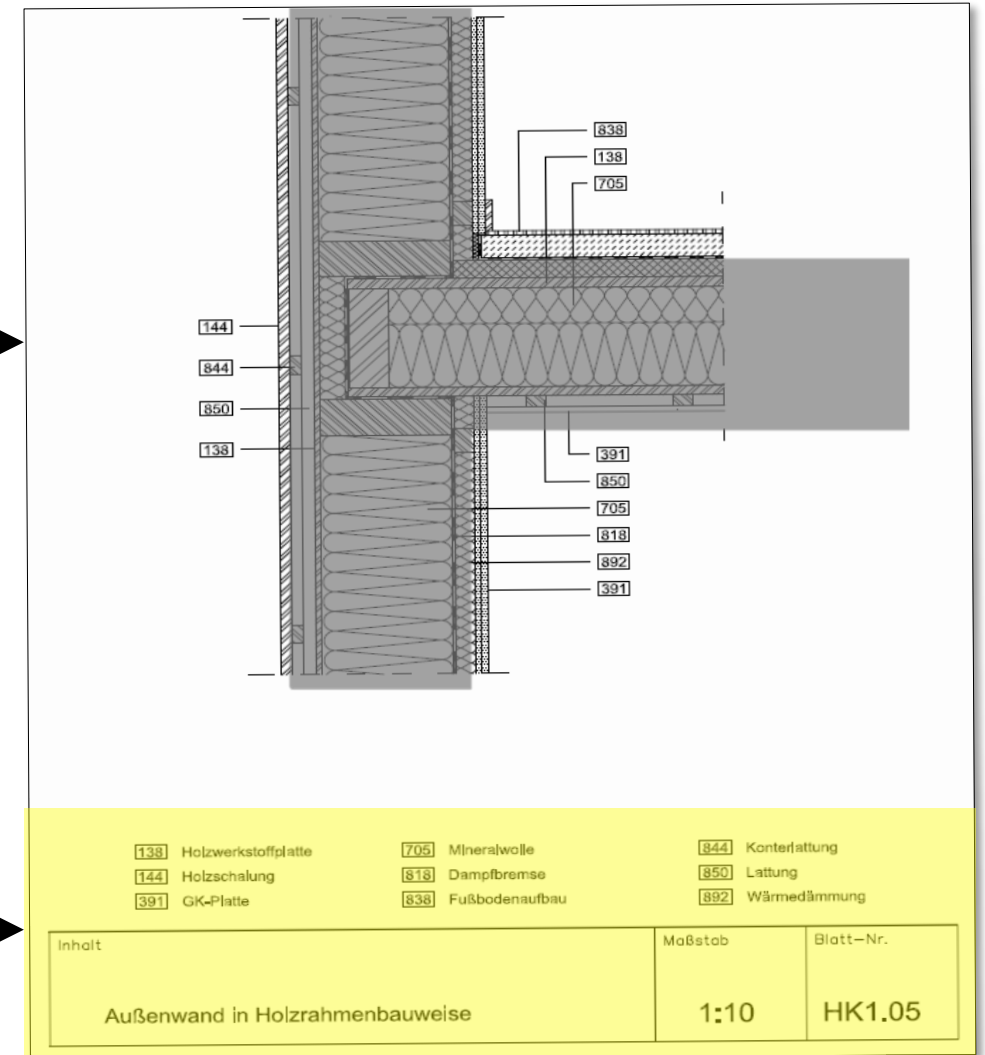
**Sockel**

# Image Reconition Elements

Graphical Content Anaylsis



Text Extraction

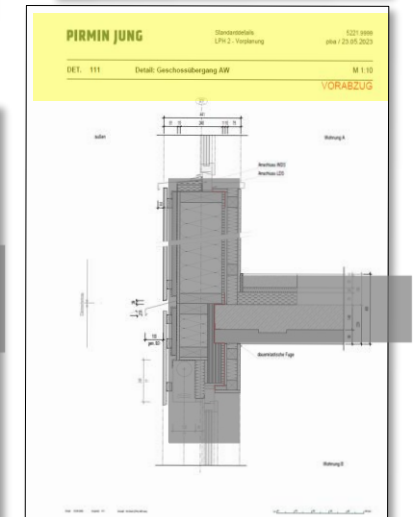
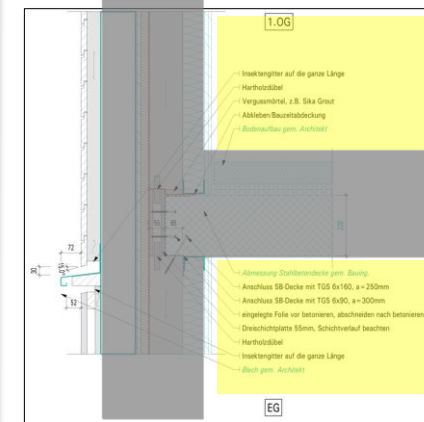
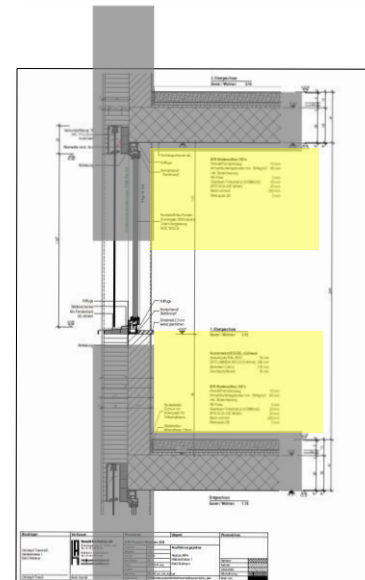
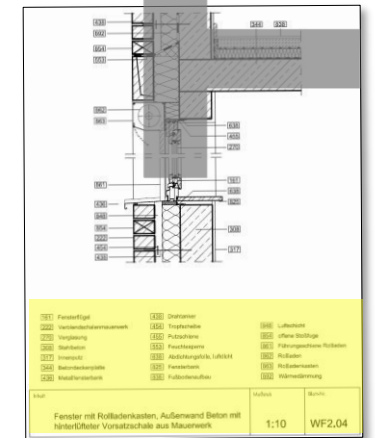
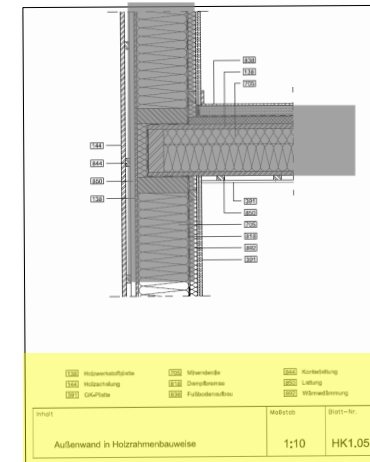
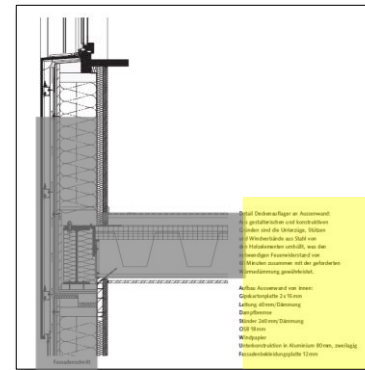


Source: SmartSearch Team

# Training for Category Recognition

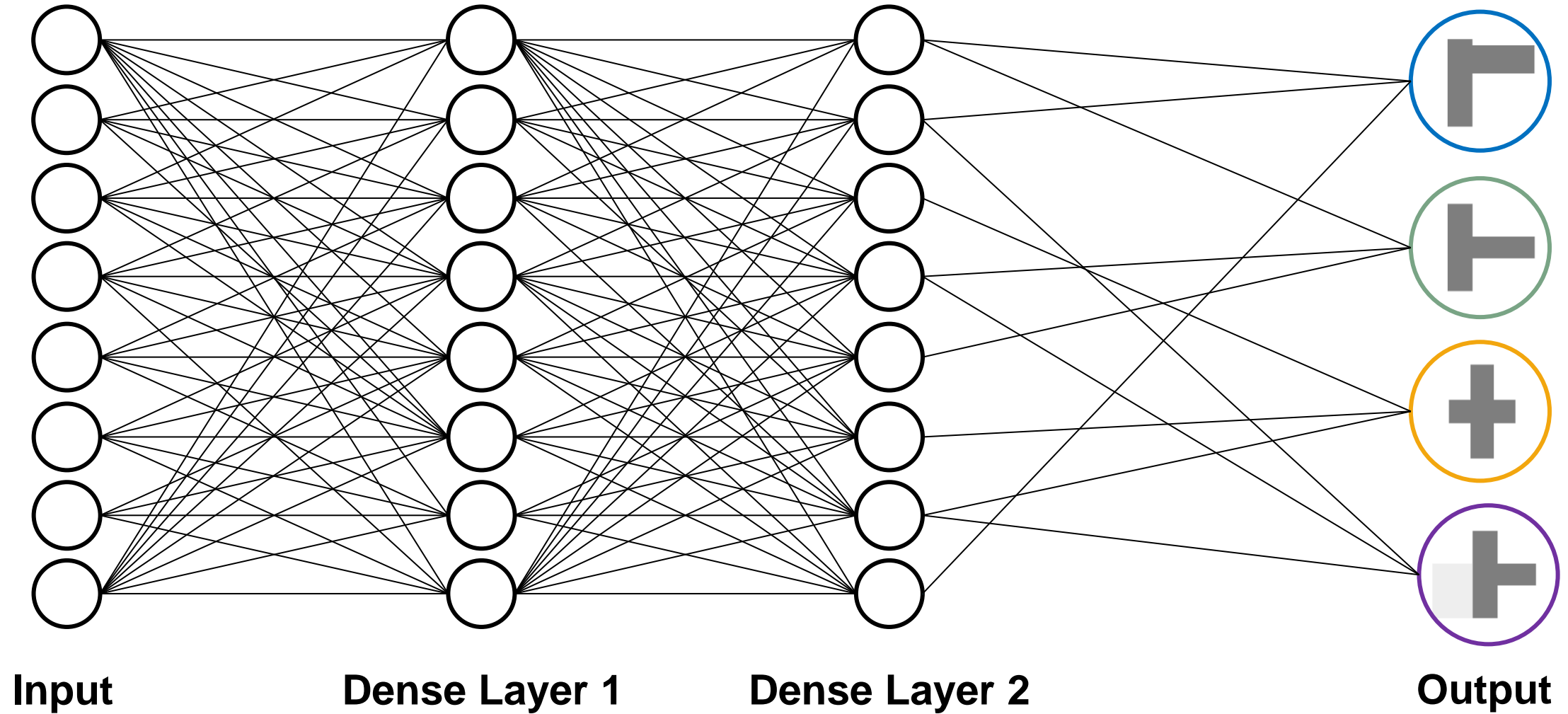


Construction Detail  
Category ECG\_GCG

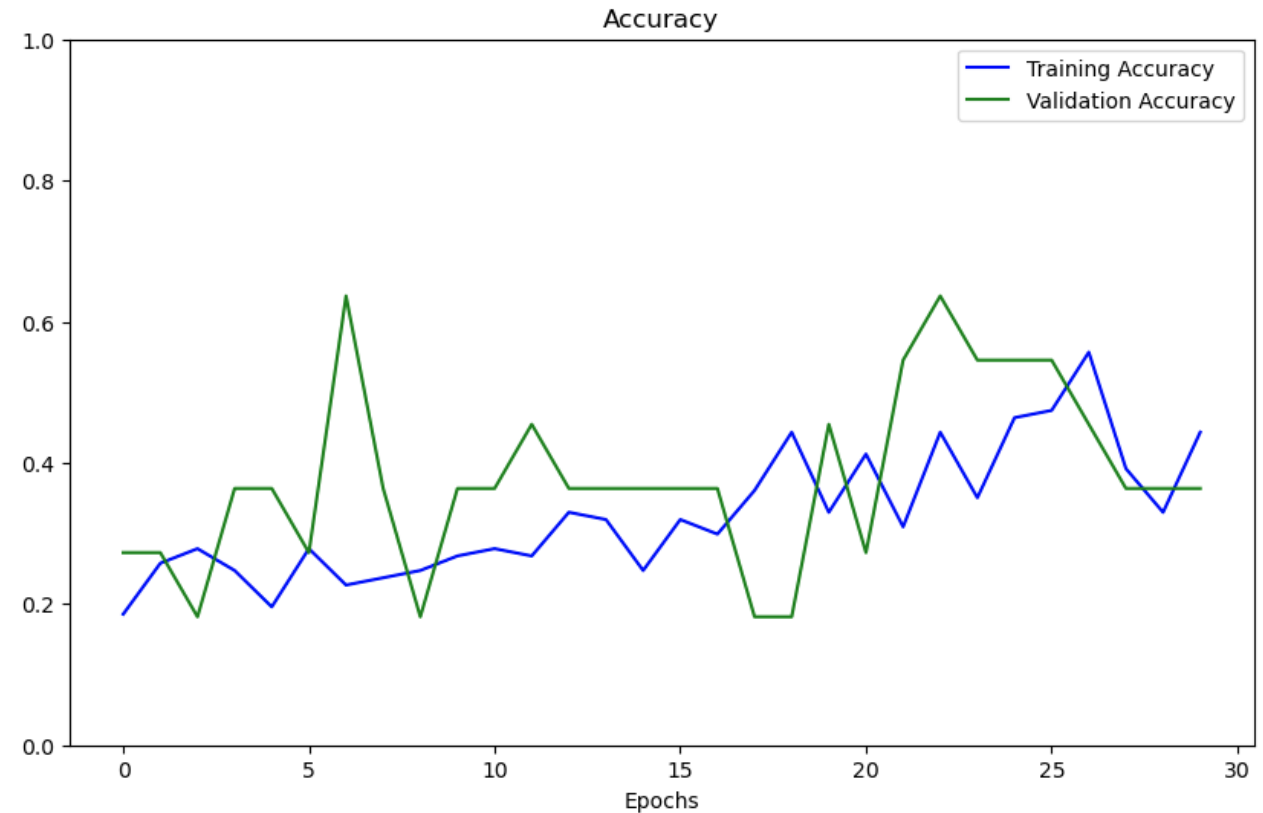
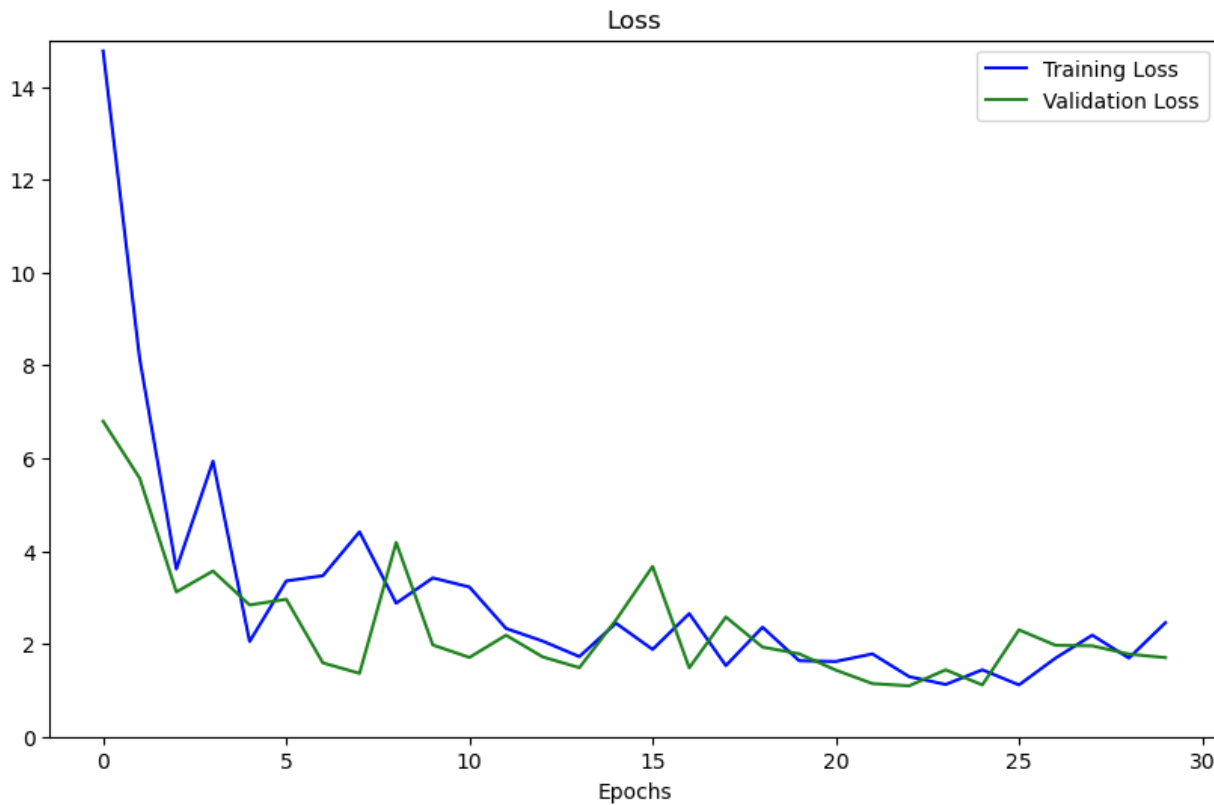


Source: SmartSearch Team

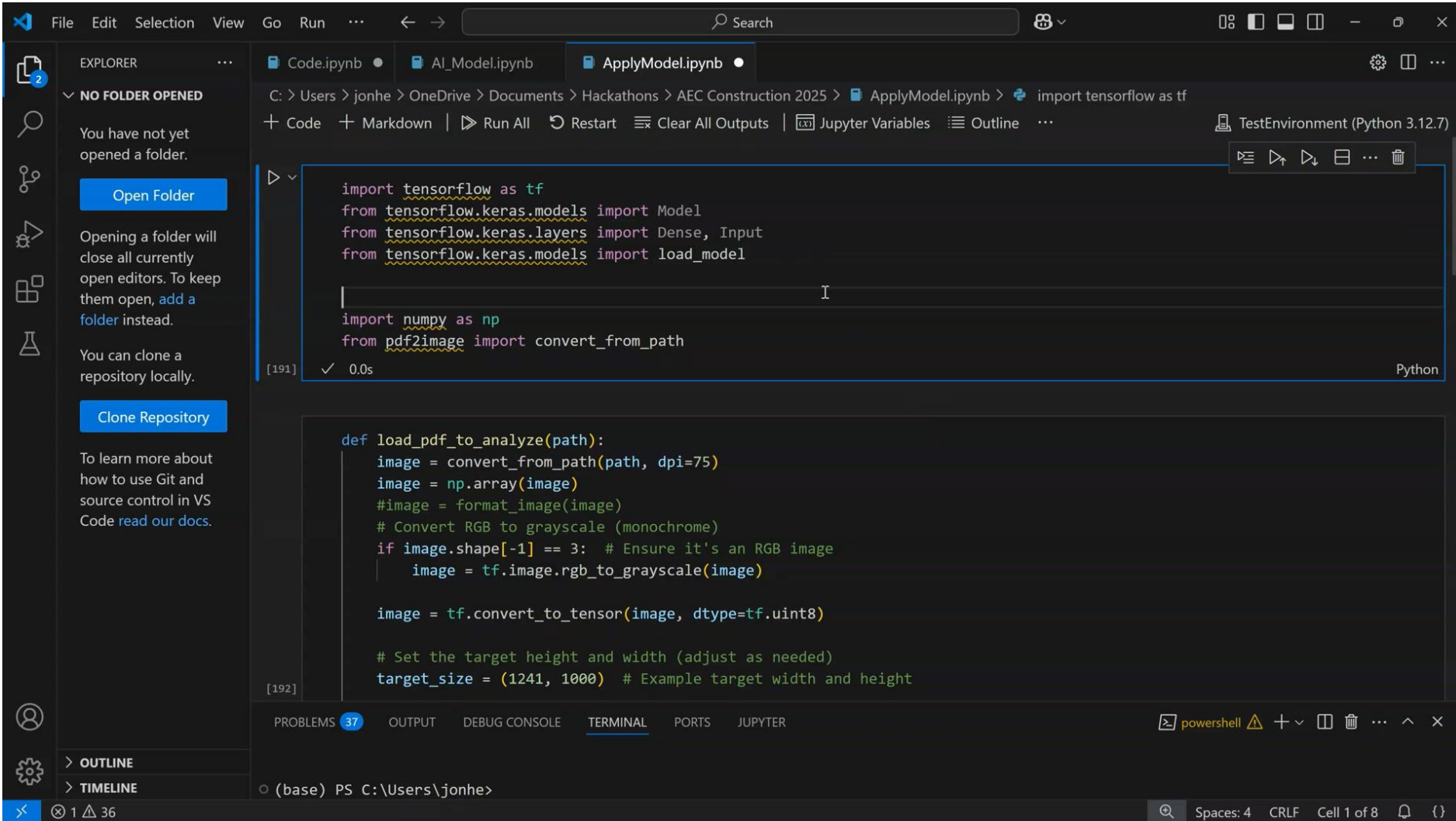
# Image Reconition Analysis Network



# Training Result – Proof of Concept



# Image Recognition



The screenshot shows a Visual Studio Code window with a Jupyter Notebook open. The Explorer sidebar on the left indicates 'NO FOLDER OPENED' and provides options like 'Open Folder' and 'Clone Repository'. The main editor area displays two code cells. The first cell contains import statements for TensorFlow, Keras, and NumPy. The second cell defines a function to load and process a PDF image. The bottom status bar shows the terminal is active with the command prompt at 'C:\Users\jonhe>'.

```
import tensorflow as tf
from tensorflow.keras.models import Model
from tensorflow.keras.layers import Dense, Input
from tensorflow.keras.models import load_model

import numpy as np
from pdf2image import convert_from_path

def load_pdf_to_analyze(path):
    image = convert_from_path(path, dpi=75)
    image = np.array(image)
    #image = format_image(image)
    # Convert RGB to grayscale (monochrome)
    if image.shape[-1] == 3: # Ensure it's an RGB image
        image = tf.image.rgb_to_grayscale(image)

    image = tf.convert_to_tensor(image, dtype=tf.uint8)

    # Set the target height and width (adjust as needed)
    target_size = (1241, 1000) # Example target width and height
```

Source: SmartSearch Team, Jonas Henriksson

# (Information Extraction) x (Expert Knowledge)

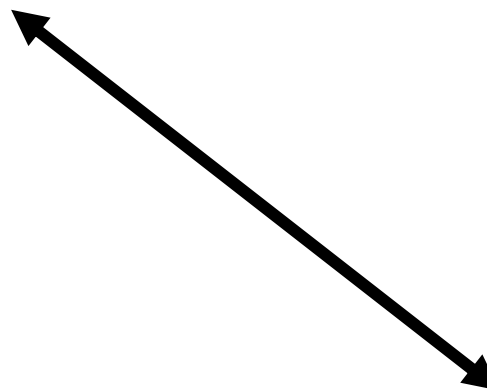
Industry specific Keywords

Extracting Keywords from  
Blueprints

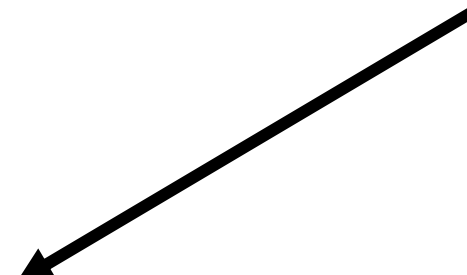
Recognizing Categories



Expert Keywords specific  
to the Category



**ECG\_GCG\_EC**



# ChatBOT Construction Knowledge

The screenshot displays a chat application interface. On the left is a sidebar titled 'Playground' containing a 'Chat' button and a list of sessions. The main area shows a chat session titled 'Session Feb 09, 10:27:58'. The chat history includes a user question and an AI response. The AI response provides detailed construction advice for a 'Sockel-Detail' (base detail), listing three key aspects: weather protection, ground conditions, and insulation, each with specific requirements and references to building codes.


**Session Feb 09, 10:27:58**

**User**  
Was muss ich beim Sockel-Detai beachten?

**AI** mistral-small-latest  
Beim Sockel-Detail sind mehrere wichtige Aspekte zu beachten, um eine funktionale und dauerhafte Konstruktion zu gewährleisten. Hier sind die wichtigsten Punkte:

- 1. Witterungsschutz und Spritzschutz:**
  - Der Sockel muss gegen Feuchtigkeit und Witterungseinflüsse geschützt sein. Dies ist besonders wichtig, da der Sockel erdberührt ist und somit direktem Kontakt mit Erdreich und Spritzwasser ausgesetzt ist. Eine geeignete Fassadenbekleidung und Abdichtung sind entscheidend.
  - Referenz: [SIA Normen](#)
- 2. Erdreich und Terrain:**
  - Der Sockel muss so konstruiert werden, dass er den Druck und die Feuchtigkeit des Erdreichs aushält. Eine korrekte Hinterfüllung und Wasserführung sind ebenfalls wichtig, um Versickerung und Wasserstand zu kontrollieren.
  - Referenz: [Bau- und Zonenordnung \(BZO\)](#)
- 3. Dämmung und Wärmedämmung:**
  - Eine gute Wärmedämmung ist notwendig, um Wärmebrücken zu vermeiden und die Energieeffizienz des Gebäudes zu gewährleisten. Dies ist besonders wichtig in der Gebäudehülle.
  - Referenz: [Minergie](#)

Durch die Berücksichtigung dieser Aspekte können Sie sicherstellen, dass der Sockel-Detail robust, funktional und langlebig ist.

Send a message... 

Source: SmartSearch Team, Elias Knoll



# On the Way to unlock the Treasure 😊



# Thank you!



Our Project on GitHub

Jonas Henriksson | Elias Knoll | André Herrera | Anne Nyffeler