Title: Detecting Subcutaneous Veins Using Hyperspectral Imaging

Abstract: Detecting subcutaneous veins is challenging, especially in patients with difficult venous access. Traditional methods often fail, causing discomfort and complications. Current imaging techniques like Near InfraRed (NIR) imaging have limitations due to factors like skin color, age, or body fat, and depend on practitioner skill. Hyperspectral Imaging (HSI) offers a superior alternative by capturing detailed images of subcutaneous structures and providing better contrast. Using dimensionality reduction techniques with HSI data can enhance vein detection efficiency and accuracy.

This talk presents the outcome of PhD research focused on several key areas:

1. **Creation of an annotated Hyperspectral (HS) image dataset for vein detection, called HyperVein.**
2. **Results from the application of several dimensionality reduction techniques,** including Principal Component Analysis (PCA), Folded Principal Component Analysis (FPCA), and Ward's Linkage Strategy using Mutual Information (WaLuMI), along with Support Vector Machine (SVM) classification for vein detection from HS images.
3. **A novel and effective dimensionality reduction method,** called Inter-Band Correlation and Clustering (ICC), and its application for vein detection from HSI images.
4. **A new Convolutional Neural Network (CNN)-based method** for vein detection from HSI images.

References:
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3. Ndu, H., Sheikh-Akbari, A., & Singh, K. K. (2024, October 14). Hyperspectral Image Dimensionality Reduction using Inter-Band Cross-Correlation and K-means Clustering Algorithm. In 2024 IEEE Thirteenth International Conference on Image Processing Theory, Tools and Applications (IPTA).
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Dr Akbar Sheikh-Akbari is an associate professor in School of Built Environment, Engineering and Computing. He holds a BSc (Hons), MSc (Distinction), and PhD in Electronic and Electrical Engineering. Dr. Sheikh-Akbari began his academic career as a postdoctoral researcher at Bristol University, working on an EPSRC project in stereo/multi-view video processing. Transitioning to industry, he specialized in real-time embedded video analytics systems.

In 2015, Dr. Sheikh-Akbari joined Leeds Beckett University as a Senior Lecturer. He has successfully completed several Knowledge Transfer Partnership (KTP) projects, including the application of RFIDs for asset management in greeting cards and developing a scalable system for monitoring and analysing behavioural patterns with Omega Security Systems, both graded OUTSTANDING by Innovate UK. He is currently leading a KTP project on developing novel hyper-spectral imaging capabilities to screen for aflatoxins in pistachios.

Dr. Sheikh-Akbari has supervised 12 PhD projects to completion and is currently overseeing 6 PhD projects. He has published over 140 conference and journal papers. His research interests include hyperspectral image processing, image source camera identification, biometric identification techniques (iris, ear, and face recognition), color constancy adjustment techniques, standard and non-standard image/video codecs, image resolution enhancement, multi-view image/video processing, video analytics, and edge detection in low SNR environments.