# AI and RE

# Artificial intelligence

Artificial intelligence (AI) is an interdisciplinary promising approach for prompting the human brain functions and incorporating them into the machine to make it human smart.

# AI gains momentum toward the change of the world's scenario

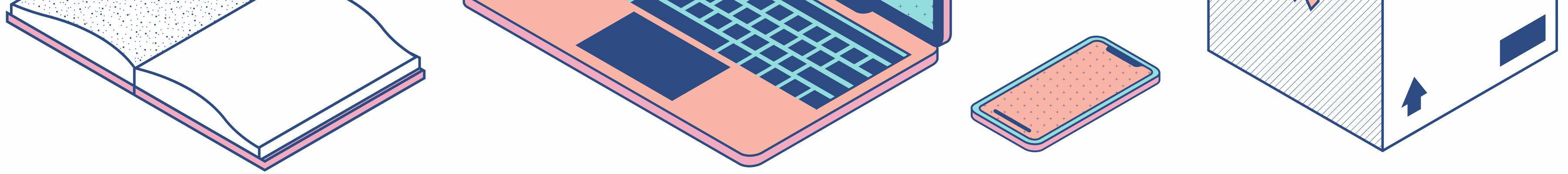**1** ——— **2** ——— **3** ——— **4** ——— **5**

Mythical thinking machines

17th century Descartes

19th century Boolean algebra

Darwinian evolution

Robotics

The transformation of the electric grid into a smart system has led to notable advancements and increased intricacy in the relationship between its components.

· The energy path is no longer the traditional path from source to consumer

· The information path is no longer the simple path of consumption and generation to control

· Control signals are no longer those signals issued by generation, transmission, and distribution stations with their known and specific functions.
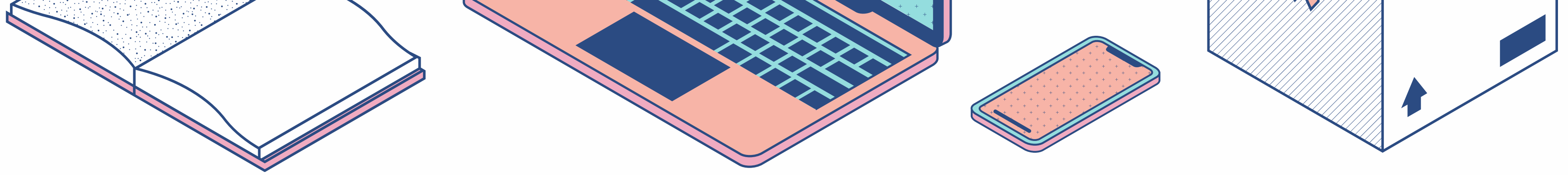
**Machine learning (ML)** applies mathematical models to large datasets to find trends and patterns while mapping inputs and outputs.
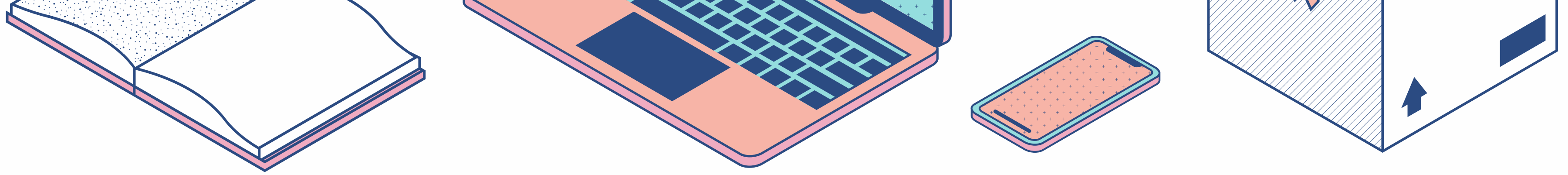
**Deep learning (DL)** is a subset of machine learning that utilises neural networks with many layers (hence "deep") to analyse various forms of data.

# Why do we need algorithms to control smart grids?

In smart grids, AI-based systems can process large volumes of data from various sources such as distributed generators, transmission media, and electricity demand-side information. The objective is to provide precise control actions with high accuracy and security measures.

We will examine the role of advanced technologies in smart grids from various component perspectives.
1. Supply-side
2. Transmission media
3. Demand side
4. Energy market
5. Security aspects

# Supply-side
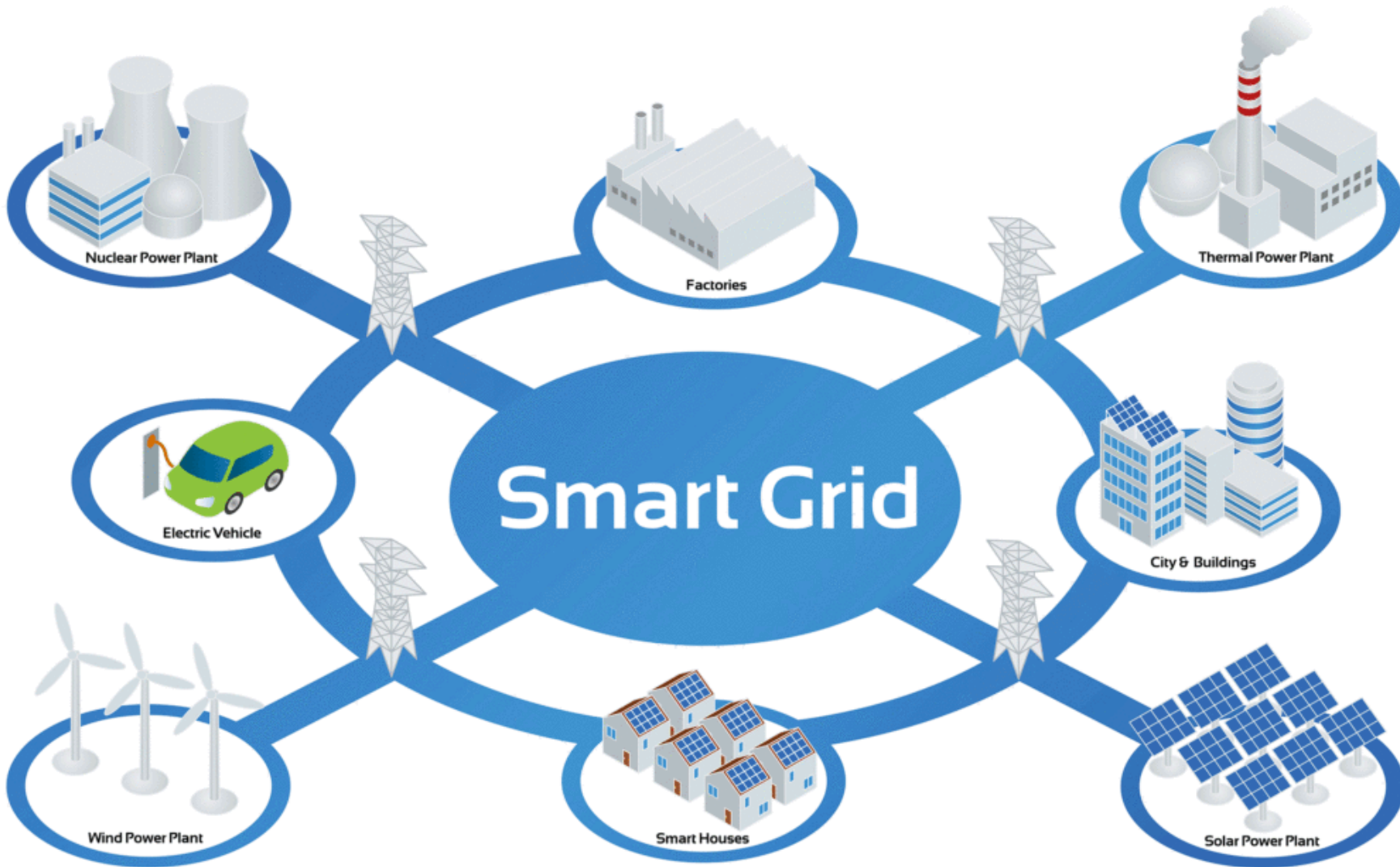
# AI in smart grid operation monitoring

Artificial intelligence algorithms can also analyse and differentiate between the causes of performance deficiencies in a solar system, such as panel cleanliness or the presence of a defective panel affecting the others.

**Grid stability assessment**

The AI also contributes to stability assessment and helps prevent power outages. It addresses various stability issues, including transient, frequency, small signal, and voltage instability.

**Energy transmission**

Energy transmission in the smart grid environment is different from traditional grids. Smart grids depend on distributed generation, and the demand is located near the generation. New means of energy transmission, like hydrogen containers and energy storage systems, are used in smart grids.