

Q1: Literature search using ChatGPT or other AI tools

1. Find a research topic that you are interested in.
2. Use ChatGPT or other AI tools to search relevant papers, report which products are you using.
3. Record your prompts and their responses.
4. Record the time it spends to find the paper you are satisfied.
5. Use traditional search engines like google scholar to search the papers by keywords, and record the time you spend.
6. Optional: If LLM products also take a lot of time to search for relevant papers, identify the potential issues (e.g., it does not understand your topic well, or it provides fake links)

I am interested in using thermal image facial tracking due to studies indicating that there are some cognitive links to facial temperature fluctuations. Thermal facial tracking is a bit different from regular RGB facial tracking because a lot of features that help, such as color, defined lines, and contours, are not available. Heat profiles the main feature in these images, so there is not as many detailed features as regular RGB images.

I used Bard to help find some papers that describe potential models that were used to track facial localization features. It took **32 seconds** to find 5 papers surrounding this topic with exact links and even a summary talking about them. All papers, except the last one, were actually relevant to what I wanted to do. Independently, I found one paper that I really liked that provided a labeled thermal facial landmark dataset (2566 images of 142 individuals), and they explored using a regression tree ensemble model that was good (SF-TL54: A Thermal Facial Landmark Dataset with Visual Pairs). This paper that I was satisfied with took me about **14 minutes**. Bard gave me good suggestions rather quickly with a good summary, so I do believe it still helped me in my manual google scholar search! I started looking for papers that did not include the ones it recommended, and ultimately came across one that I was interested in.

My prompt was: **“Find me research papers about using machine learning to detect face localizations from thermal images”**.

Bard responded with:

Sure, here are some research papers about using machine learning to detect face localizations from thermal images:

- Detecting changes in facial temperature induced by a sudden auditory stimulus based on deep learning-assisted face tracking: This paper proposes a deep learning-based method for tracking faces in thermal images and detecting changes in facial temperature caused by auditory stimuli. The

method uses a convolutional neural network (CNN) to detect faces and then tracks them across video frames. Another CNN is used to predict the temperature changes in the tracked faces. The method was shown to be effective in detecting subtle changes in facial temperature, even in low-resolution thermal images.

- **Face with Mask Detection in Thermal Images Using Deep Neural Networks:** This paper investigates the use of deep neural networks for face detection with masks in thermal images. The authors compare the performance of different pre-trained models, such as YOLOv3 and Inception v3, and find that YOLOv3 performs better overall. They also show that transfer learning, where a model pre-trained on visible light images is fine-tuned on thermal images, can improve performance.
- **A deep learning model for classifying human facial expressions from infrared thermal images:** This paper proposes a deep learning model called IRFacExNet for classifying facial expressions from thermal images. IRFacExNet uses residual and transformation units to extract features from the images and then classifies the expressions into eight categories (fear, anger, contempt, disgust, happy, neutral, sad, and surprise). The model was shown to be effective in classifying facial expressions from thermal images, even when the images are low-resolution or noisy.
- **Automatic Feature Localization in Thermal Images for Facial Expression Recognition:** This paper proposes a method for automatically localizing facial features in thermal images for facial expression recognition. The method uses principal component analysis (PCA) to extract features from the images and then classifies the expressions using a support vector machine (SVM). The method was shown to be effective in localizing facial features and recognizing facial expressions in thermal images.
- **[2304.02931] Mask Detection and Classification in Thermal Face Images:** This paper proposes a method for detecting and classifying masks in thermal face images. The method uses a convolutional neural network (CNN) to detect faces and then classifies the type of mask that is being worn. The

method was shown to be effective in detecting and classifying masks in thermal images, even when the images are low-resolution or noisy.

These are just a few examples of the many research papers that are available on using machine learning to detect face localizations from thermal images. The field is still relatively new, but there has been a lot of progress in recent years. Machine learning has the potential to revolutionize the way we use thermal imaging, and it is likely that we will see even more advances in the years to come.

I hope this helps!