

## EuroTeQ Collider 2024

Challenge

### CONSCIENCE: Concrete for Sustainable Climate Neutral Construction and Engineering

Category

**Nature**

Focus

**Research**

**Concrete is the most widely used material on earth after water. However, concrete production contributes to 8 - 10 % of global emission of greenhouse gases. With increasing infrastructure demands worldwide, reduction in CO2 emissions due to concrete production is essential for a sustainable future.**

#### **Problem definition**

The development of new concrete mix designs with reduced CO2 emissions by e.g. the use of alternatives to Portland cement, recycled or waste materials is slow, expensive and inefficient when using traditional materials design approaches .

#### **Description**

Develop a data-driven computational ML-tool for identifying sustainable concrete compositions with characteristics such as performance (strength, stiffness etc.), availability and affordability that is at least equivalent to that of concrete. In addition, the tool shall generate region-specific low-carbon concrete compositions by esp. taking local resource availabilities into account. The identified concrete mix designs will be validated by production and testing in the concrete laboratory at TUM.

#### **Key questions**

- How to efficiently generate a complete dataset from existing literature and other data sources for training the ML model
- What state of the art Generative Algorithms from ML are optimal for this task
- What are the requirements for the ML tool to be extensible and modular

#### **Links**

<https://www.mae.ed.tum.de/cbm/forschung/betontechnologie/>

#### **Skills**

The module is open to Master/PhD students as well as interns; The 5-person team is optimally comprised students with following background. 2 - ML, 1 - database, 1 Civil or Materials Engineer and 1 Chemist.

#### **Partner**

The Center for Building Materials at TU Munich is one of the leading research and testing institutes for building materials in Germany with around 110 employees. This challenge will be executed in close cooperation with members of the working group 'Concrete Technology' and 'Computational Modeling and Simulation'.