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INSIGHTS INTO HUMAN BODY THROUGH BIOMEDICAL SIGNAL AND IMAGE PROCESSING

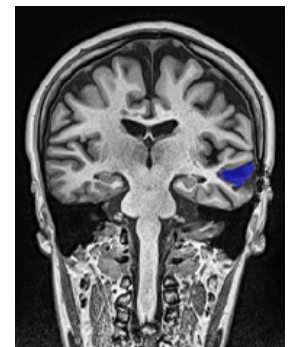
Assistant Professor Dr Chow Li Sze



**Assistant Professor Dr
Chow Li Sze**

Biomedical signal and image processing is a very fascinating field of research that brings insights into our human body. Assistant Professor Dr Chow Li Sze, from the Department of Electrical and Electronic Engineering, is working on several forefront research projects in this field, which will lead to a better understanding of diseases and allow early intervention or assessment of treatment.

Prediction of brain tumor-related epilepsy based on quantitative MRI using a deep convolutional neural network (DCNN) with multi-task learning (MTL). At least one-third of the brain tumor develops epileptic seizure, known as tumor-related epilepsy. The prediction of tumor-related epilepsy is essential to identify patients at greater risk of epilepsy for early treatment as well as prevent unnecessary treatment for patients at minimal risk of epilepsy. This project is also collaborative research with the neurologist from the Department of Medicine and neuroradiologist from the Department of Biomedical Imaging and , University of Malaya.



**Segmented brain
tumor (blue) on
MPRAGE image.**

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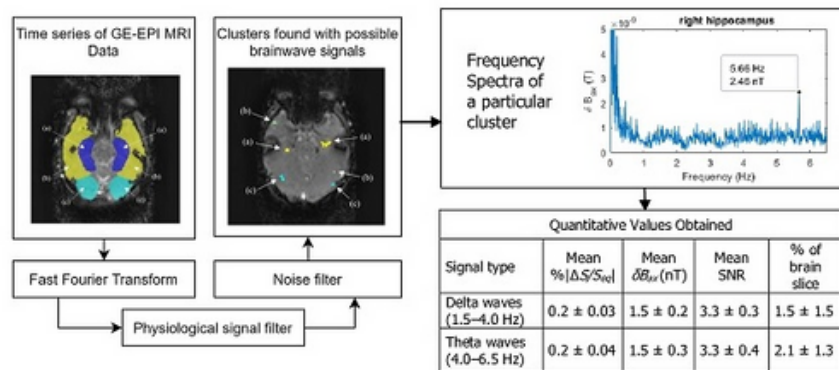
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Direct detection of human brainwaves using Magnetic Resonance Imaging (MRI) is interdisciplinary research with the Academic Unit of Radiology, University of Sheffield, UK, and Department of Electrical Engineering, University Malaya. Fast Fourier Transform and Shannon Sampling Theory are used to detecting the delta waves and theta waves in the human brain. The result of this project was presented at the 11th IEEE Information Technology, Electronics, and Mobile Communication Conference (Nov 2020), and published in the IEEE Access (ISI Q1 journal), Oct 2021: <https://ieeexplore.ieee.org/document/9576735>

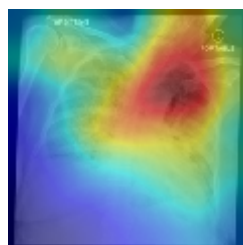


An overview of this research is available on YouTube - [Click here](#)

Diagnosis of COVID-19 on chest X-ray (CXR) images using 18 deep convolutional neural network (CNN) models with transfer learning. This is cross-disciplinary research, which uses artificial intelligence as an additional tool to assist the radiologist in diagnosing COVID-19. It is collaborative research with the Department of Biomedical Imaging, University Malaya, funded by Universiti Malaya Covid-19 Related Special Research Grant (UMCSRG). The preliminary result was presented at the IEEE Canadian Conference on Electrical and Computer Engineering (Sept 2021): <https://ieeexplore.ieee.org/abstract/document/9569064>

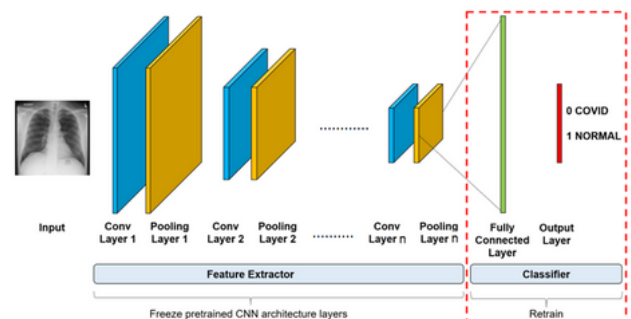


(a)

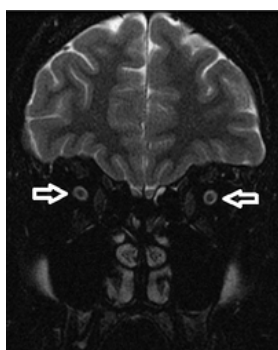


(b)

(a) Chest X-ray (CXR) image with COVID-10,
(b) Grad-CAM heatmap produced by DarkNet-53.



Pre-trained CNN architecture with transfer learning.



Optic nerves
(pointed by arrows)
on T2W image.

Study of Neuromyelitis Optica Spectrum Disorder (NMOSD) effect on optic nerve volume and signal intensity using MR images. NMOSD is a severe idiopathic inflammatory disease of the central nervous system that predominantly affects the optic nerve and spinal cord, causing optic neuritis and transverse myelitis. Optic neuritis due to NMOSD involves long segments of the optic nerve. Therefore, we aim to measure the optic nerve volume using an advanced post-processing technique with interpolation and segmentation. This project is collaborative research with the Department of Biomedical Imaging and the Department of Medicine, University of Malaya.



Ts Sr Dr Nadzirah Hj Zainordin



Ts Sr Khoo Sui Lai

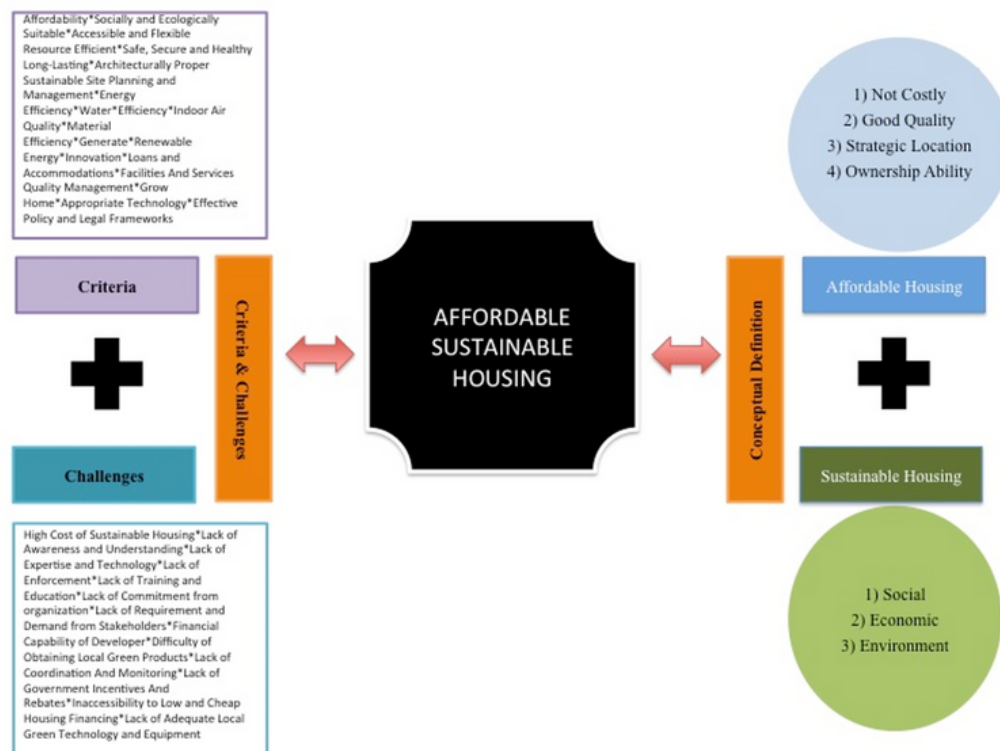
3RD WORLD INVENTION OLYMPIAD FAIR (WIOF 2021) GOLD MEDALISTS AND SPECIAL AWARD AICA

Invention title: **Model of Affordable Sustainable Housing Concept**

Researchers: **Ts Sr Dr Nadzirah Hj Zainordin (School of Architecture & Built Environment), Ts Sr Khoo Sui Lai (School of Architecture & Built Environment)**

Award synopsis:

Affordable sustainable housing is a new concept that should be introduced the construction practitioner. It could be break down into two sector which is affordable housing and sustainable housing. No specific definition for affordable sustainable housing found throughout the research, hence the meaning of affordable housing and sustainable housing will be defined separately. By referring to both terms, a rough idea of affordable sustainable housing will be defined later on by considering both term definition. Which the clear definition on emerging between affordable and sustainable in delivery the housing may benefit to the potential buyer as well as to the construction player. There are no specific criteria for affordable sustainable housing yet, hence this invention may discuss further on developing the framework of affordable sustainable housing concept with in-depth study on definition, criteria as well as the challenges in implementing these two concepts. There are no specific criteria for affordable sustainable housing yet, hence this research covers the criteria of sustainable housing and the criteria affordable housing. There are twenty (20) criteria cover the sector of social, economic and environment such as affordability, socially and ecologically, accessible and flexible, resource efficient, safe, secure and healthy, long-lasting, architecturally proper, sustainable site, energy efficiency, water efficiency, and others.



Model of Affordable Sustainable Housing Concept

WORLD INNOVATION CONTEST (WIC 2021) GOLD MEDALISTS & SPECIAL AWARD AICA

Invention title: **Model of Smart Home Conceptual Application**

Researchers: **Ts Sr Dr Nadzirah Hj Zainordin (School of Architecture & Built Environment), Ts Sr Khoo Sui Lai (School of Architecture & Built Environment)**

Award synopsis:

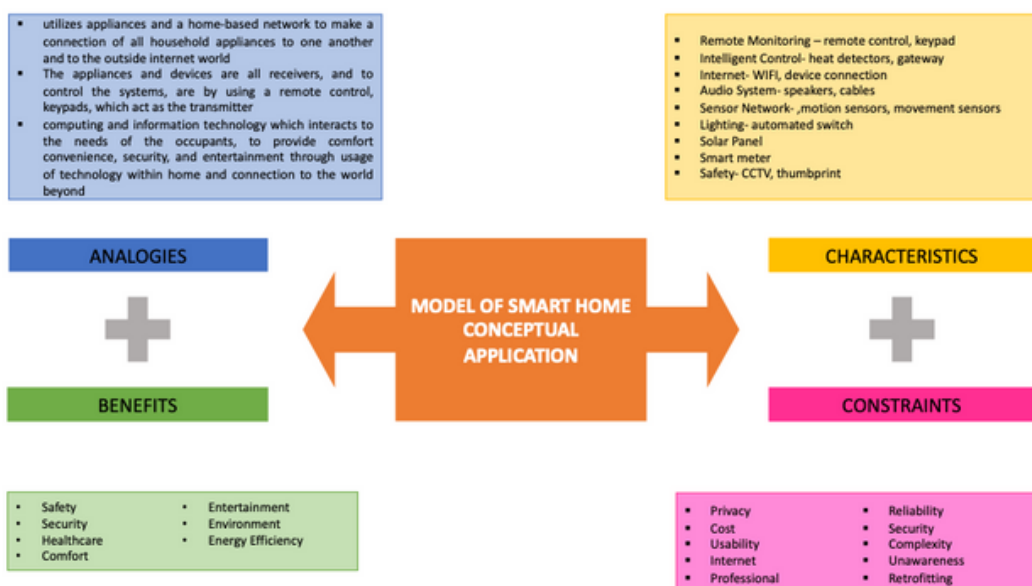
A smart home is an entirely automated home and exists to ease and provide convenience to everyday activities in the home. This technology allows all electronic devices to act 'smart'. They integrate technologies and services through home network to make a better living quality. It covers a wide aspect that includes security, energy saving, ventilation, smart kitchen, and more with the help of smart devices such as remote control etc. The analogies start as Smart Home are homes which utilizes appliances and a home-based network to make a connection of all household appliances to one another and to the outside internet world. They are expected to have some useful properties too. Such as, to improve energy efficiency thus lowering down electrical bills, increased security in homes, upgradeable appliances, on-demand video programming and safety mechanisms for elderly to live in the home. Having the use of smart home system will greatly benefit in a wide area, which includes limiting environmental impact, electrical cost savings, and an improved building security and safety of household occupants. The biggest yet problem faced in applying a smart home system is the cost. This Model of Smart Home Concept Application, by emerging the analogies, benefits, characteristics, and constraints factors as one unit to give clear in-depth understanding on what Smart Home concern should consider. The analogies defining in simple understanding on the concept of Smart Home itself. There are seven (7) main benefits highlighted, which are: safety, security, healthcare, comfort, entertainment, environment, and energy efficiency. There are nine (9) characteristics of Smart Home highlighted: Remote Monitoring – remote control, keypad; Intelligent Control- heat detectors, gateway; Internet- WIFI, device connection; Audio System- speakers, cables; Sensor Network- motion sensors, movement sensors; Lighting- automated switch; Solar Panel; Smart meter; and Safety- CCTV, thumbprint.



Ts Sr Dr Nadzirah Hj Zainordin



Ts Sr Khoo Sui Lai



Model of Smart Home Conceptual Application



HEALTHY LIFESTYLE WITH MIXED SPROUTED BREAD

Sharifah Maria Sahila Syed Ali Hassan

A healthy lifestyle is a way of living that lowers the risk of being. According to the existing studies, it can be said that: lifestyle has a significant influence on physical and mental health of human being. One of the variable of lifestyle that influence on health is Diet and Body Mass Index (BMI): Diet is the greatest factor in lifestyle and has a direct and positive relation with health. Poor diet and its consequences like obesity is the common healthy problem in urban societies.

Mixed Sprouted Bread was created for the Facebook live stream program by Kenwood Malaysia and Singapore on April 29th 2021. In view of food trends and consumer demands towards healthy food, ketogenic (keto) and plant based diet are increasingly nowadays, this is another reason why this recipe was created. This sprouted bread is suitable for those practiced healthy, low carbohydrate diet and it is 'keto' diet friendly. This bread was inspired from the original Sprouted Wheat Bread.



Sharifah Maria Sahila Syed Ali Hassan

This Mixed Sprouted Bread has a unique and nutty taste came from the ingredients used with a light, airy and soft texture yet healthy. Mixed Sprouted bread does not contain wheat flour like ordinary bread products. The recipe was carefully created to tailored for 'keto' friendly and low carbohydrate diet, so they can enjoy eating bread while on diet. Myself, who practiced low carbohydrate diet has been enjoying this bread on my daily basis without hesitation. This bread can be toasted, eat with scramble eggs, sandwiches and etc. However, this bread is not recommended to those with 'celiac' disease or gluten intolerance as it's contain gluten.

Bean sprouts is the main ingredients for this recipe. Bean sprouts are a great keto-friendly vegetable. Bean sprouts is good to consumed it may help to improve your overall heart health by balancing cholesterol. Bean sprouts may also increase levels of "good" HDL cholesterol, which helps clear fatty deposits from the blood. Sprouting also breaks down the seed, nut or legume to a form that easier to digest. Compared to whole grains, sprouted grains and legumes are higher in important vitamins and minerals but lower in anti-nutrients that inhibit their absorption. They may reduce blood sugar, promote heart health and aid weight loss.



Mixed Sprouted Bread

To get a texture like regular bread which is soft, light and airy, wheat flour was substituted with vital wheat gluten. Vital wheat gluten is a protein found in wheat flour that produces gluten that is necessary for structure building and texture of the bread. Vital wheat gluten is used to produced a lighter and airy texture to the bread by improving bread dough its elasticity and create a better crumb and chewiness in the final product. Without the used of vital wheat gluten the bread texture will be dense and heavy. Vital wheat gluten is an excellent source of many vital minerals such as selenium and iron. Vital wheat gluten is keto friendly, high in protein and low in carbohydrate.

THE INGREDIENTS

Mixed Sprout (Mung Beans, Red Beans, Wheat Berries)	200 gm
Flaxseed Meal	24 gm
Coconut Powder	10 gm
Oat Fiber	14 gm
Vital Wheat Gluten	50 gm
Xanthan Gum	½ tsp
Instant Dry Yeast	2 gm
Honey	1 tsp
Salt	½ tsp
Softened Butter	10 gm
Cold Water (as needed)	(app. 50 ml)
Coating: (Chia, sesame, flaxseed seeds)	

Flaxseed meal not only give the bread nutty tasting yet high fiber content, help with digestive issues like constipation, lowering cholesterol levels, has possible anticancer compounds called lignans, improving insulin and help you feel full.

Coconut powder is gluten free, rich in fiber and MCTs, it may promote stable blood sugar, good digestion and heart health. Oat fiber has zero calories because it's insoluble fiber. Xanthan gum is used to increase dough strength and loaf volume.

This section below will show you how to make Mixed Sprouted Bread with step by step photos and details about the techniques.

Methods of preparation

Step 1: Preparing Sprouted Beans

Wash properly the mung beans, red beans, and wheat. Soak separately for 12 hours. Then drain the seeds cover and leave in a dark place for 2-3 days. When it is sprouted it is ready to be use.



Put the mixed sprout in the food processor. Blend.



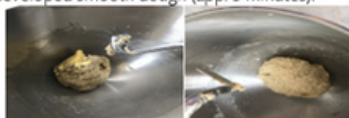
Step 2: Mixing

Transfer mixed sprout into the mixer bowl. Add in together flaxseed meal, coconut powder, oat fiber, vital wheat gluten, xanthan gum, instant dry yeast, and honey.

Using hook attachment knead the ingredients with low speed until all ingredients combined then turn to medium speed mixed the dough approximately 10 minutes to ensure gluten has been properly developed.



Afterwards, add in softened butter, knead until developed smooth dough (app. 5 minutes).



Take a piece of dough to check the gluten development.



Dough is stretchable when pulled.

Step 3: Fermentation

Ferment the dough 30-40 minutes at room temperature. Cover the dough properly preventing from drying. When the fermentation completed, the dough rises double in size and airy when touch.



Another method to check on fermentation is to press the centre part of the dough, if it is not rising immediately this indicates fermentation is completed.



Punch the dough to expel the carbon dioxide.

Step 4: Shaping

Shape the dough into oval shape. Place the dough into the rectangular mould.



Step 5: Proofing

Ferment the dough for second time approximately 30 minutes to one hour. When the dough is rise and double size, transfer to oven.



Step 6: Baking

Bake at 190°C approximately 20 - 30 minutes or until brown colour. Remove from the oven. Leave the bread to completely cool before slicing.



APEC SUSTAINABLE COASTAL CITIES SYMPOSIUM

Associate Professor Dr Eric Chan Wei Chiang

The APEC Sustainable Coastal Cities Symposium was duly conducted from 24 November 2021 to 26 November 2021. The Symposium is organized by an inter-faculty taskforce led by, Associate Professor Dr Eric Chan Wei Chiang, Associate Professor Ts Dr Ang Chun Kit, Assistant Professor Dr Michelle Soo Oi Yoon, Assistant Professor Dr Eugenie Tan Sin Sing and Assistant Professor Dr Chew Yik Ling. The symposium deals with the important topic of sustainability in coastal cities which are among the most populated cities with over half of the global population living in the coastal zone.



The geographic coverage of the Asia-Pacific Economic Cooperation (APEC) covers many coastal cities that contribute to trade, transport, and transboundary cooperation between member economies. Over 200 participants have registered for this event from 12 APEC Economies and 2 Non-member Economies. Participants consist of various stakeholders such as government agencies, non-governmental agencies, private companies, and universities.

This project is supported and financed by APEC via its Marine Debris Management and Innovation sub-fund. The theme for the Symposium this year focuses on marine debris but we hope that this would be expanded in the coming years to cover other topics related to sustainability.

The Symposium was officiated by Yang Berhormat Dato' Sri Dr Adham Baba, Minister of Science, Technology and Innovation, Malaysia. In his speech, the minister emphasised the need to keep global warming below 1.5 °C this century by halving greenhouse gas emissions in the next eight years in line with the Paris Agreement adopted during the United Nations Paris Climate Accords in 2015. He nonetheless acknowledged the problem of marine litter from consumer consumption.

Yang Berhormat Dato' Sri Dr Adham Baba proceeded to describe the 26th United Nations Climate Change Conference which highlighted the struggles of coastal cities with coastal erosion and rising sea levels, but also the increased prevalence of marine debris. According to data from the United Nations Environmental Programme 2021, at least 8 million tonnes of discarded plastic are dumped into our oceans each year and this figure is projected to double by 2030 and may even triple by 2040 if things are left unchecked.

In her welcome address, Professor Datuk Ir Ts Dr Siti Hamisah Binti Tapsir UCSI Group Chief Executive Officer, Vice-Chancellor UCSI University, reaffirmed this by highlighting the University's ironclad commitment to achieve societal, scientific, economic and behavioural change towards sustainability. This commitment is supported by a strong research culture with UCSI more than tripling its World of Science and Scopus publications from 2015 to 2020 and the University is home to eight Fellows of Academy of Sciences Malaysia.



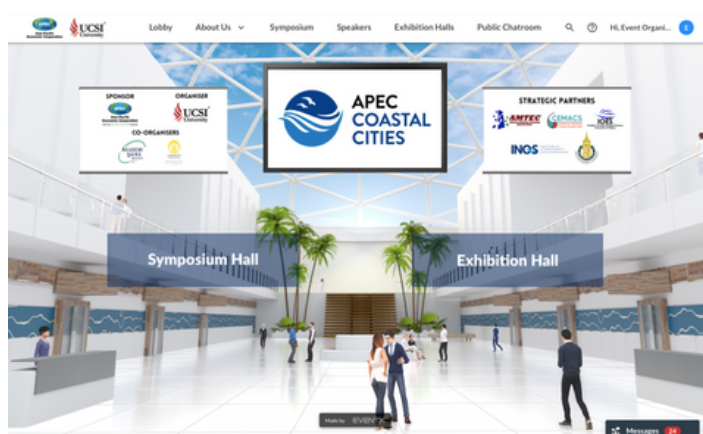
**APEC
COASTAL
CITIES**

Clean seas, future cities.

The Symposium was attended by Professor Datuk Dr Asma Ismail, President of Academy of Sciences Malaysia and Professor Dr Athor Subroto, Director of School of Strategic and Global Studies, Universitas Indonesia who represent co-organisers. The three-day programme of the Symposium hosted a variety of speakers from 7 APEC member economies and 1 non-member economy. Topics ranged from government policy, involvement of the non-governmental and private sector and technologies related to sustainability.

On the final day of the Symposium, the APEC Sustainable Coastal Cities Research Consortium was inaugurated that would continue the sustainability agenda into the future as a platform for disseminating information and generating new knowledge that is relevant towards sustainable coastal cities. Professor Datuk Dr Asma Ismail delivered the closing address congratulating UCSI University for launching the Research Consortium.

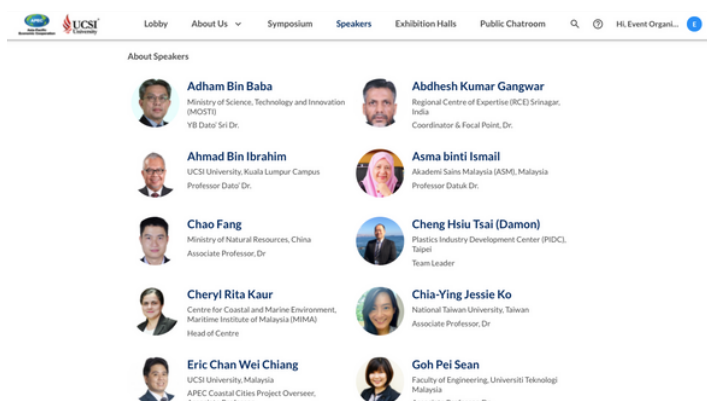
Findings from the Symposium would be compiled in an APEC publication entitled, "Best practices and recommended policies for optimizing the plastic supply chain in Southeast and East Asia".



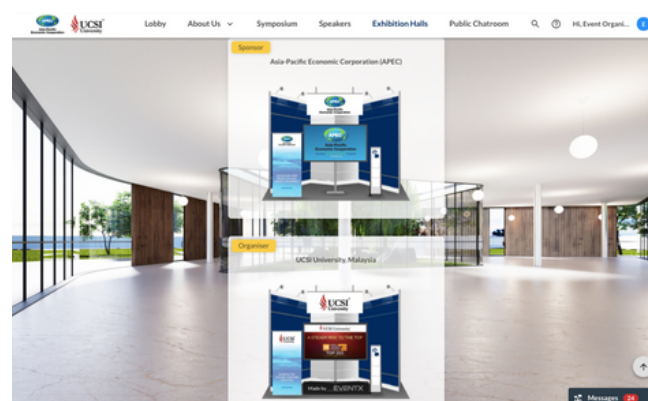
Symposium lobby featuring APEC, UCSI, co-organizers and strategic partners



Yang Berhormat Dato' Sri Dr Adham Baba, Minister of Science, Technology And Innovation, Malaysia officiating the symposium



Speakers from different APEC member and non-member economies.



Exhibition hall of the symposium featuring 12 exhibitors



MTE concluded its 2nd COVID-19 International Innovation Awards which was held virtually from 14-18 June 2021. The award welcomed 101 entries. Of which, 85 entries were shortlisted from Malaysia, Ukraine, Taiwan, Hong Kong, Singapore, Kuwait, US, Iran, Turkey, Thailand, India and Saudi Arabia. Participants competed in 17 categories covering the entire spectrum from prevention to tracking, individual to group technologies and ideas, business concept to humanitarian efforts. Congratulations to the UCSI Researchers for winning **4 GOLD MEDALS, 2 SILVER MEDALS, 2 BRONZE MEDALS, ASSOCIATION OF BRITISH INVENTORS AND INNOVATORS AWARD** and **BEST CATEGORY AWARD: BUILDING** in the Malaysia Technology Expo (MTE 2021)

ASIAN YOUTH INNOVATION AWARD: GOLD MEDALIST

Invention title: **Fabrication of Cocoa Butter Base Amlodipine Besylate Fast Melt Tablets**

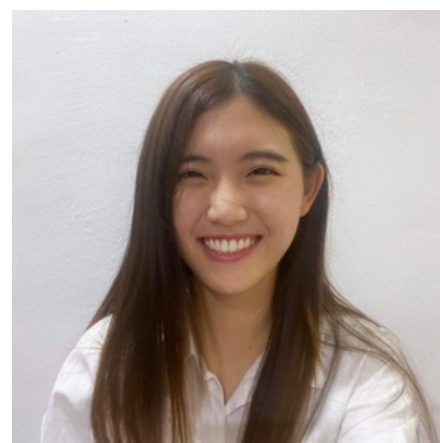
Category: **Healthcare, Personal Care Technology, Biotechnology and Life Sciences**

Researchers: **Ong Khai Khee (Faculty of Pharmaceutical Sciences, UCSI), Assistant Professor Dr Ashok Kumar Janakiraman (Faculty of Pharmaceutical Sciences, UCSI), Assistant Professor Dr Shiek Abdul Kadhar Mohamed Ebrahim Habibur Rahman (Faculty of Pharmaceutical Sciences, UCSI), Assistant Professor Dr. Liew Kai Bin (University of Cyberjaya)**

Award synopsis: Our research is related to the development of a drug delivery system that is much more convenient, preferable and superior in terms of administration, palatability and bioavailability. The active pharmaceutical ingredient we focused on in this study was the amlodipine besylate, a drug used to treat hypertension commonly. Considering the limitation of conventional tablets which is the issue of swallowing difficulty, especially in the elderly group (a significant patient group who have hypertension), we came up with an idea of fast melt tablet preparation using the cocoa butter base. Cocoa butter has many polymorphisms ranging from form I to VI with different melting points. Among them, form V cocoa butter has comparable better stability, desired melting point (melt readily when put on the tongue) with the additional advantage of having a shiny and smooth texture that is more appealing appearance. Such characteristics led to the formation of our fast melt tablets in which we were trying to use as the base. Based on a couple of research, chitosan as the disintegrant was desired as it acts efficiently in lower concentrations to the cocoa butter-based fast melt tablets. Briefly, we were trying to make a fast melts tablet that is able to disintegrate within 3 minutes using cocoa butter, improving the bioavailability and patient compliance. This invention eventually brings benefits and more related research should be carried on suitable active pharmaceutical ingredients and make it into a reality to be used in the future.



Assistant Professor Dr Ashok Kumar Janakiraman



Ong Khai Khee



**Associate Professor Ts Dr Ganeshsree
Selvachandran**



Assistant Professor Dr Quek Shio Gai

INTERNATIONAL INNOVATION AWARD: GOLD MEDALIST

Invention title: **An Artificial Intelligence System Powered by Machine Learning and Complex Fuzzy Logic for the Automated Detection of Diabetic Retinopathy and Other Eye Diseases**

Category: **Information, Communication and Technology (ICT)**

Researchers: **Associate Professor Ts Dr Ganeshsree Selvachandran (Faculty of Business & Management, UCSI), Assistant Professor Dr Quek Shio Gai (Faculty of Business & Management, UCSI)**

Award synopsis: Type 2 diabetes has been classified as a global epidemic and is said to be the biggest epidemic in human history. However, diabetes has been seriously underrated as a global public health issue and more needs to be done to tackle the disease and the health complications caused by diabetes. In view of this, an **Artificial Intelligence (AI)** system is innovated which enables the automated detection of **Diabetic Retinopathy (DR)** and other eye diseases using only retinal images, without the need for any human intervention. This is the first detection system of its kind in literature and in existence in Malaysia. As there is no automated detection system for DR or any other eye diseases in Malaysia at this point in time, our system is very timely and novel. Our proposed AI system is trained to identify retinal abnormalities using more than 88,000 actual retinal images sourced from 3 international databases. The performance of our AI system is compared with the hard truth, which is the actual results of diagnosis of the retinal images made by ophthalmologists. In addition, our AI system is powered by complex fuzzy logic and is, **therefore**, able to detect even the slightest abnormality in the retinal images that are fed into it to make an accurate diagnosis of retinal problems such as the early onset of DR and other eye diseases. This is a major improvement over the previous systems in literature whose function **is** based on the **principle** of maximum likelihood to detect damage in the retinal tissues, in which the previous systems are not able to detect the early onset of the disease which is crucial for early intervention and treatment.

INTERNATIONAL INNOVATION AWARD: BRONZE MEDALISTInvention title: **Smart AR Tour**Category: **Information, Communication and Technology (ICT)**Researchers: **Assistant Professor Ts Chit Su Mon (Institute of Computer Science and Digital Innovation, UCSI), Meliana (Institute of Computer Science and Digital Innovation, UCSI)**

Award synopsis: Information and Communication Technology (ICT) advancement has altered many daily activities specifically the pattern and culture of people in communicating, interacting, accessing, obtaining, and spreading the information. Internet accessibility enables people to discover and be curious about the outside world which can affect the travelling demand. The expansion and growth of tourism as part of the economic sector is guaranteed in the future by United Nations World Tourism prediction. There are several models conducted to aware of the behaviour and needs of the consumer in tourism. To ensure tourist experiences and intention to re-visit is the primary role of the tour guide. It is believed that they are the ones who take any responsibility, spread information including culture. Since the number of smartphone and internet users keeps increasing and gaining popularity over the years, there are many development features in the mobile phone such as the Global Positioning System (GPS) to detect and track the user coordinate location.

There are many available smart tour guide systems to assist tourists on their trips. Tour guide mobile application gives information on the point of user interest around their trips. This guide system has been implemented in many ways including using big data and IoT. Over time, Augmented Reality has played its role in many applications including tourism. Augmented Reality (AR) is a technology that enables the virtual object to harmonize with the actual environment. With AR capability in the system, users capable of seeing the virtual object are in the real environment thus it enriches the interface of the system. AR has been applied in daily life routines such as in marketing, education, tourism specifically historical sites, theme parks, urban places, and many more. As for current, AR application has been implemented in tourism to provide some historical or cultural information through text, picture, or even virtual object form. Although the existing application is good enough for tourist usage, however, some improvements can be done to increase the efficiency and user interactivity, decrease the task and time spent for the trip.



Assistant Professor Ts Chit Su Mon



Meliana

RESEARCH GRANT CALLS, EXHIBITIONS AND SYMPOSIUMS

No.	Funding Scheme	Endorsement by CERVIE	Submission Closing Date
1	Malaysia Grand Challenge, MOSTI <ul style="list-style-type: none"> Applied Innovation Fund (AIF) Technology Development 1 Fund (TeD 1) Bridging Fund (BGF) MOSTI combatting COVID-19 Fund URL link: https://edana.mosti.gov.my/	Open, no closing date as for now	Open, no closing date as for now
2	Ernst Mach-Grant – ASEA-UNINET URL link: https://grants.at/en/	14 Feb 2022	1 March 2022
No.	Exhibition(s)	Submission Closing Date	
1	32 nd International Invention, Innovation & Technology Exhibition Malaysia (ITEX 2021) URL link: https://itex.com.my/	13-14 Dec 2021	
No.	Symposium(s)	Abstract Submission Closing Date	
1	AUA Academic Conference on Sustainable Energy and Green Technology URL link: https://ces.um.edu.my/2022-aaa-academic-conference-on-segt	3 Dec 2021	
2	MyTech Pitch Programme URL link: https://www.yim.my/ms/2021/06/program-mytech-pitch-bil-4-2021/		

Please refer to your respective Head of Research for more information.

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