

University of Stuttgart

Institute of Nuclear Technology and Energy Systems

Prof. Dr.-Ing. Jörg Starflinger

Chair of Nuclear Technology and Reactor Safety

#### **Objective:**

The task of the work includes the training of an artificial neural network (ANN) based on experimental data for the heat transfer prediction at two-phase closed thermosyphons (TPCT).

#### **Background:**

TPCTs are highly efficient passive heat transfer devices that can continuously transport heat from a heat source to a heat sink without any mechanical and electrical components. The thermal performance of TPCTs depends on the thermo-fluid dynamic behaviour in the evaporator and condenser sections. However, the prediction of the heat transfer in these sections might represent an issue to be addressed, since the available correlations (Fig. 1) in the literature are valid only for the range of parameters covered in the respective study. The goal of this work is to train an ANN (Fig. 2) using data points of experimental results to predict the heat transfer of TPCTs.

### Procedure:

- Familiarization with the fundamentals of TPCTs and ANN,
- Literature review on experimental works with TPCTs,
- Training of the ANN,
- · Validation with separated data from training,
- Consideration of counter overfitting and model generalization,
- Evaluation and classification of the results,
- Written elaboration and oral presentation.

# **Requirements:**

- Interest in deep learning,
- Knowledge in math and stats,
- Basic knowledge/experience with Matlab or Python (e.g. TensorFlow),
- Very good German or English skills.

# Start: 01.06.2022

Contact: M. Sc. Sergio Cáceres / M.Sc. Marc Kirsch Pfaffenwaldring 31 • Room no. 2.232 D-70569 Stuttgart sergio.caceres@ike.uni-stuttgart.de +49 711 685 69662 mark.krisch@ike.uni-stuttgart.de +49 711 685 61798

# **Masterthesis**

# Neural networks heat transfer prediction for two-phase closed thermosyphons



Fig 1: Comparison of experimental and theoretical heat transfer coefficient values for the evaporator section. [Jafari 2016]



Fig 2: Exemplary ANN with two hidden layers



Die Universität Stuttgart möchte den Anteil der Frauen im wissenschaftlichen Bereich erhöhen und ist daher an Bewerbungen von Frauen besonders interessiert. Schwerbehinderte werden bei gleicher Eignung vorrangig eingestellt.

