

July 2024 Report



Rahul Mishra

# Classification Of Diabetic Foot Ulcer Using Thermogram

## **Supervisor**

Dr Chandra Prakash

Assistant Professor

Department Of Computer Science and Engineering  
Sardar Vallabhbhai National Institute Of Technology, SURAT

# Work Report

## Papers Read

Sno	Paper Title	Type	Technique	Max Accuracy
1	A proposed automated system to classify diabetic foot from thermography <sup>1</sup>	White Paper	GLCM	Fine KNN-96.8%
2	A review of non-invasive sensors and artificial intelligence models for diabetic foot monitoring <sup>2</sup>	Review Paper	NA	NA

## Thermogram Datasets

Dataset Name	Type	Instances
Plantar Thermogram Dataset(Hernandez-Contreras et al. 2019)	Label(2)	CG:90, DM:244,

## Paper Implementation

Implementation	Max Accuracy	Dataset Used	Month	Remark
V1 Paper 1	KNN: 60%	Plantar Thermogram Dataset	June	Plain
V2 Paper 1	DT: 70%	Plantar Thermogram Dataset	July	Minor Improvement

<sup>1</sup>(Eid, Yousef, and Mohamed 2018)

<sup>2</sup>(Kaselimi et al. 2022)

Implementation	Max Accuracy	Dataset Used	Month	Remark
V3 Paper 1	LogReg: 88%	Plantar Thermogram Dataset	Aug	Improved Accuracy Quite a bit by segmenting image

## Other Work

Sno	Type	Title	Remark
1.	Mail To Author	Requested Dataset From Author Of Provided Paper	No Reply Till Date
2.	Project	Working On GLCM Tool to explain That Technique Further	Almost Done, Reducing Latency to make it run live and Implementing Better Noise Algorithm
3.	Data Acquisition	Foot Dataset Collection	Assisted Miss Parul and Mr Ajinkya in Dataset Collection With Kinect
4.	Project	Attempted to build kinect Libraries and use programatically	In Progress
5.	PPT	Presentated PPT1	PPT About Thermography Cameras and Thermogram
6.	PPT	PPT2	Work Summary
7.	Course	Understanding Deep Learning	Undertook a NPTEL Course DLCV

- Note: I Will Upload all the code into a github repo and attach that link in further reports

## Further Work : August

- Read Related Papers
- Papers Suggested By Sir

S.no	Title	Authors
1.	Application of non-contact thermography as a screening modality for Diabetic Foot Syndrome – A real time cross sectional research outcome	(Christy Evangeline, Srinivasan, and Suresh 2023)
2.	Deep neural net for identification of neuropathic foot in subjects with type 2 diabetes mellitus using plantar foot thermographic images	(Christy Evangeline and Srinivasan 2024)
3.	Development of AI classification model for angiosome-wise interpretive substantiation of plantar feet thermal asymmetry in type 2 diabetic subjects using infrared thermograms <sup>3</sup>	(Evangeline N, Srinivasan, and Suresh 2022)
4.	Intelligent Remote Photoplethysmography-Based Methods for Heart Rate Estimation from Face Videos: A Survey	(Premkumar and Hemanth 2022)
5.	Han, Kai and Wang, Yunhe and Guo, Jianyuan and Tang, Yehui and Wu, Enhua	(Han et al. 2022)

- Understand and Implement Deep Learning Method
- Related Paper

---

<sup>3</sup>Requested Dataset from Author's of this paper

Title	Authors
Deep Learning Classification for Diabetic Foot Thermograms	(Cruz-Vega et al. 2020)

## References

- Christy Evangeline, N., and S. Srinivasan. 2024. “Deep Neural Net for Identification of Neuropathic Foot in Subjects with Type 2 Diabetes Mellitus Using Plantar Foot Thermographic Images.” *Biomedical Signal Processing and Control* 96 (October): 106509. <https://doi.org/10.1016/j.bspc.2024.106509>.
- Christy Evangeline, N., S. Srinivasan, and E. Suresh. 2023. “Application of Non-Contact Thermography as a Screening Modality for Diabetic Foot Syndrome – a Real Time Cross Sectional Research Outcome.” *Biomedical Signal Processing and Control* 79 (January): 104054. <https://doi.org/10.1016/j.bspc.2022.104054>.
- Cruz-Vega, Israel, Daniel Hernandez-Contreras, Hayde Peregrina-Barreto, Jose de Jesus Rangel-Magdaleno, and Juan Manuel Ramirez-Cortes. 2020. “Deep Learning Classification for Diabetic Foot Thermograms.” *Sensors* 20 (6): 1762. <https://doi.org/10.3390/s20061762>.
- Eid, Marwa, Reem Yousef, and Mohamed Mohamed. 2018. “A Proposed Automated System to Classify Diabetic Foot from Thermography.” *International Journal of Scientific and Engineering Research* 9 (December): 371–81.
- Evangeline N, Christy, S. Srinivasan, and E. Suresh. 2022. “Development of Ai Classification Model for Angiosome-Wise Interpretive Substantiation of Plantar Feet Thermal Asymmetry in Type 2 Diabetic Subjects Using Infrared Thermograms.” *Journal of Thermal Biology* 110 (December): 103370. <https://doi.org/10.1016/j.jtherbio.2022.103370>.
- Han, Kai, Yunhe Wang, Jianyuan Guo, Yehui Tang, and Enhua Wu. 2022. “Vision Gnn: An Image Is Worth Graph of Nodes.” arXiv. <https://doi.org/10.48550/ARXIV.2206.00272>.
- Hernandez-Contreras, Daniel Alejandro, Hayde Peregrina-Barreto, Jose de Jesus Rangel-Magdaleno, and Francisco Javier Renero-Carrillo. 2019. “Plantar Thermogram Database for the Study of Diabetic Foot Complications.” *IEEE Access* 7: 161296–161307. <https://doi.org/10.1109/access.2019.2951356>.
- Kaselimi, Maria, Eftychios Protopapadakis, Anastasios Doulamis, and Nikolaos Doulamis. 2022. “A Review of Non-Invasive Sensors and Artificial Intelligence Models for Diabetic Foot Monitoring.” *Frontiers in Physiology* 13 (October). <https://doi.org/10.3389/fphys.2022.924546>.

Premkumar, Smera, and Duraisamy Jude Hemanth. 2022. "Intelligent Remote Photoplethysmography-Based Methods for Heart Rate Estimation from Face Videos: A Survey." *Informatics* 9 (3): 57. <https://doi.org/10.3390/informatics9030057>.