# Tutorial 1

## Task 1

Classify the following models into normative or descriptive modelling.

1. A map of Europe.
2. A CO2 tax.
3. The election forecast for the 2024 American presidential election.
4. A train timetable.
5. Income tax models.

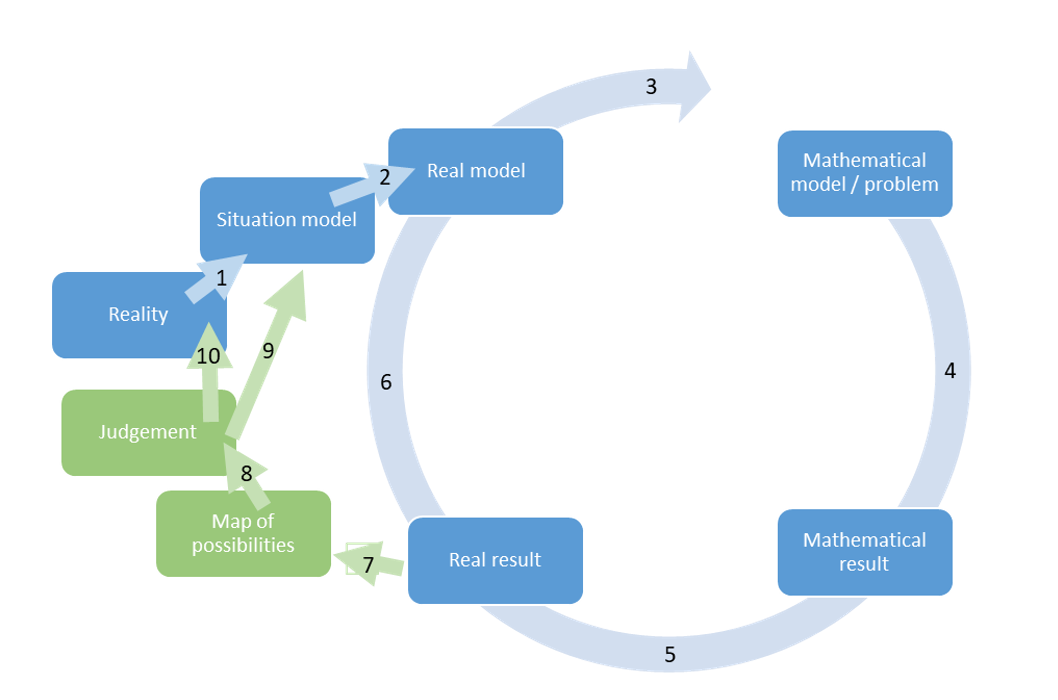
## Task 2

In the following you are requested to develop your own normative modelling. You will find some suggestions and ideas on the next page for the following topics:

* Modelling the climate impact of certain food products.
* Modelling the climate impact of electric cars.

1. Choose one of the topics above, or your own topic and develop a concrete question that you would like to address with the help of your normative modelling.
2. Use the normative modelling cycle (given on the next page) to investigate your question. Document and describe the individual steps you take. The following tipps may support you:
   * Write down the situation model you have for the question and agree together on a real model.
   * Note explicitly your assumptions and framework conditions that you make for your real model.
   * Sketch your mathematical model and document your mathematical steps (for example, by stating your calculation).
   * Interpret your mathematical result in relation to your real model and your normative question.
   * Carry out at least one more modelling with a slightly modified real model and compare and discuss your results afterwards.

### Normative modelling cycle



|  |  |
| --- | --- |
| 1. Understanding/Constructing | 1. Simplifying |
| 1. Mathematisation | 1. Mathematical work |
| 1. Interpreting | 1. Validating |
| 1. Reflecting | 1. Judegement building |
| 1. Relating to the situation model | 1. Relating to reality |

### Suggested topics

* Climate impact of certain food products

In Germany, food is a major factor in climate change, accounting for more than 25% of German greenhouse gas emissions. In this context, it was repeatedly discussed whether food consumption should be limited or changed, for example through a meat tax or similar. Others criticised above all the eating of nonregional and seasonal food.

On the following website you can already find some modelling of how much CO2 some foods emit under certain conditions. You may use this as a starting point to generate ongoing questions.

<https://ourworldindata.org/environmental-impacts-of-food?country=#carbon-footprint-offood>

* Climate impact of electric cars

In the context of climate protection, there are repeated calls to switch from cars with combustion engines to electric cars. To this end, there are, among other things, high purchase premiums from politicians for the purchase of an electric car. However, the lower CO2 emissions of electric cars are currently controversial:

Data retrieved from [www.statista.de](http://www.statista.de)

Additional information on the graphic:

* Small cars with a mileage of 150,000 km were considered.
* The vehicle with the lowest eco-test consumption was selected for all drive types.
* The information on the electricity mix refers to data from 2013.
* The information on the CO2 balance is based on an entire life cycle.

You may use this as a starting point to generate ongoing questions.

# Homework 1

## Task 1

Fully document the normative modelling you started in the classroom exercise so that you can briefly present it in the upcoming tutorial. In doing so, also address the points at which your model could be criticised or discussed.