Thank you Martin

So then, how do we tackle this problem? We at Wepfer thought of a solution. Introducing, InfraStrjoke: a smart headband designed to detect strokes and alert the emergency services should one occur.

Our product has four primary features. The first one is of course infra-red stroke detection using NIRS technology, which I will talk more about in a minute. Second, is an AI network to which we will feed the captured NIR images for interpretation to determine whether a stroke has occurred. And if so, it will contact the emergency services using the patient's phone via Bluetooth. A GPS chip is also embedded in the headband to provide the paramedics with the patient's precise location.

With these four core features, we hope to trivialise and shorten the time taken from the first signs of stroke to getting treatment as much as possible to minimise neuron damage. Gone are the times when you have to fumble with seeking for help yourself in an altered state of mind. Instead, paramedics are automatically summoned to your precise location when you are most helpless and desperate. This, is why we believe InfraStrjoke, is a lifesaver.

Now, allow me the dive deeper into the technology of this product. As I have mentioned, InfraStrjoke utilises NIRS, which stands for Near Infra-Red Spectroscopy, to image the blood vessels in the brain. We chose to use near infra-red because, firstly, it is a low-energy radiation, unlike x-rays and UVs, so it will not pose harm to the user. Secondly, it has the best wavelength for measuring blood sugar and oxygenation. Thirdly, it has a long wavelength, which consequently makes it also have a comparatively higher penetrative power, which as you can imagine, is very useful for probing the brain. In fact, some citations suggest that it can penetrate up to 5 centimetres of skull and brain tissue, as demonstrated by the picture here, which computes to around 89% coverage of the brain.

For InfraStrjoke, we have decided to use 2 different infra-red sensors. Now, if I may draw your attention to the graph here, the first sensor will be at the wavelength 730 nanometers, which is the best wavelength for measuring blood oxygenation, since the brown and blue lines, which correspond to oxygenated and deoxygenated blood respectively, have the largest gap between them. The second sensor will be at 850 nanometers where the sum of the absorption curves is the lowest, which is what allows it to penetrate the furthest to help with imaging.

However, there is one problem. Unfortunately, infra-red images tend to be quite noisy. And this is why we opted to use AI, or more specifically, a Convolutional Neural Network to analyse and interpret the images for us. This type of AI network is designed to perform well in image processing tasks with very high accuracies. In fact, CNNs are already in use today to help interpret MRI images in hospitals, which speaks for the reliability of this technology. After training, we expect it to be able to isolate the important features such as the blood vessels and use the data to determine whether the user is currently suffering from a stroke.

Apart from the main features, we will also include some complementary features such as constant health monitoring, sleep quality tracking, and exercise tracking. We thought to include them because they can utilise the already incorporated sensors to provide extra utility with no added cost. In addition, we think they can help with broadening the consumer market from the niche of stroke detection only, to a lifestyle and healthcare product similar to smart wearables like Fitbit. We also planned to add bone induction headphones for InfraStrjoke+, which is our premium model.

Furthermore, InfraStrjoke also comes with a complementary mobile app. It allows users to setup their medical information and emergency routines. It also stores data collected by the headband to keep

track of and draw the users' attention to any irregularities of their cerebral-vascular health and calculate the probability of a stroke in the near future. Furthermore, it can calculate the aforementioned vitals, sleep quality, exercise intensity, et cetera.

Now, I will give to Kart for the hardware aspect of InfraStrjoke.

Of course, InfraStrjoke will be useless if it is not worn on the head. This is why we have designed it to be ergonomic, to fit the users' head perfectly, flexible, so it is comfortable even when the user is sleeping, and customisable, to suit the users' preferences as well as for the ease of cleaning. We hope that the final product would be comfortable enough to be worn 24/7 for round-the-clock stroke protection.