

We offer a full-time position for a **doctoral researcher/PhD student** for the DFG Collaborative Research Center **SFB 1574 - Circular Factory** <https://www.sfb1574.kit.edu/english/index.php> concerning the subproject **Information Representation and Management of Product Instances**.

For each individual physical object instance (objects can be parts, assemblies or complete products) within the Circular Factory, it is necessary to describe all its quality relevant attributes together with uncertainties and mutual dependencies. For this purpose, parametrized probability distribution models with universal approximation capabilities are to be used, e.g. Gaussian Mixture Models. To cover different sources and causes of uncertainty, probability is consistently interpreted as a Degree of Belief (DoB), the interpretation also adopted in Bayesian statistics and in the ISO/IEC Guide to the expression of uncertainty in measurement (GUM). The radical approach is to use DoB-distributions as a canonical format to uniformly represent every attribute.

For each object instance, all pertaining attributes are organized in a suitable data structure that is managed by an individual SW-agent, which provides the dynamic, operative integration of an object instance into the control system of the circular factory.

In this context, the following initial **research questions** are to be pursued and answered:

- (1) How can different kinds of data, information and knowledge about attributes be consistently transformed into DoB-distributions? Can this be accomplished by transforming available data, information and knowledge into constraints with respect to which DoB-distributions with maximum entropy are calculated? How can information loss and bias be minimized in this transformation process?
- (2) What is an appropriate information model for object instances with attributes in DoB-format? How can such an information model be managed by an associated SW-agent which cares for all object-relevant tasks like: communication, information transformation, information fusion, lifetime management of an instance, etc.

Salary: 100 % TV-L E13

Start: April 1, 2024

Conditions: fixed term employment contract for two years with an option for a prolongation by another two years.

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