

# Utilization of Deep Learning Techniques for Fog-Induced Visibility Detection in Matsu Region

黃仲誼<sup>1</sup> 陳平陽<sup>1</sup> 張日昇<sup>1</sup> 李政達<sup>2</sup> 林達遠<sup>2</sup> 許義宏<sup>2</sup> 李俊穎<sup>2</sup> 林芳邦<sup>1</sup>

國家實驗研究院國家高速網路與計算中心<sup>1</sup>  
交通部運輸研究所臺灣技術研究中心<sup>2</sup>

## Abstract

This study investigates the visibility disruptions in the Matsu region between March and May caused by dense fog formation. Traditional image recognition techniques face limitations due to variable environments, lighting, and angles. Deep learning techniques offer a promising solution to these challenges. We propose a visibility detection model utilizing the Res2Net deep learning network, providing valuable insights for visibility forecasting applications in harbor operations. This study implemented and evaluated deep learning models, settling on Res2Net-50 for visibility detection.

We compared the visibility estimations from our model with standard machine values. Among the 300 tested images, the model's predicted visibility values were within a 20% margin of error for 261 images. This result indicates an accuracy rate of 87% in the detection of low visibility conditions. This high level of accuracy affirms the effectiveness of the Res2Net-50 model in visibility detection and suggests its applicability in real-world scenarios, such as harbor operations, where accurate visibility prediction is critical. Future work could explore using 4K cameras to capture more detailed information, improving differentiation in high visibility conditions.