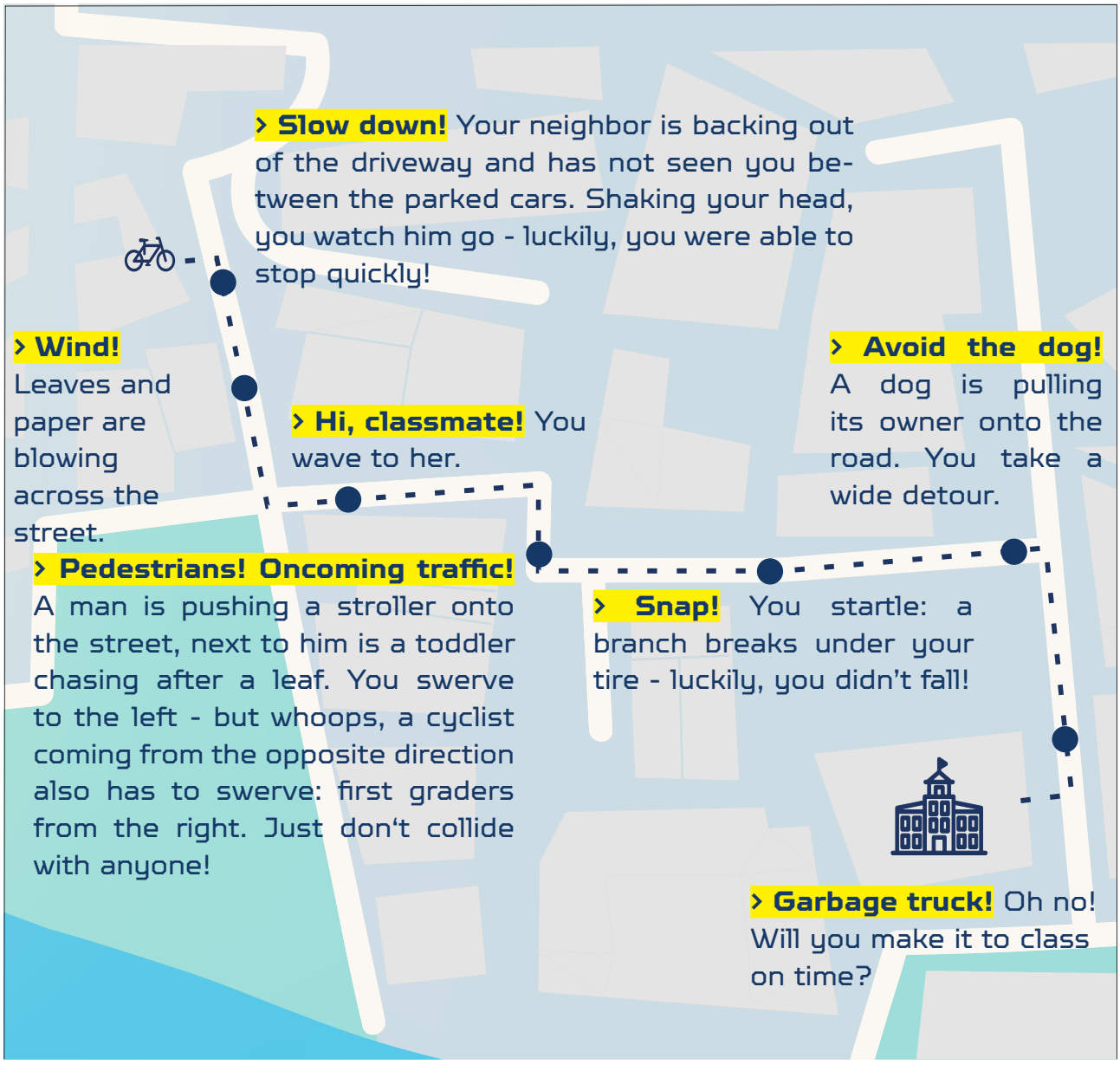
SEE THE WORLD AS AN AI SYSTEM

Let‘s start with a little thought experiment. Imagine you are riding your bike to school in the morning:



Even if the journey to school might have been exhausting for you under such circumstances, it was no problem for you to recognize all the dangers and act accordingly. An AI system in an autonomous vehicle does not have it so easily. This is because AI systems perceive their environment differently than humans do. They use various sensors to imitate human perception of our senses. For example, an autonomous vehicle can use a distance sensor and a camera to detect other road users and react appropriately: brake, swerve, and stay in lane.

But how does the AI system know which of the perceived images, distance data, or even sounds are important and to which situations it must react?

To do this, the recorded information must first be filtered and sorted by importance so that the AI system is not overloaded with unnecessary information, because, in reality, thousands of impressions flood an AI system every second. You can test how much that really is yourself: Try to count all the things in your field of vision precisely. Or close your eyes for a moment and see how many sounds you can hear around you.

Conveniently, the brain filters out all irrelevant sensory impressions very well in everyday life, so you only perceive what is important at that moment. In addition, we have abstract concepts that sort of summarize individual pieces of information and help us quickly understand and assess situations. For example, while riding a bike, you automatically recognize all the objects around you – cars, trees, pedestrians – without having to think about what they are. Thoughts like "Ah, that looks like two circles within two more circles, those could be eyes!" and "Below the eyes is a nose, meaning that‘s a face!" don‘t exist. Your brain processes the visual image, and you know: "Person!" At the same time, your brain registers "The object is crossing the street in front of me." and combines both pieces of information, so you get the feedback "Danger!" You thus assess both the object and the situation within a very short time.

A self-driving vehicle, on the other hand, uses various sensors (e.g. ultrasound, RADAR, LIDAR) and cameras to "see". However, with cameras, whole objects cannot be perceived, only colorful pixels, which are small squares with certain colors that the image can be divided into. Based on these, it cannot yet determine how to behave, as it would have to process too much information. Therefore, images must first be analyzed, for example, with a neural network: Are there adjacent pixels with the same color that can be distinguished from neighboring pixels? Then this could be a line. What arrangements do the lines have so that more complex shapes, such as triangles, can be composed of them? And finally:What objects do the shapes and patterns recognized in the image represent? In other words, what meaning ("tree", "person") can the AI system assign to the numerical values representing a specific pattern?

Through this processing, the AI system filters reality and attempts to extract important information from an image. Without this reduction and summarization of information, computers and AI systems cannot handle the complexity of the environment that humans can process in a fraction of a second. And that is just one image. If everything is now moving and changing rapidly, as is the case in traffic, recognition becomes even more challenging. The challenge in designing AI systems is therefore to reduce the complexity of reality through good processing of sensor data, so that only the necessary information remains – and in just the right measure so that everything can still be recognized, but the AI system is not overwhelmed and makes mistakes. In autonomous driving and other AI applications that can endanger people if they do not function correctly, this is particularly important.

You tried this reduction of information at the station. You tried to describe a real image to your partner using only geometric shapes, colors, and positions. Thus, you did not use abstract concepts that are normal in our everyday lives but cannot be processed by AI systems. The task sounds simple at first, but the result is usually an image that has little in common with the original if you can even recognize what was supposed to be depicted. By omitting abstract ideas and simplifying, crucial information is lost. Or simply said: If someone tells you, "Draw a pear!" then you probably immediately have the image of a pear in your head and can draw it, but drawing a pear only with a geometric description is (almost) impossible.

SOURCES

Graphic "On the way to school"

created by Annabel Lindner, city map: Sonja Gagel

SOURCES
PICTURE CARDS REALITY TABOO

Golden Retriever

https://pixabay.com/de/photos/hund-golden-retriever-welpe-2655463/,
Photo by Nick, Pixabay

Pear

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Photo by Steven Giacomelli, Pixabay

Horse

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Cathedral of Cologne

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Photo by Andi Graf, Pixabay, modified

Cruise Ship

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Photo by Ed Judkins, Pixabay, modified (Namens and brands removed)

Fish

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Photo by Daniel Franco, Pixabay

Car_complex background

https://pixabay.com/de/photos/vw-k%C3%A4fer-volkswagen-oldtimer-wagen-405876/,
Photo by JayMantri, Pixabay

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ElephantPisa

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Eifel Tower

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SOURCE
PICTURE CARDS REALITY TABOO

Leaves

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Fairground

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Noodles

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Indoor plant

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Buildings

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Shell

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Mountains

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Globus

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Books

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Bird

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