Student assignment

Transfer learning in Bayesian belief networks

High-tech systems such as lithography machines in semi-conductor factories, magnetic resonance scanners in hospitals, and high-volume printers in publishing companies operate in a dynamic environment. As a consequence, the orginal models that drive the operations may become less suitable over time. Mitigation is to

1. detect that a model is outside its operational bounds
2. identify which parts of the model are inadequate
3. adapt the model to fit the new context.

Wafer scanner in operation

ESI, an initiative of Industry, academia and TNO, have in cooperation with ASML set the first steps towards adaptivity of Bayesian Belief Network (probabilistic models) with a proof of concept of novelty detection and a theoretically underpinned plan for adaptivity.
One of the research topics is to investigate how model parts can be reused in different circumstances, such as a different factory, or different product line. Instead of rebuilding or retraining models from scratch, transfer learning could improve model creation and maintenance.

High-volume inkjet printer

Assignment

1. Identify transfer learning methods and assess their theoretical implications
2. See how transfer learning can be applied to Bayesian belief networks
3. Apply promising transfer learning methods on existing models in changing circumstances (such as “new product”) and assess their performance.

Profile

You are Master’s student with a strong background in statistics and probabilities looking for a graduation assignment of 6-9 months. You can grasp scientific literature and translate concepts into working software (Python, R).

About ESI

ESI is a leading research group for high-tech embedded systems design and engineering. It has a close cooperation with high-tech industry, as well as a strong association with fundamental research of academia, both national and international. ESI contributes to society and economy by driving advances in high-tech systems technology, with a strong shared research programme, dedicated innovation support, a focused competence development programme, and various knowledge-sharing activities.

More information

ESI (TNO)
High Tech Campus 25
5656 AE EINDHOVEN (NL)
ir. Emile van Gerwen
T +31 (0)88-866 5420
E emile.vangerwen@tno.nl