國立臺東大學 理工學院
NATIONAL TAITUNG UNIVERSITY COLLEGE of SCIENCE and ENGINEERING

# 教師指導學生專題製作與論文競賽補助 成果報告

## 一、申請補助計畫基本資料

| | | | |
|---|---|---|---|
| 申請教師 | 徐位文 | 核定經費 | 8000 |
| 單位系所 | 資訊工程學系 | 經費執行情況 | ■已請購核銷完畢<br>□尚未請購核銷<br>□經費餘款_____ |
| 計畫執行年度/學期 | 114 年度 2 學期 | 參賽期程 | 114 年 8 月 24 日~ 114 年 8 月 26 日 |
| 參加競賽/學術活動名稱 | CVGIP 2025 | 作品名稱 | 1. A Lesion Annotation-free Approach for Predicting Skin Lesion Type of Whole Slide Images Using Mutual Calibration Training<br>2. Weakly Supervised Learning for Glioma Subtyping through Mitigating Noisy Data Problem Using Feature Selection Scheme |
| 指導參賽學生姓名 | 1. 林承億<br>2. 丁倫暐 | 班級 | 資工四乙 |
| 競賽性質 | □國際性<br>■校際<br>□校內(院級以上) | 參賽地點 | 大板根森林溫泉酒店 |
| 系所主管簽章 | 教授兼資訊工程學系主任 賴盈勳 | 日期 | 114. 11. 14 |
| 學院院長簽章 | | 日期 | |

## 一、 參賽作品：(論文摘要或作品說明)

1. Cheng-Yi Lin (林承億), Lun-Wei Ting (丁倫暐), Yao-Feng Li(李耀豐) and ,*Wei-Wen Hsu (徐位文). ” A Lesion Annotation-free Approach for Predicting Skin Lesion Type of Whole Slide Images Using Mutual Calibration Training” (CVGIP 2025)

   ABSTRACT - The classification of skin lesions plays a critical role in clinical diagnosis and treatment planning, especially given the increasing incidence of skin cancer worldwide. To address the challenges of heavy diagnostic workloads and the scarcity of annotated data in clinical settings, this study proposes a deep learning-based classification framework that integrates weakly supervised learning, noise-aware sample labeling, and dual-model ensemble voting. The experimental dataset consists of 2,580 histopathological whole slide images (WSIs), encompassing 14 common benign and malignant skin lesion categories. To mitigate class imbalance and reduce overfitting risks, the training data are split into two subsets based on input order and used for mutual calibration training. Misclassified samples are relabeled as noise classes suspected, generating another 14 classes to make a total of 28-class training dataset. In the inference stage, a voting mechanism with confidence threshold is employed, while discarding the samples predicted to the noise classes to boost performance. The experimental results show that the proposed method achieves an overall accuracy of 82.29%, outperforming the baseline model (78.67%) by 3.62%. It may imply the proposed denoising scheme can boost model performance by reducing the impact of noisy data.

2. Lun-Wei Ting (丁倫暐), Cheng-Yi Lin (林承億), Yao-Feng Li(李耀豐) and ,*Wei-Wen Hsu (徐位文). “Weakly Supervised Learning for Glioma Subtyping through Miti gating Noisy Data Problem Using Feature Selection Scheme” (CVGIP 2025)

   ABSTRACT - In digital pathology, whole slide imaging (WSI) involves data in gigapixel level. Therefore, the patching scheme is usually applied to sample the representative patches from the annotated regions. However, the annotations of the lesion regions from WSI by medical specialists are costly. As a result, the inexact supervision of weakly super vised learning was adopted in this study. Without lesion annotations, random sampling was performed, and the patches sampled from a WSI case were labeled to the same glioma subtype, resulting in noisy samples. Then, the objective of this study is to propose a feature selecting scheme that reduces the interference of the noisy samples, improving the classification performance of glioma subtyping. By applying the pro posed feature selection scheme, the features that overfit the noisy samples were dis carded, mitigating the model corruption problem. Experimental results show that the overall classification accuracy improved from 0.7829 to 0.845, verifying the proposed feature selection scheme works for the task of glioma subtyping in the weakly super vised fashion. This study proposes a three-stage feature selection and data filtering strategy. First, feature maps were extracted from the last convolutional block of a CNN, and each channel was flattened into a one-dimensional vector. The average of the top ten activation values was calculated as the feature intensity indicator for each channel. For each class, the 90th percentile of these indicators across all patches was computed to define a class-specific activation threshold, ensuring that the retained features were highly relevant to the corresponding tumor subtype. Next, class-specific feature selec tion was performed by retaining only channels that exhibited more than 98% activa tion consistency within the same class. To maintain balanced feature representation, an equal number of discriminative channels was selected for each class. Finally, dur ing the formal sampling stage, a patch was retained only if the average of its top 20 activation values from class-specific channels exceeded the corresponding threshold. This strategy effectively filtered out noisy or misclassified patches, allowing the mod el to focus on representative tumor regions and improving overall classification relia bility. To evaluate the

impact of the proposed method on final classification perfor mance, we conducted two ablation studies focusing on the feature selection strategy. In the first experiment, feature selection was based solely on channel intensity, with out applying class-specific consistency filtering, to examine whether response strength alone could achieve effective classification in glioma subtyping. In the second experiment, class-specific filtering was retained, but the activation consistency threshold was relaxed from 98% to 80% to assess the trade-off between consistency and classification flexibility under weakly supervised conditions. Compared to the baseline model without feature selection (accuracy = 0.7829, AUC = 0.858), the full pipeline achieved a significant improvement in classification performance (accuracy = 0.845, AUC = 0.905). In ablation study, the first approach yielded an accuracy of 0.814 and an AUC of 0.859, while the second achieved an accuracy of 0.8217 and an AUC of 0.845. These results confirm that each component of the proposed method contributes meaningfully to overall performance, demonstrating that the strategy pro vides a robust, scalable, and effective solution for weakly supervised glioma subtype classification tasks in digital pathology.

## 二、 參加之競賽活動：(請依據參加活動次數，附上相關活動簡章或海報、議程與參加證明等佐證資料)

### 1. CVGIP 2025

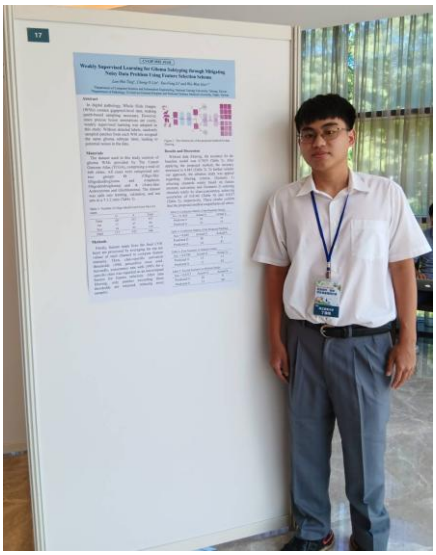
| 時間 | Monday, August 25 | | | | | | |
|---|---|---|---|---|---|---|---|
| 08:00-08:30 | Registration | | | | | | |
| 08:30-09:30 | Oral Session 9<br>Intelligent Multimedia Processing I<br>1200、1011、1186、1017<br>鄭文皇 教授<br>麗水廳（大） | Oral Session 10<br>Industrial Application<br>1120、1153、1161、1163<br>顏志達 教授<br>麗泉 A | Oral Session 11<br>Machine Learning<br>1183、1050、1013<br>郭永明教授<br>麗泉 B | Oral Session 12<br>Deep Learning for Images & Videos I<br>1114、1122、1130、1019<br>楊致芳教授<br>麗泉 C | *Oral Session 13*<br>Deep Learning for Images & Videos II<br>1154、1169、1172、1002<br>曾俊元 教授<br>麗景 A | *Oral Session 14*<br>Intelligent Multimedia Processing II<br>1199、1140、1112<br>王家慶 教授<br>麗景 B | Poster Session II<br>1202、1205、1056、1097、1151、1155、1198、1073、1167、1201<br>盧沛怡 教授<br>海報區 |
| 09:30-09:40 | Break | | | | | | |
| 09:40-10:10 | IPPR會員大會 暨 CVGIP 2025開幕式 | | | | | | |
| 10:10-10:20 | Coffee Break | | | | | | |
| 10:20-11:10 | Keynote Speech I<br>講題：AI運算的衝擊與展望<br>梁伯嵩 博士 資深處長<br>聯發科技 | | | | | | |
| 11:10-12:00 | Keynote Speech II<br>講題： Recent Results on Multimodal Foundation Models<br>楊明玄 教授<br>加州大學美熹德分校 | | | | | | |
| 12:00-13:00 | Lunch午餐 | | | | | | 12:30-13:00<br>女力專題講座<br>講者： 蔡芸琤 副教授<br>Room B |
| 13:00-15:00 | Oral Session 15<br>Image and Video Processing<br>1008、1034、1049、1058、1119、1166<br>江振宇 教授<br>麗水廳（大） | Oral Session 16<br>Deep Learning for Images & Videos III<br>1039、1045、1067、1079、1085、1092、1110<br>施皇嘉 教授<br>麗泉 A | Oral Session 17<br>Multimedia and Machine Leaerning<br>1139、1027、1138、1133、1144、1051、1059<br>李朝陽 教授<br>麗泉 B | Oral Session 18<br>Advanced AI and its Applications II<br>1055、1075、1031、1096、1142、1194、1121、<br>夏至賢 教授<br>麗泉 C | Oral Session 19<br>Computer Vision III<br>1156、1178、1179、1180、1189、1190、1078<br>王鵬華 教授<br>麗景 A | Oral Session 20<br>*頂尖會議分享論壇*<br>1035<br>許志仲 教授<br>麗景 B | Poster Session III<br>1100、1206、1090、1091、1043、1048、1124、1064、1021、1052、1068、1082、1191、1107、1184、1109、1141、1181、1103、1105、1113、1134、1173、1003<br>王才沛 教授<br>巴桑塔 教授<br>海報區 |
| 15:00-15:30 | Coffee Break | | | | | | |
| 15:30-16:30 | AI Technology Forums<br>議題：AI運算技術與平台論壇<br>群聯、奇景、友晶(Altera)、AMD<br>麗水廳（大） | | | | | | 國科會成果發表會<br>智慧計算學門<br>(15 :30-16 :30) |
| 16:30-17:30 | Keynote Speech III<br>講題：可信賴人工智慧與數位媒體鑑識<br>張明清 教授<br>紐約州立大學 奧爾巴尼分校 | | | | | | |

## 三、參賽準備與活動記錄


圖說明：CVGIP 2025 研討會看板

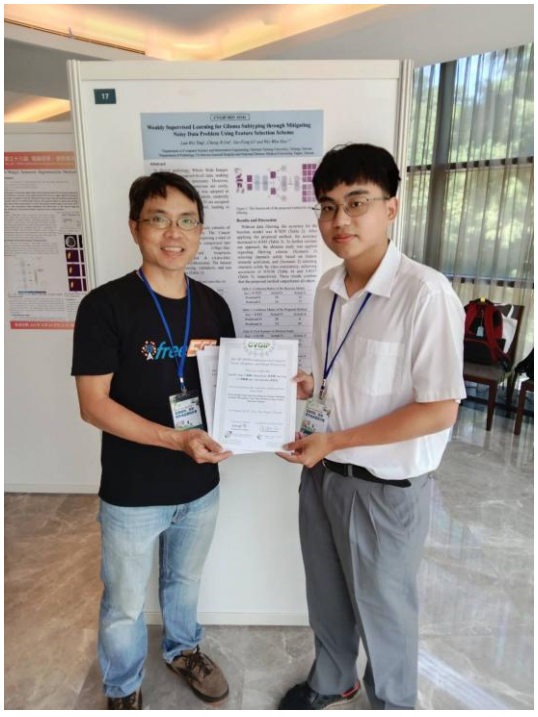

圖說明：CVGIP 2025 研討會看板


圖說明：CVGIP 2025 oral presentation



圖說明： CVGIP 2025 poster presentation


圖說明：CVGIP 2025 參加證明頒發



圖說明：CVGIP 2025 參加證明頒發

CVGIP
2025

*The 38th IPPR Conference on Computer Vision, Graphics, and Image Processing*

*This is to certify that*

***Lun-Wei Ting (丁倫暐), Cheng-Yi Lin (林承億),***

***Yao-Feng Li (李耀豐) and Wei-Wen Hsu (徐位文)***

*has participated to the conference, and presented a paper titled*

***#1141 Weakly Supervised Learning for Glioma Subtyping through Miti gating Noisy Data Problem Using Feature Selection Scheme***

*on August 24-26, 2025, New Taipei, Taiwan*

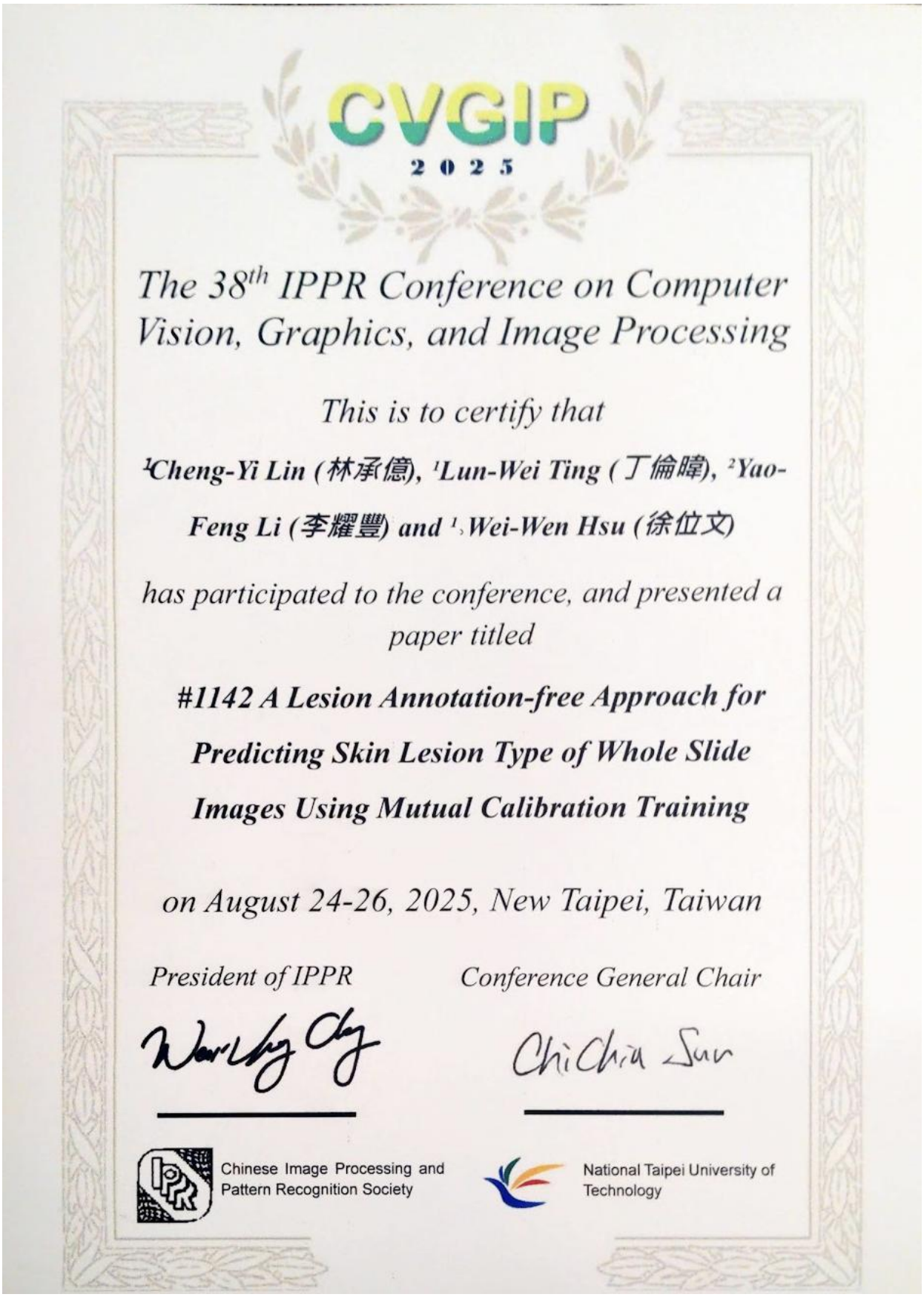
*President of IPPR*

*Conference General Chair*

Chinese Image Processing and Pattern Recognition Society

National Taipei University of Technology

**四、參加競賽成果** (參賽證明、得獎證明或學生心得)



CVGIP
2025

*The 38th IPPR Conference on Computer Vision, Graphics, and Image Processing*

*This is to certify that*

***[1]Cheng-Yi Lin (林承億), [1]Lun-Wei Ting (丁倫暐), [2]Yao-Feng Li (李耀豐) and [1]Wei-Wen Hsu (徐位文)***

*has participated to the conference, and presented a paper titled*

***#1142 A Lesion Annotation-free Approach for Predicting Skin Lesion Type of Whole Slide Images Using Mutual Calibration Training***

*on August 24-26, 2025, New Taipei, Taiwan*

*President of IPPR* — *Conference General Chair*

Chinese Image Processing and Pattern Recognition Society

National Taipei University of Technology

**心得 1:** 參加研討會並進行口頭報告是一次非常特別的經驗，雖然在上台前的心情比較緊張，但是對於教授及聽者的提問都有順利回答，順利完成報告，也聆聽了許多講者的報告，讓我受益良多。

**心得 2:** 大學期間參加研討會是很難得的經驗，以海報發表的形式與主持人及聽者介紹與交流並進行討論，研討會期間也參觀了其他組別的海報和聆聽口頭報告，讓我學到了許多尚未接觸到的知識。