



## PhD Project

Project Details	
Project Title	Stroke subtype Classification in Low Resource Settings using Facial Expressions and Physiological Data
Project Summary	<p>Stroke is a leading cause of mortality and disability in India. Quick and reliable estimation of the stroke type is key to suitable care and management of stroke patients. There are very few specialists working in rural India and hence diagnosis and recognising type of stroke is challenging. There is no single biomarker available for recognition of stroke or to identify types of stroke.</p> <p>Our earlier work indicates that it is possible to get good prediction accuracy for stroke type classification by building suitable AI/ML models on the clinical parameters alone. This project aims to extend this work by building more advanced AI/ML based models based on computational vision and deep learning for prediction of the stroke type. The project will employ the following additional information to infer about the stroke sub-type (a) facial expressions in response to emotional stimuli (b) Physiological data.</p> <p>There are several facial markers (such as facial droop) that are identifying features in stroke patients. Using algorithms from computational vision and deep learning, it might be possible to accurately track facial key-points and derive biomarkers that are predictive of stroke type. The project will explore advanced AI/ML methods for accurate tracking of facial keypoints and using these features to predict the stroke type.</p> <p>The physiological parameters such as pulse rate, blood pressure, pulse shape and other measures of pulse based on differential pulse response in different parts of the body may give important clues to the stroke type and sub-type. This project will explore the use of these measures to build an AI/ML based model to help classify the stroke type based on these parameters.</p> <p>References.</p> <p>Middi, Venkata Sai Rishita, Kevin Job Thomas, and Tanvir Ahmed Harris. "Facial Keypoint Detection Using Deep Learning and Computer Vision." In International Conference on Intelligent Systems Design and Applications, pp. 493-502. Springer, Cham, 2018.</p> <p>Nonis, Francesca, Nicole Dagnes, Federica Marcolin, and Enrico Vezzetti. "3D Approaches and challenges in facial expression recognition algorithms—a literature review." <i>Applied Sciences</i> 9, no. 18 (2019): 3904.</p> <p>Runchey, Shauna, and Steven McGee. "Does this patient have a hemorrhagic stroke?: clinical findings distinguishing hemorrhagic stroke from ischemic stroke." <i>Jama</i> 303, no. 22 (2010): 2280-2286.</p> <p>Gąsecki, Dariusz, Agnieszka Rojek, Mariusz Kwarciany, Kamil Kowalczyk, Pierre Boutouyrie, Walenty Nyka, Stéphane Laurent, and Krzysztof Narkiewicz. "Pulse wave velocity is associated with early clinical outcome after ischemic stroke." <i>Atherosclerosis</i> 225, no. 2 (2012): 348-352.</p> <p>Kim, Jinkwon, Tae-Jin Song, Dongbeom Song, Ki Jeong Lee, Eun Hye Kim, Hye Sun Lee, Chung Mo Nam, Hyo Suk Nam, Young Dae Kim, and Ji Hoe Heo. "Brachial-ankle pulse wave velocity is a strong predictor for mortality in patients with acute stroke." <i>Hypertension</i> 64, no. 2 (2014): 240-246.</p>

<b>PhD Supervisors</b>			
<b>Role</b>	<b>Faculty</b>	<b>Academic Unit in IITD</b>	<b>Email ID</b>
Supervisor 1	Rahul Garg	Computer Science and Engineering	<a href="mailto:rahulgarg@cse.iitd.ac.in">rahulgarg@cse.iitd.ac.in</a>
Supervisor 2	Dr. Vishnu VY	Department of Neurology, AIIMS	<a href="mailto:vishnuvy16@yahoo.com">vishnuvy16@yahoo.com</a>

<b>Project requirements (Student qualifications, experience required, etc)</b>
<ul style="list-style-type: none"> <li>• Must be B.Tech. in Computer Science, Electronics and Communications, Biomedical Engineering, Mathematics and Computing with good programming abilities and good exposure to fundamentals of Machine Learning and an interest in Biology (specifically Physiology and Neuroscience).</li> <li>• Students with M.Sc in relevant areas from top institutions with relevant expertise may also be considered</li> </ul>

<b>Source of funding (IRD/FITT Project details, if any)</b>
6 months funding available from the project: RP04048G: Machine Learning model for early diagnosis of stroke in resource limited settings

<b>Role of Faculty Members involved:</b>
Prof. Rahul Garg will supervise the AI/ML part of the project. Dr. Vishnu will supervise neurology part of the project.