

PhD Student – Object Pose Estimation Under Geometric Uncertainties

University of New Brunswick - Eigen Innovations

LOCATION: Fredericton, New Brunswick, Canada

PROJECT DESCRIPTION:

Advanced image analysis techniques can be used to gain better insights into manufacturing processes to improve the performance of machine learning algorithms for quality inspection. Many manufacturing processes repeatedly mass-produce specific parts with known geometries (models). Arrays of imaging sensors (e.g., colour, monochrome, near-infrared, infrared, etc.) can be deployed with varying view-points to provide adequate part coverage to perform a reliable quality inspection. However, variability in the part pose (position and orientation), differences in the image backgrounds, and geometric differences between parts (e.g., warping), can introduce undesirable variations into the dataset. Effectively handling these variations on small datasets can require customized machine learning algorithms to be trained and deployed to achieve desirable inspection performance.

This research project will focus on creating a model-based object pose estimation algorithm that can be applied to a single image of an arbitrary type (e.g., colour, infrared) using a mesh representation of the part model. The geometric uncertainties of the real part, relative to the model, should be predicted so that the geometries of the predicted model and the real part adequately match. Furthermore, the developed algorithms should apply to the online inspection of high-speed manufacturing processes.

The student will leverage vast amounts of industrial inspection data to develop and validate their algorithms and will have access to industry experts to improve their knowledge of industrial manufacturing. They will contribute to topics such as:

- Object pose estimation;
- Template matching;
- 3D reconstruction;
- Computer vision.

REQUIREMENTS:

- Masters in Computer Science, Engineering, or a closely related field.
- A strong track record in research, demonstrated by peer-reviewed publications and top-tier conference presentations.
- Expertise in computer vision, machine learning, optimization and 3D modelling.

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- Experience with Unix/Linux and strong programming skills (e.g., Python, C/C++).
- Ability to work well with others towards a common goal.
- Research independence: the ability to take responsibility and initiative to conduct your research as it is required in working towards the common goal.

PARTNER ORGANIZATION – EIGEN INNOVATIONS:

Eigen is an Industrial IoT company that specializes in advanced analytics and machine learning to solve complex, real-time quality problems. We deploy advanced quality inspection solutions that capture machine and sensor data and leverage the cloud to train and generate algorithms that power edge computing within manufacturing. Our research team has access to many advanced tools including thermal cameras and industrial robots, as well as proprietary data analysis techniques. We provide an exceptional learning environment and solve real-world manufacturing problems. The company will be working closely with UNB personnel on this PhD project.

CONTACT

If interested, please contact us at careers@eigen.io and share a copy of your CV.

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