



## COLLEGE of ENGINEERING AND PHYSICAL SCIENCES

SCHOOL OF COMPUTER SCIENCE

# MSc Defence

**Wednesday August 23, 2023 at 1pm in Reynolds 1101**

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*Line Labelling of Polyhedral Scenes: Comparing Performance and Properties of Different Neural Architectures*

**Chair:** Dr. Fei Song

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**Advisory:** Dr. Minglun Gong

**Non-Advisory:** Dr. Luiza Antonie

### **Abstract:**

The classical problem of line labelling involves classifying an object's edges into three categories: convex, concave, and occluded. Understanding the properties of an object's edges yields the capability to recognize and interact with the objects in a scene. However, to what extent neural networks can relate geometry across a scene to produce the correct labelling of edges is unclear.

To investigate this, we introduce a dataset generator that, without any manual input, generates random two-dimensional polyhedral scenes and ground truth labels for the object's edges. We then conduct a comprehensive benchmark of the performance of select Convolutional Neural Networks, Recurrent Neural Networks, and Vision Transformers performing semantic segmentation to classify edge categories. Results indicate that gradually upsampling the encoded features and using recurrent algorithms improve segmentation performance. Furthermore, we perform a series of data-driven experiments to investigate how various scene conditions can influence the performance of these neural networks.