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黃田宇（國立台灣大學/指導教授: 王偉仲）

Email: henleyhwang99@gmail.com

Title：Catheter Segmentation and Misplacement Classification using Deep Learning

Abstract：

Chest X-ray is commonly used to assess the appropriateness of catheter placement since misplacement could lead to serious complications. With the emergence of deep learning, computer aided detection methods were developed to assist radiologists by detecting catheter misplacement and highlighting the course of the catheter. However, catheter is difficult to segment accurately due the nature of their shape, especially the tip. Moreover, there is also an extreme data imbalance for misplaced catheters due to there rareness, leading to difficulty in training a classifier. To confront these problems, we implemented several methods, including contrastive learning, topology loss, tip-attention and tip-distance loss. We collected 5767 chest X-rays from National Taiwan University Hospital which are labeled for misplacement of nasogastric tube (NGT) and endotracheal tube (ETT) catheters and possess a pixel-wise annotation of each catheter and relevant anatomical landmarks. Catheter and Line Position (CLiP) public dataset is also used to enhance the robustness and generalizability. We combine DeepLabv3+ and DenseNet to perform catheter segmentation and misplacement classification simultaneously. We reached AUC of 0.97 for classification and Dice score of 0.60 for segmentation.

劉書詠（國立臺灣師範大學/指導教授: 樂美亨）

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Title：Homotopy continuation in conformal energy minimization

Abstract：

Surface conformal parameterization is an angle-preserving map from a surface to a planer domain. In our algorithm, we use the homotopy continuation method to solve the conformal energy minimization. The minimizer is the desired disk-shaped conformal parameterization. The convergence of our algorithm can be proven. Also, numerical experiments indicate the accuracy of our algorithm is better than other state-of-the-art algorithms for the cases of larger numbers of vertices.

廖唯廷（國立中央大學/指導教授: 楊肅煜）

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Title：An entropy-weighted local intensity clustering model for inhomogeneous image segmentation

Abstract：

We propose an entropy-weighted local intensity clustering model for segmenting intensity inhomogeneous images caused by the bias field arising from improper image acquisition. The model minimizes an energy functional consisting of a regularization term of the total length of object boundaries and a data fitting term weighted by the local entropy. The resulting method can simultaneously segment the image and estimate the bias field for intensity inhomogeneity correction. Furthermore, the so-called iterative convolution-thresholding scheme can be applied to realize the resulting method efficiently. Finally, numerical simulations are carried out to validate the high performance of the proposed approach.

蔡承璋 （國立中央大學/指導教授: 楊肅煜）

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Title：A sparse dictionary learning-based method for image inpainting

Abstract：

Single-image inpainting is an image processing technique that fills in the pixels in a missing data region with the information from the other pixels in the same image. There are many different approaches in the literature for dealing with single-image inpainting problems. In this work, we study the single-image inpainting based on the dictionary learning and sparse representation framework. Such an approach generally has better image texture results. However, it usually takes a lot of time for efficient dictionary learning. Therefore, we propose an algorithm for learning a dictionary, which is computationally more efficient. Furthermore, we verify the algorithm's performance with several test problems.

劉秀盈 （國立陽明交通大學/指導教授: 林文偉）

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Title：Ellipsoidal Volume-Preserving Parameterizations of 3-Manifolds

Abstract：

There are many algorithms for volume-preserving mapping of a 3-manifold to a unit sphere. However, if we map a flat object to the ellipsoid, it would be better than mapping to a sphere. Hence, we propose a novel algorithm for Ellipsoidal volume-preserving parameterizations of simply connected 3-manifolds. We will show the algorithm and numerical results in this talk.

廖家緯 （國立陽明交通大學/指導教授: 林文偉）

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Title：Application of Optimal Mass Transportation to Medical Image Analysis

Abstract:

Computational conformal geometry is a novel field which is proposed in 2000 and has many applications such as virtual broadcast, facial expression recognition, texture mapping, and so on. In this seminar, we will introduce the optimal mass transportation (OMT) theory and its application. Then, we combine the OMT with deep learning and apply it to the brain tumor segmentation competition successfully. Numerical results will be demonstrated thereafter.

高卡納（輔仁大學/指導教授: 嚴健彰）

Title：Modified fractional derivative to solve desingularization

Abstract：

In this talk, a modified fractional numerical differentiation formula which approximates the Caputo fractional derivative is proposed. The sole of the numerical approach is de-singularization. We modify the integrand of the Caputo fractional integral as a product of two differentiable function, and numerical results using the Trapezoidal method to approximate the arbitrary order $0 < \alpha < 1$ in integrals that the order of accuracy cannot be increased as the number of zones increases using the uniform discretization. However, for a fixed coarsest grid discretization, a refinable mesh approach has been employed and the corresponding results show the order of accuracy is about 1.6.

陳育熙（國立陽明交通大學/指導教授: 吳金典）

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Title：A prior feature enhanced network for motion capture

Abstract:

Motion capture is the process of recording the movement of objects. It is used in a wide variety of applications such as military, sports, and medical. Although the development of the field is quite mature, there are still some thorny issues to be dealt with. For example, how to capture a specific moving object in a complex or changing background is not a simple problem. Therefore, we propose a preprocessing layer that can effectively reduce the difficulty of capturing the moving object.

謝君彤 (國立中興大學/指導教授: 謝博文)

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Title：A study on image stitching with contrast enhancement

Abstract：

影像拼接是指將多張有重疊部分的圖片合併為一張，通常分為影像對準和影像融合兩步驟。由於圖片容易受到光照條件影響而導致特徵提取性能不佳，在影像對準時可能會造成匹配錯誤或者無法對準，因此我們在特徵提取前加入對比強化的技術來提升影像對準的準確性，並使用 Poisson 融合技術來改善拼接區域色彩不連續的問題。

呂秉澤（國立成功大學/指導教授: 舒宇宸）

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Title：An Introduction to Quantum Computation

Abstract：

Quantum Computing has been a rising research topic in recent years, for example, solving large scale linear systems, solving ODE systems and so on. In this talk, I will give a brief introduction to Quantum Computation and some related topics such as solving nonlinear differential equation systems or quantum information. This talk will be organized in the following two parts. First, I will present some mathematical representation of qubits in Quantum Mechanics for solving linear systems, and then extend to solve differential equations. Second, from quantum entanglement, I will also introduce some ways to quantify entanglement and introduce some optimization problems.

涂仁傑（國立成功大學/指導教授: 舒宇宸）

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Title：Based on Vibration Decision Tree Model to Analyze Ship Operating Performance and Detect the Extreme Behavior.

Abstract：

在本次演講中我們將會展示船舶震動訊號的分析並且配合船舶運行狀態及機器學習找出震動訊號中的特殊表現。船舶震動訊號是由成大系統及船舶機電工程學系的老師提供，為某一實際運行之船舶主機震動訊號，透過傅立葉時頻分析取出頻率帶功率、功率總和及最高功率的頻率值等作為訓練特徵，透過決策樹分類模型對應轉速高中低，將分類結果與實際運作狀態相異者稱為特殊表現，結合其餘航行紀錄討論其產生的原因。

郭昱婕 (國立高雄大學/指導教授:曾昱豪)

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Title：Sparse identification of nonlinear dynamical system

Abstract：

在此專題報告中，我們的主要目標是利用非線性動態系統之稀疏辨識 (Sparse Identification of Nonlinear Dynamics, SINDy)來處理未知的動態系統。該方法是透過蒐集有關系統的數據來辨識出相對應的數學模型。同時，我們也會利用大量的數值模擬來驗證此方法。

李玉萱 (國立高雄大學/指導教授: 劉青松、曾昱豪)

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Title：Solve PDEs by deep learning method: Physics-informed neural networks

Abstract：

此專題報告是使用深度學習來求解偏微分方程，主要將使用演算法 Physics-Informed Neural Networks (PINNs)和 Deep Learning Based Iteration Scheme Approximation (DeLISA) 來建構各自的神經網絡架構。另一方面，我們也會分析網絡的廣度與深度對其訓練之影響，選取適當的神經元數量 使得訓練效果達到最佳。最後，將比較兩個演算法間的訓練優劣程度。

鄭宜昕 (國立高雄大學/指導教授: 劉青松)

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Title：Non-negative matrix factorization and its application

Abstract：

非負分解(Non-negative Matrix Factorization, NMF)在降維問題中扮演重要的角色。由於它的非負性質，因此特別適合應用在圖像、影像等具有非負特性的資料上。在這次的報告中，我們將介紹一個新的方法來處理非負最小平方問題(nonnegative least squares problem)，並將其套用至求解非負分解問題上。最後，我們會將非負分解應用在圖像壓縮、圖像修復與特徵提取等應用上，並提供與其他演算法比較之結果。