

2020
科技部AI+
跨域交流觀摩會



+ 基於文化脈絡發展失智症照護之人工智慧化 輔助評估與處遇系統

Development of AI assisted assessment and intervention system
based on the culture contextualization for care of people with
neurocognitive disorder

黃敏偉 副院長 Deputy Superintendent Min-Wei Huang

臺中榮總嘉義分院 Chia-Yi Branch, Taichung Veterans General Hospital

1956 Dartmouth AI Project

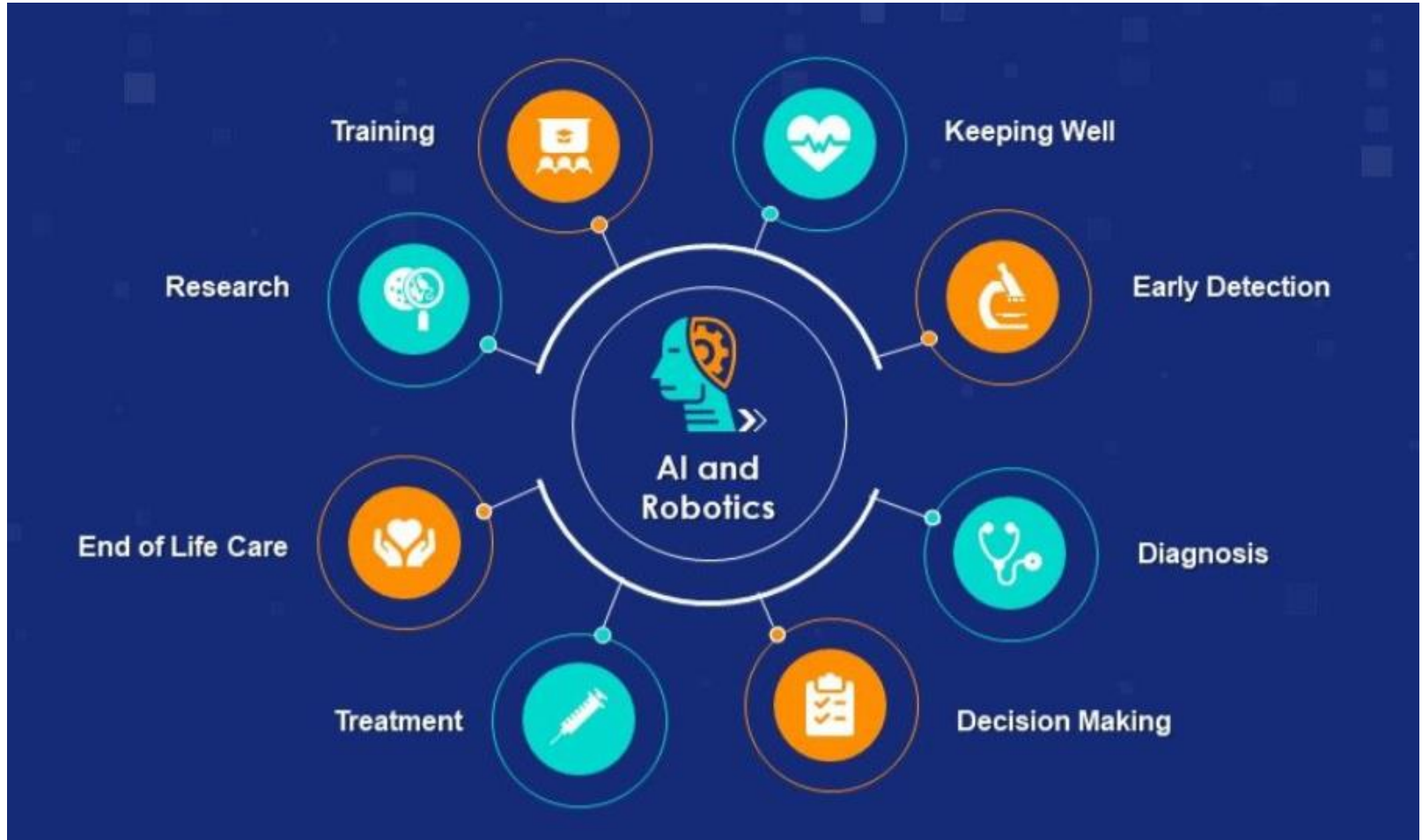


Five of attendees of the 1956 Dartmouth Summer Research Project on AI Reunited in 2006: Trenchard More, John McCarthy, Marvin Minsky, Oliver Selfridge, and Ray Solomonoff. Missing were: Arthur Samuel, Herbert Simon, Allen Newell, Nathaniel Rochester and Claude Shannon.

人工智慧發展簡史 The History & Development of AI



AI in Health Care



McKinsey&Company

MCKINSEY GLOBAL INSTITUTE

THE INTERNET OF THINGS: MAPPING THE VALUE BEYOND THE HYPE

JUNE 2015

EXECUTIVE SUMMARY

Where is the value potential of the Internet of Things?



Interoperability
required to capture
40% of total value



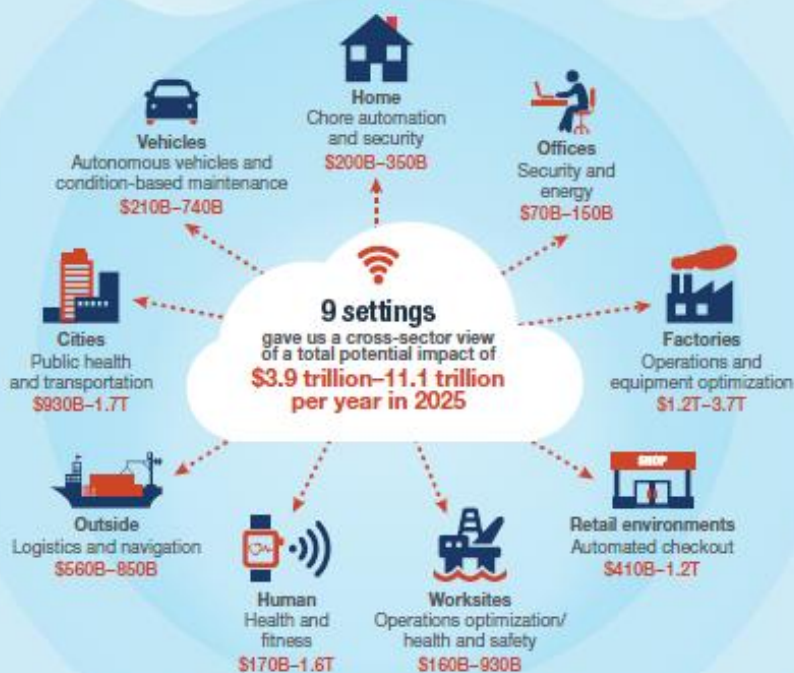
< 1% of data currently used,
mostly for alarms or real-time
control; more can be used for
optimization and prediction



2X more value
from B2B applications
than consumer



Developing: 40%
Developed: 60%

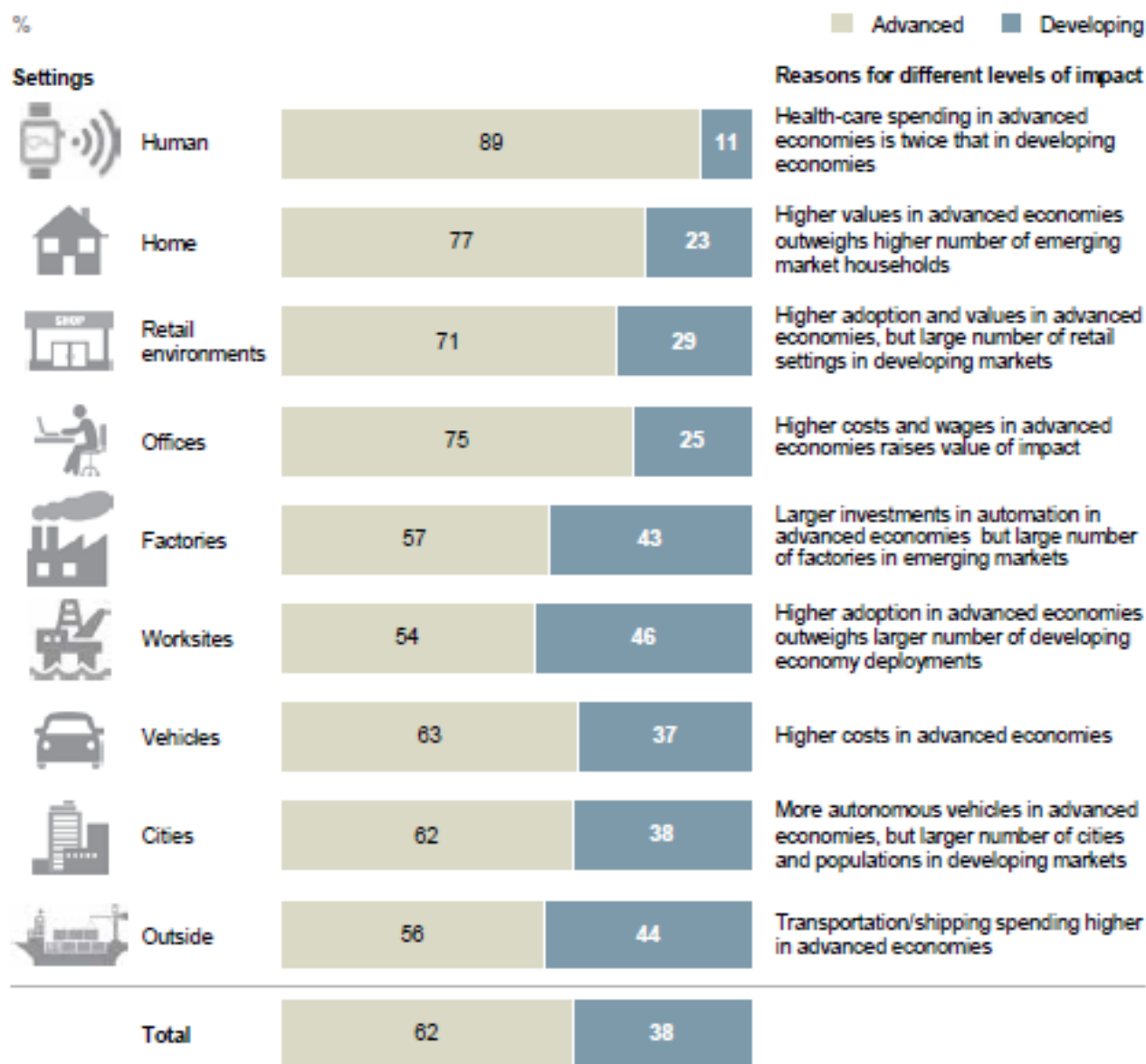


Transform business processes
Predictive maintenance, better asset
utilization, higher productivity



Enable new business models
For example, remote monitoring enables
anything-as-a-service

More value from IoT could be created in advanced economies, but the number of deployments could be higher in the developing world



NOTE: Numbers may not sum due to rounding.

SOURCE: McKinsey Global Institute analysis

Quality-of-life impact is estimated using DALY and assumptions of impact by disease

■ Substantial benefit
 ■ Moderate benefit
 ■ Limited benefit

	DALY Million	Treatment compliance	Early detection of complications	Real-time treatment management	Sample metrics tracked
Neuropsychiatric conditions	13.3				Medication use, activity, communication
Heart disease	10.4				Medication use, activity, blood pressure, heart rate, weight
Cancer	8.3				Weight, exercise, heart rate, body temperature, blood in urine
HIV/AIDS	4.0				Medication use, blood pressure, heart rate, body temperature
Sense organ diseases	3.9				Medication use (e.g., glaucoma)
Respiratory diseases	3.9				Medication use, respiratory rate, air quality, oximetry, pollen count
Diabetes	1.6				Medication use, exercise, weight, foot ulcers, HgbA1C, protein in urine, heart rate, blood pressure
Other chronic	6.3				Disease-dependent (e.g., mobility/flexibility for arthritis)
Non-chronic	15.0				Disease-dependent (e.g., wound humidity)
Total	66.7				

SOURCE: Global health estimates, WHO; McKinsey Global Institute analysis

整合樂齡族群日常行為表現及感知理論之科技輔具系統

A technological aid system that integrates the daily behavior and perception theory of the elderly

基於文化脈絡發展失智症照護之人工智慧化輔助評估與處遇系統－黃敏偉 副院長



科技輔具 Technology Aids

認知功能評估遊戲

- 以臨床常見評估量表作為遊戲題目架構
- 認知功能
 - 注意力
 - 判斷力
 - 反應力
 - 記憶力
 - 定向力



雲端數據收集平台 & AI模型建構



空間定位與方向指引系統

- 系統以紅外線攝影機、雷射燈方向指引與喇叭組成。
- 可辨識使用者之位置，並記錄使用者行走軌跡。
- 透過雷射燈與語音提示受試者行走方向。



生理訊號量測

- 利用多項生理訊號量測技術，量化高齡者情緒與生理反應訊號的生理指標。

電子桌遊系統

- 可單人使用，也可多人共用，促進人際互動。
- 以觸控方式操作，易用性高。



Attention and Reaction Training

- Scope of Application

- Tier-C LTC station around the blocks, Institution of long-term care, and home

- The game is designed to evaluate and improve the attention and reaction abilities

- Whack-A-Mole
- Hit-the-ball



Interactive wall video game

- Scope of Application
 - Tier-C LTC station around the blocks , Institution of long-term care and home
- Single player/two players game for improving the interpersonal interaction.
 - Find the picture differences
 - Whack-A-Mole
 - Chess
 - Nostalgic Serious Game
 - Reaction game



Physical fitness

- Scope of Application

- Imitation house, Tier-C LTC station around the blocks, Institution of long-term care, and home

- Purpose:

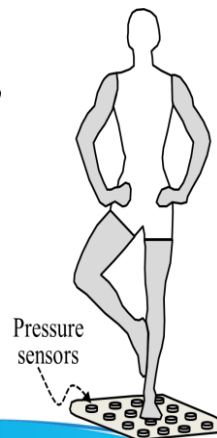
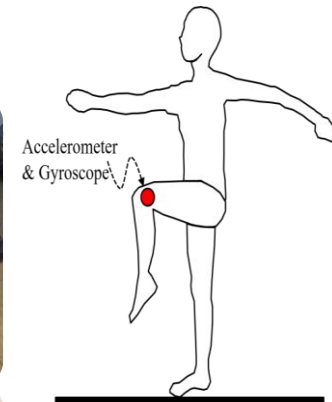
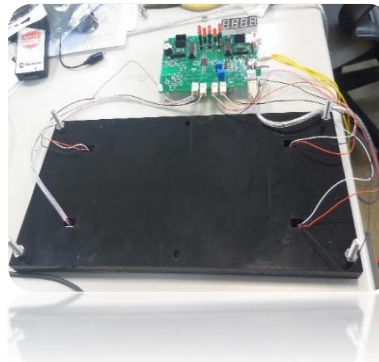
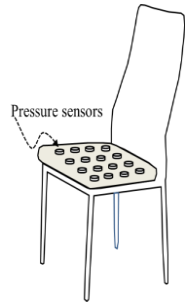
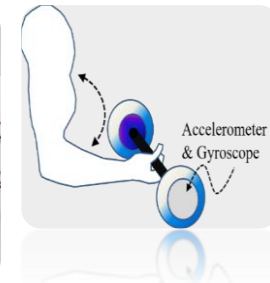
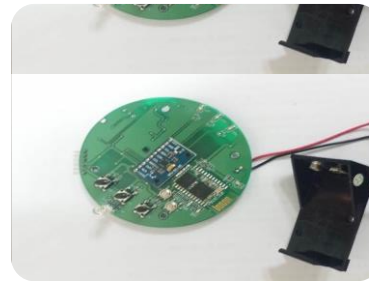
- To develop some of the physical fitness test items scientifically to eliminate errors caused by records and to import into the data chain

- Component:

- Inertial measurement unit(IMU),
- Strain gauge(Load cell)

- Function:

- To get the time and number of tests correctly
- To use individual tests can be for entertainment and training purposes



Interactive table videogame

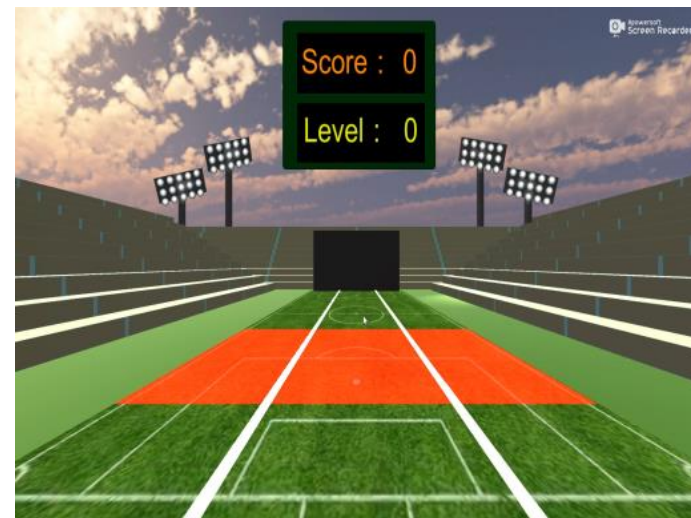
- Scope of Application
 - Tier-C LTC station around the blocks , Institution of long-term care and home
- Single player/two players games for improving the interpersonal interaction.
 - Find the picture differences
 - Whack-A-Mole
 - Chess



專注感官知覺訓練及虛實互動及認知促進系統

Sensory perception training & virtual reality interaction and cognitive promotion system

- 注意力 Attention
- 反應能力 Response capability
- 判斷力 Judgment
- 記憶力 Memory
- 命名 Naming



▲ 專注感官知覺訓練



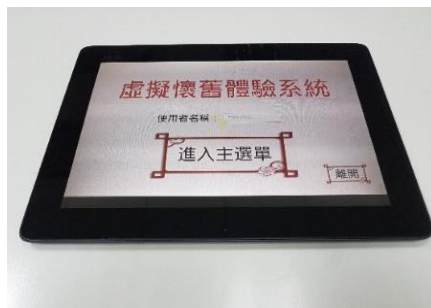
▲ 虛實互動及認知促進系統



虛擬懷舊體驗系統

Virtual nostalgia experience system (APP)

- 計算能力
- 定向-時間
- 定向-地方
- 語言
- 口語理解及行為能力
- 命名

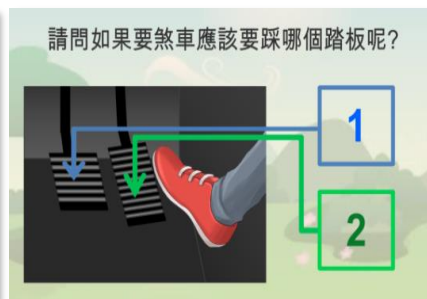


IADL- (Instrumental activities of daily living)

從臨床評估延伸至功能復原

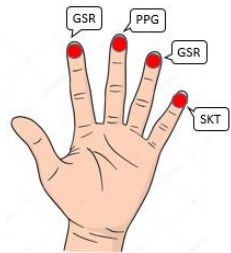
From clinical evaluation to functional recovery

- 工具性日常生活活動能力
- 命名
- 記憶力
- 計算力
- 注意力

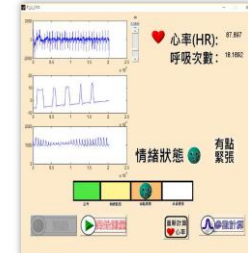
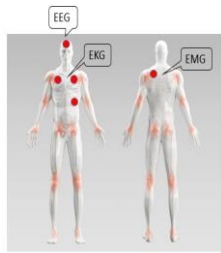


Wearable Physiological Signal Measurement System

- Scope of Application
 - Institution of long-term care and home
- Physiological signals consist of electrocardiogram (ECG), Photoplethysmography (PPG), and electroencephalogram (EEG)
- Applying heart rate variability (HRV) to analyze the activity of the automatic nerve system (ANS)
- Applying the alpha and beta waves to detect the attention and reaction
- Recognize the response of emotion



▲ 感測器擺放位置



▲ 使用者介面示意圖

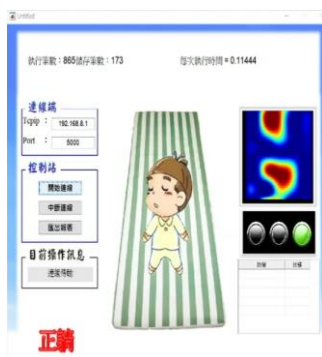


▲ 生理訊號回饋系統場域

Pressure Sensing Mattress

• Scope of Application

- Imitation house, Institution of long-term care, and home
- Detecting pressure distribution, bedridden duration, bedridden posture, body activity, sleep apnea, and on/leave the bed.
- Turn over reminder for reducing the occurrence of pressure sores.
- Bed-inductive illumination for reducing the risk of a fall.



▲ 高齡者臥床行為與預防壓瘡偵測系統

▲ 高齡者坐姿行為與預防壓瘡偵測系統

Spatial positioning and direction guide device

• Scope of Application

- Imitation house, Tier-C LTC station around the blocks, Institution of long-term care, and home

• Purpose:

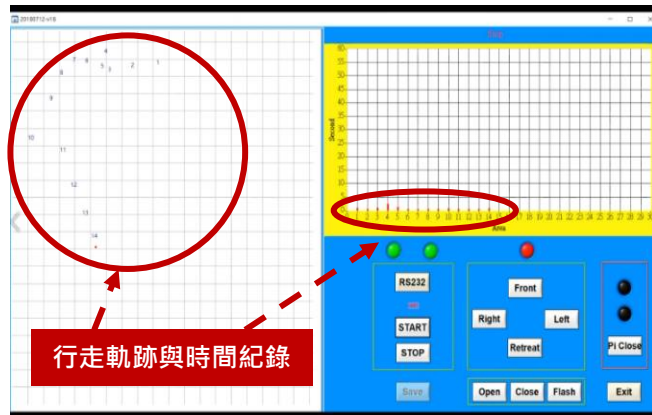
- To develop the behavioral monitoring and analyzing system with interactive response functions for subjects.

• Component:

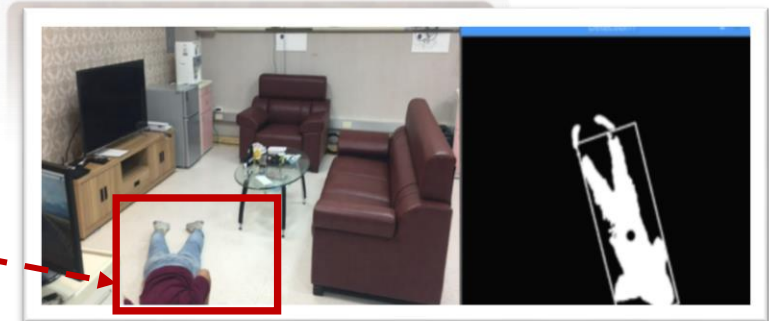
- Visible or near-infrared camera
- Laser light direction guide and speaker

• Function:

- To identify the position of the subject
- To record the walking trajectory of the subject
- To point the direction of the subject by the laser light and the voice.

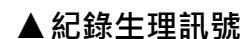


跌倒偵測



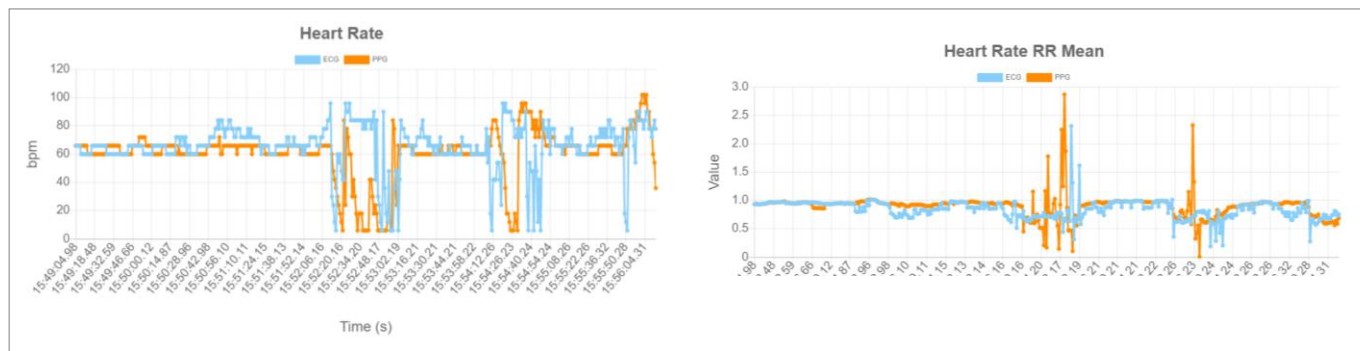
基於文化脈絡發展失智症照護之人工智慧化輔助評估與處遇系統——黃敏偉 副院長

▲使用電子表單收集MoCA與MMSE資料



資料庫使用者介面User Interface of Database

▼ 紀錄生理訊號與計算生理參數(HR, RR)



▲ 懷舊遊戲-認知功能



▲ 打地鼠 - 反應力



▲ 足球 - 反應力

場域收案Case Collection in Experimental Field



• 生理訊號量測



• IADL互動遊戲
從臨床評估延伸至功能復原



• 虛擬懷舊體驗系統
• 虛實互動及認知促進系統
• 電子桌遊系統

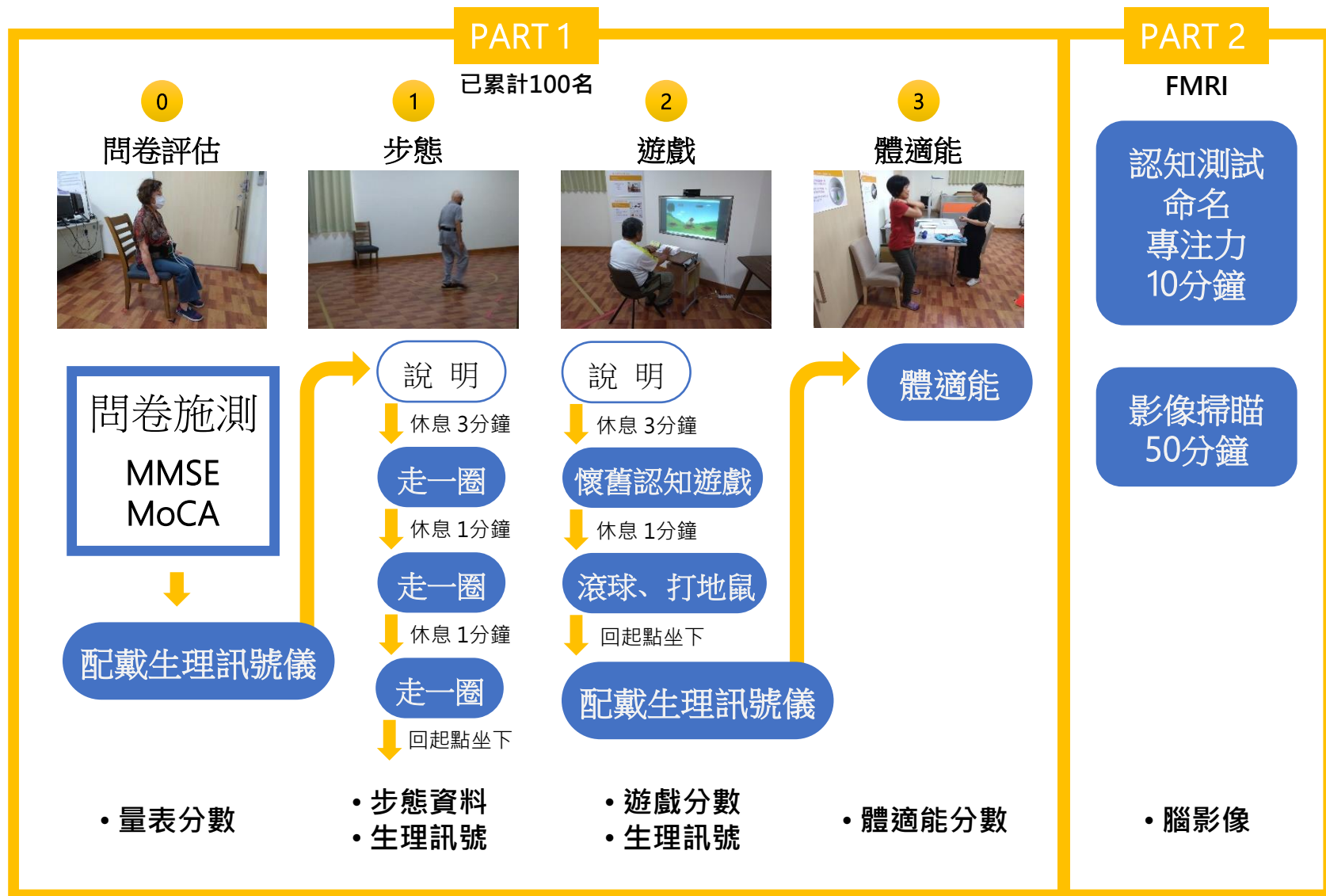


• 空間定位與方向指引系統



場域收案流程 Procedures of Case Collection in Experimental Field

基於文化脈絡發展失智症照護之人工智慧化輔助評估與處遇系統－黃敏偉 副院長



Model development
using AI-based techniques



fMRI Image

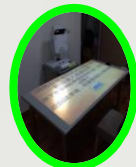
Clinical questionnaire
assessment



Pressure Sensing
Mattress



Table game



Attention
Reaction
Game



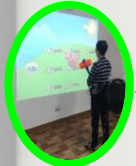
Physiological Signal
Measurement



Spatial
positioning
direction guide
device

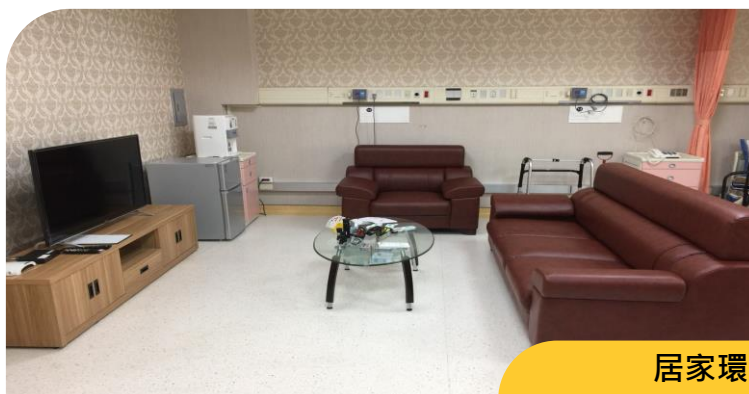


Wall
game

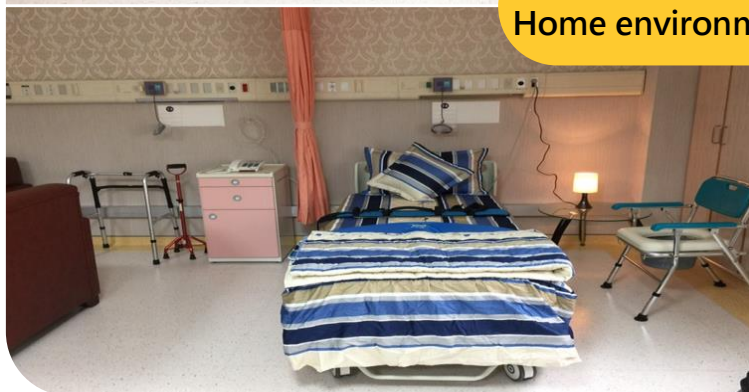


場域介紹-仿家屋 Imitation House

為使失能者能早些適應銜接居家環境，模擬家中多障礙空間練習食衣住行生活起居操作能力。In order to enable the disabled to adapt to the home environment earlier, the multi-hazardous space in the imitation home is built to practice the daily living skills such as food, clothing, housing, transportation.



居家環境模擬
Home environment simulation



場域介紹-病人體驗仿家屋Patient Experience in Imitation House

基於文化脈絡發展失智症照護之人工智慧化輔助評估與處遇系統－黃敏偉 副院長



▲ 餐具使用



▲ 輔具使用

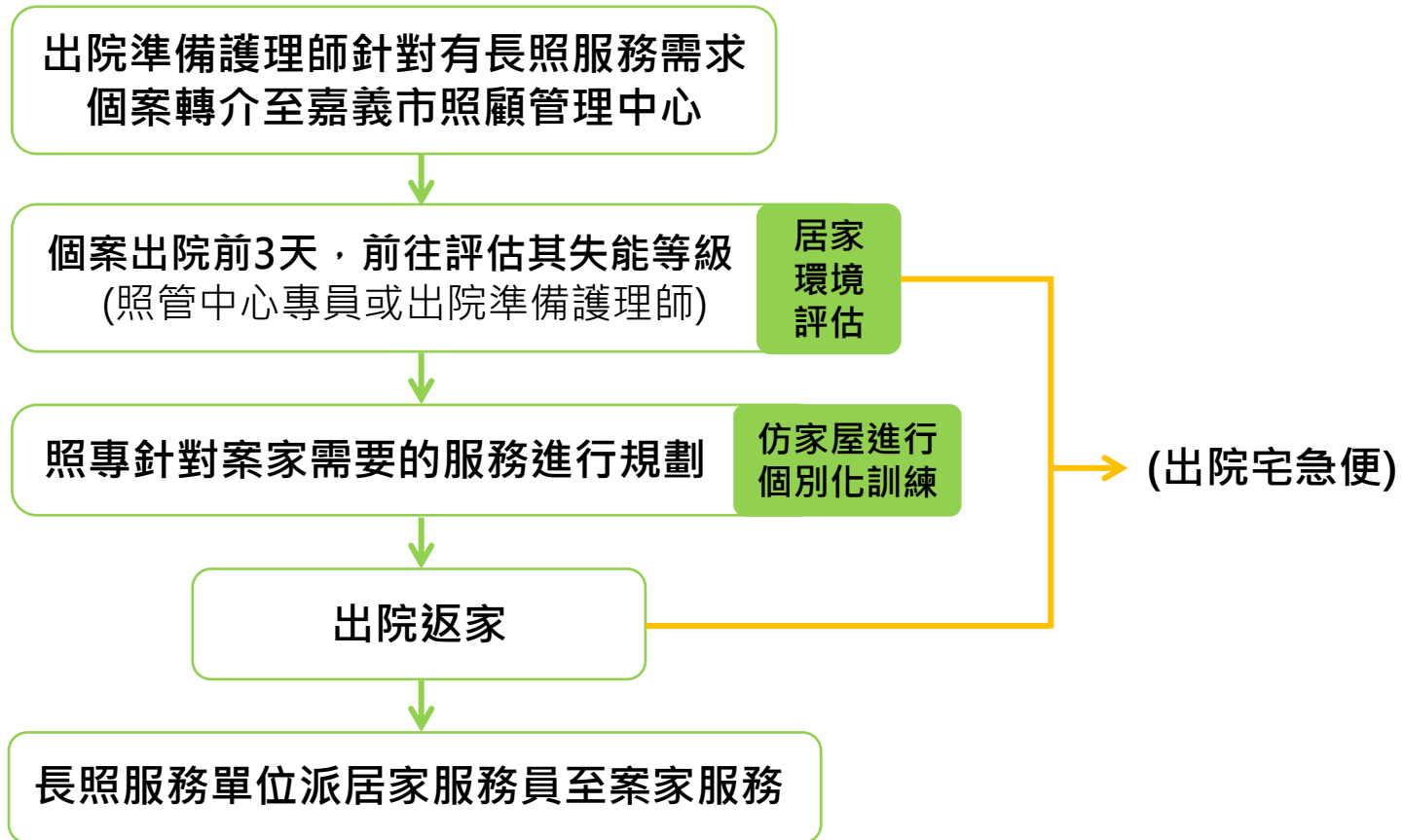


▲ 水龍頭練習



▲ 輔助電話機

Home Service Connection with Imitation House Training before Discharged from Hospital



「客製化」服務-情境模擬、輔具使用

"Customized" service-scenario simulation, assistive use



▲ 視覺輔助設備



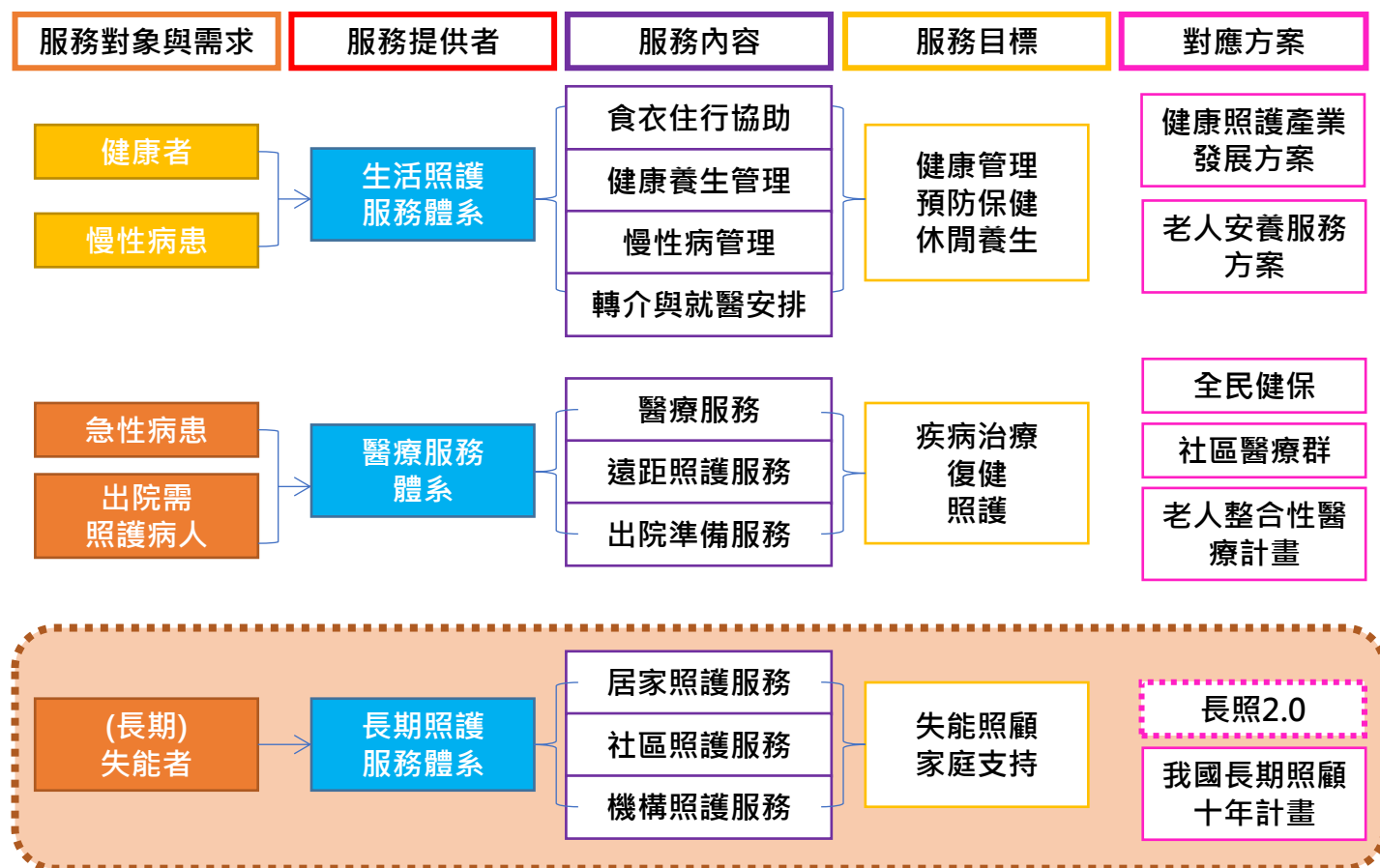
▲ 進餐輔助設備



▲ 社交娛樂



Breakthrough, value and benefit of main achievements



Long-term care integration-statistics of medical treatment for dementia

108年全年門、急、住-前十大診斷排名

排名	疾病名稱	平均年齡	男性%	女性%	就醫人次
1	慢性腎臟疾病	67.09	65%	35%	20,907
2	高血壓	65.86	57%	43%	19,538
3	腰頸椎疾病	63.85	52%	48%	16,322
4	胃潰瘍，急性或慢性，有/無出血或穿孔	60.85	57%	43%	13,139
5	糖尿病	65.36	53%	47%	11,981
6	其他精神分裂症	47.49	65%	35%	8,965
7	心臟疾病	68.27	61%	39%	8,125
8	老年性大腦變性，癡呆症	79.87	53%	47%	7,846
9	其他肌炎，未指定部位	65.73	36%	64%	7,412
10	前列腺腫大並伴有下尿路症狀	73.71	100%	0%	6,428

失智症是啥米

失智症是一群症狀的組合(症候群)，由各種可影響記憶、思考、行為和日常生活能力的大腦病症導致而成。

接納失智症

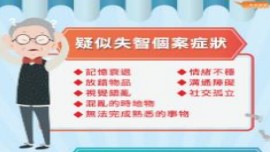
給予友善支持，協助提供就醫資訊，及早發現及早就醫與治療。



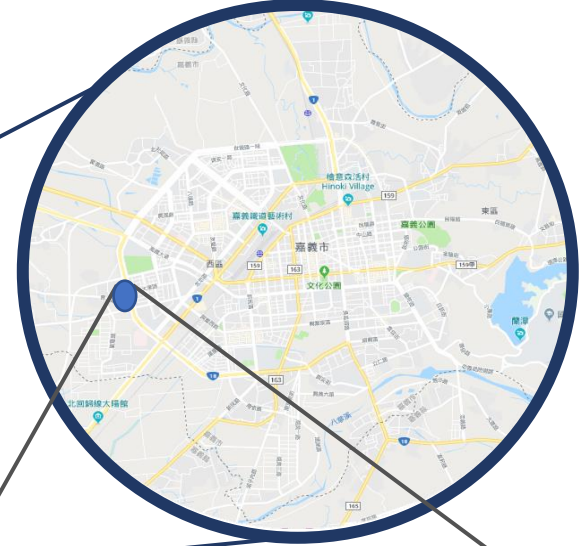
失智症 Dementia

- 是一種疾病而不是正常的老化
- 症狀除記憶力減退，還會影響到其他認知功能(語言能力、空間感、計算力、判斷力、抽象思考能力等)
- 同時可能出現干擾行為、個性改變、妄想或幻覺等症狀

失智症照護服務



Chiayi Branch, Taichung Veterans General Hospital Location

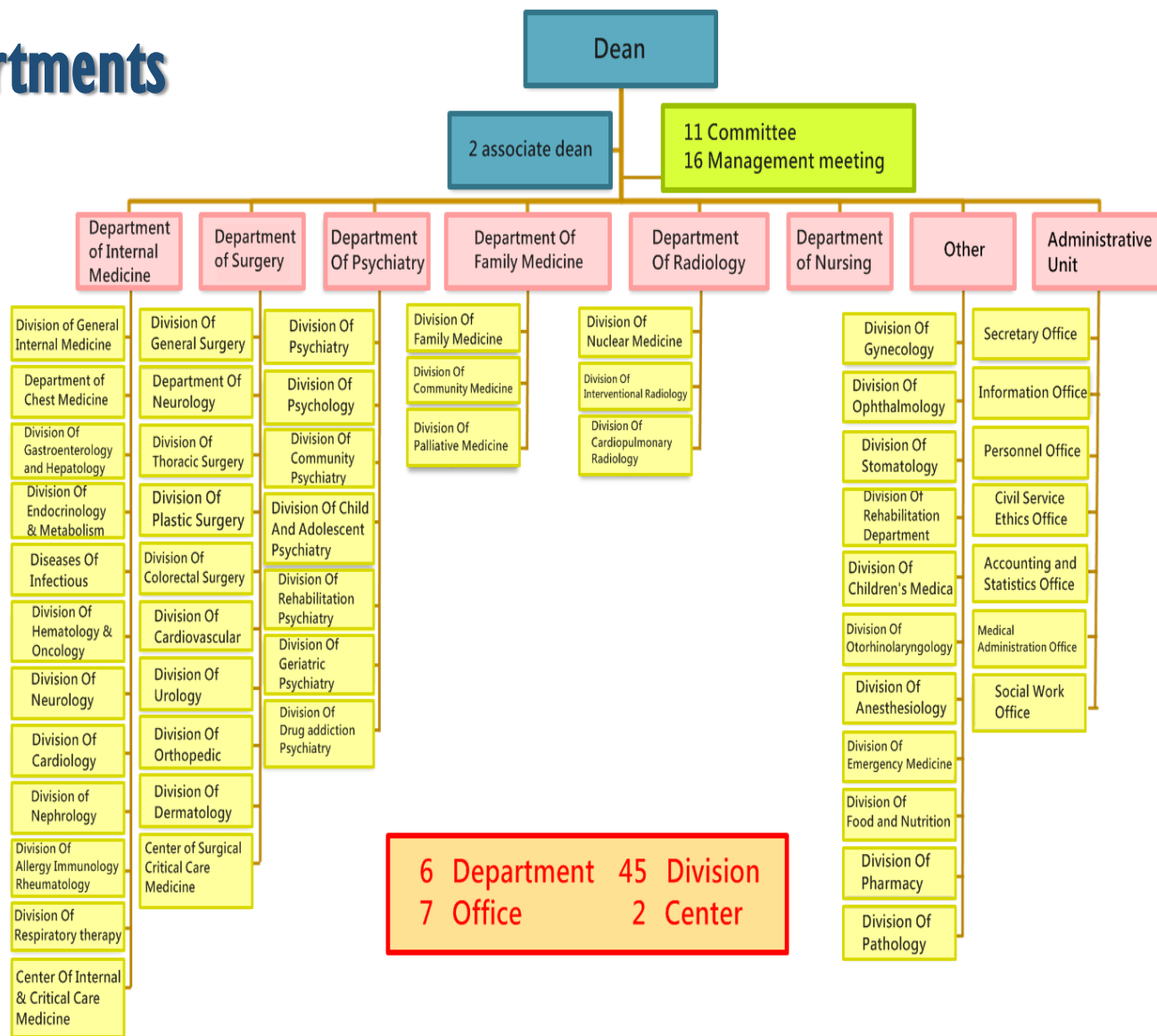


Chiayi Branch, Taichung Veterans General Hospital history

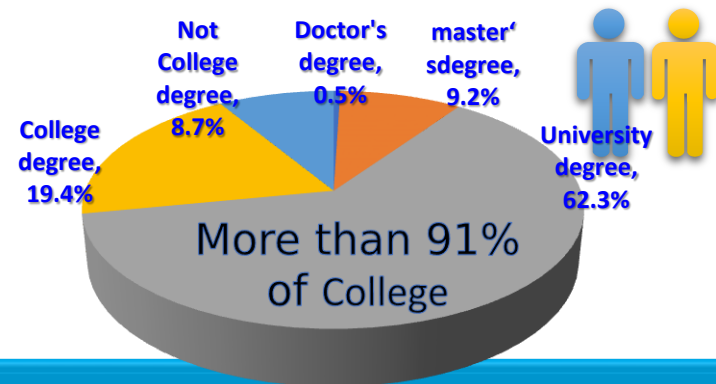
- 1952 Formerly a land, sea and air force lung disease sanatorium
- 1959 The counseling meeting took over and was renamed Chiayi Rongmin Hospital. There are four branches in Xiancao, Wanqiao, Luman and Tanzhong.
- 1974 Transformation into a general general hospital with a public clinic
- 1984 Medical network by the Health Department expansion project completed Yuan into the National Medical Network
- 2004
- 2010.1 Complete horizontal integration with Bay Bridge Veterans Hospital
- 2011.1 Completed the vertical integration with Taichung Veterans General Hospital and renamed it "Taichung General Hospital Chiayi Branch"
- 2014 New hospital evaluation is rated as excellent
- 2018 Qualified for hospital evaluation and qualified for emergency grading



Departments



Employees And Education



基於文化脈絡發展失智症照護之人工智慧化輔助評估與處遇系統－黃敏偉 副院長

Category	Number Of People	Percentage	Qualified Teacher Tualifications Tn The Ministry Of Education		
			Associate Professor	Assistant Professor	lecturer
Doctor	69	8.81%	1	3	12
Nurse	371	47.38%	0	0	4
Medical Staff	117	14.94%	0	0	3
Administration Staff	226	28.86%	0	0	1
total	783	100.0%	1	3	20

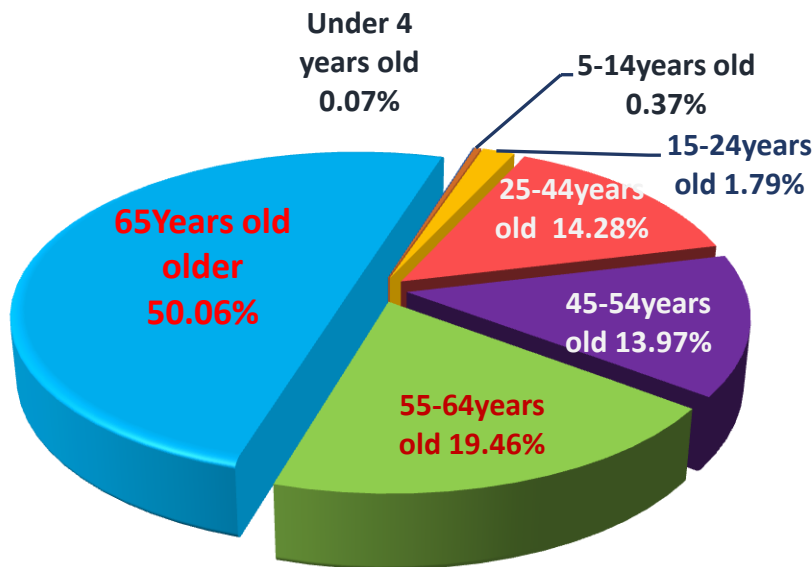
As of 2018.12.31 (excluding concurrently) physicians include dentists, Chinese medicine practitioners

Number of hospital beds

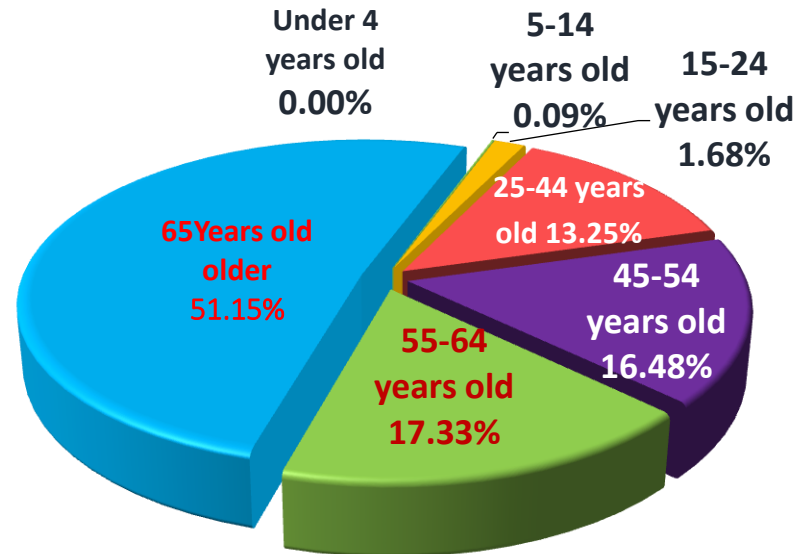
project	General beds	Special beds								Psychiatry beds	Attached institution					
	Acute bed	Chronic bed	Intensive care bed	Emergency observation bed	Negative pressure isolation ward	Surgical recovery room	Hemodialysis bed	Chronic respiratory care bed	Peaceful bed	Acute bed	Chronic bed	Nursing home	Psychiatry Nursing home	Daytime agency	Accommodation agency	Psychiatric day care
	250	36	37	5	4	4	38	60	6	50	175	274	44	28	54	20
	665											440				
beds																
total	665											440				

Population characteristics of the service area

Category	2016	2017	2018
65 years old older/Household registration population(Chiayi City)	36,268/269,874	38,140/269,398	40,147/268,543
65 years old older/Household registration population(Chiayi County)	92,234/515,320	99,476/511,182	97,216/506,206
65 years old older(%) (Chiayi City/Chiayi County/National)	13.45/ 17.90/13.20	14.16/18.47/13.86	14.95/19.20/14.70
Aging index (Chiayi City/Chiayi County/National)	93.99/174.29/98.86	101.43/188.11/105.70	109.07/204.89/113.93



Outpatient average medical age
(average 63.3 Years old)



Average medical age of hospitalization
(average 65.4 Years old)

Follow the system concept to provide holistic care

Spiritual care



Hospital volunteers



Sad counseling



Celebrate the festival together



Disability,
dementia,
long-term bed rest,
no support for the
people, providing
physical and
mental health
care

Promote Long-Term Care To Achieve Local Aging

基於文化脈絡發展失智症照護之人工智慧化輔助

與處遇系統－黃敏偉 副院長

Long term
2022-2026年

- **Become a best standard hospital**

Midterm
2019-2021年

- **Develop diversified home treatment and home medical services**
- **Develop a smart care system (technical aids) combined with the HIS system**
- **Become an A-level community integration center / Changzhao flagship store**

Short term
2017-2018年

- **Community and institutional attached day care services**
- **Complete team member long-term study training**
- **Promote home care, services, and medical care**
- **Strengthening the integration of Baihe and Yunlin Rongjia**

Executed

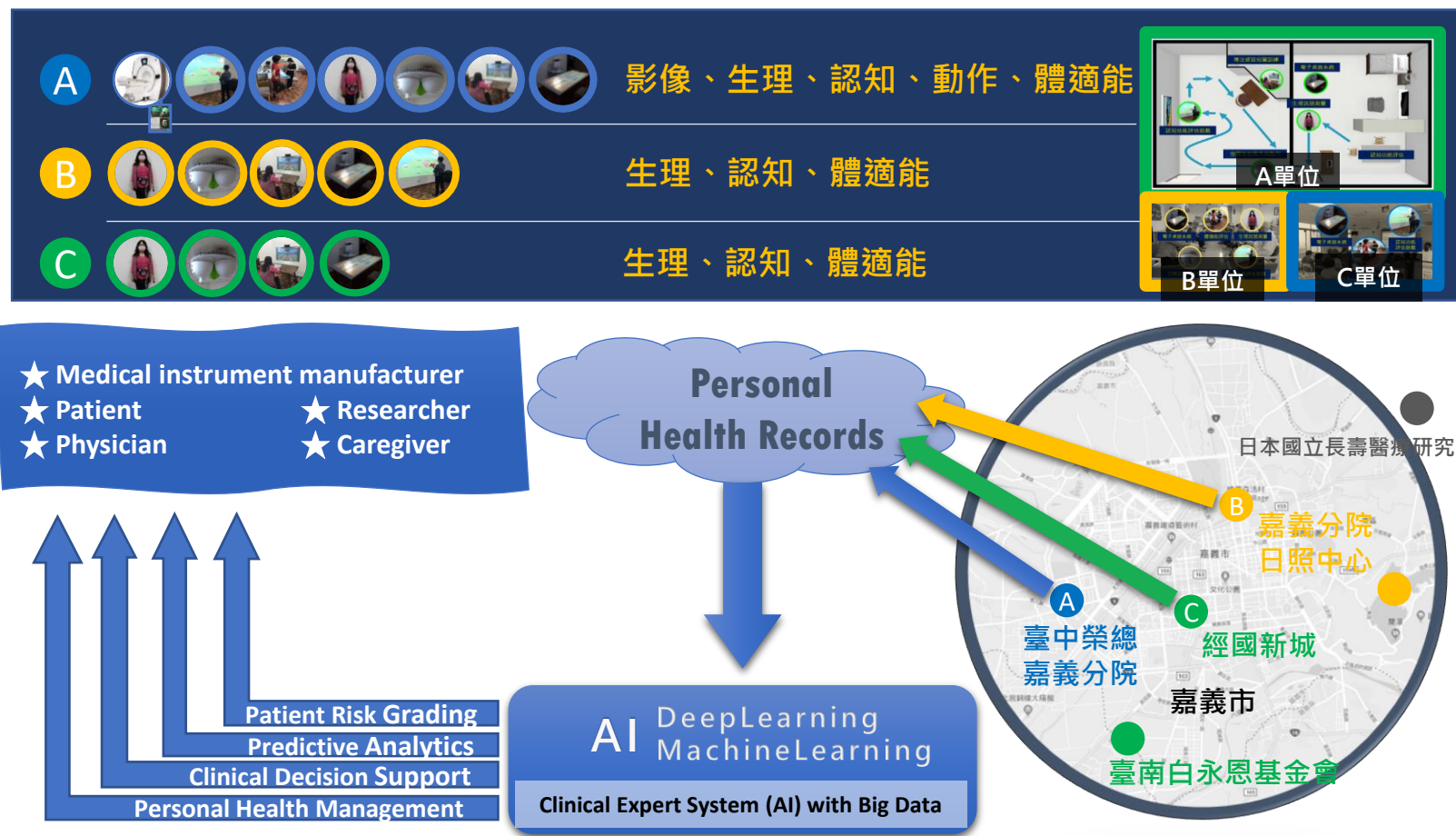
- ★ Home respite service
- ★ Home care, rehabilitation
- ★ Institutional respite
- ★ Long-term care service- Nursing home
- ★ Discharge preparation service
- ★ Community building, Caring stronghold, Together Meal
- ★ Disability aid center

Future execution

- ★ Day care bed
 - City Outpatient 20 Beds
 - Wanqiao Branch 16 Beds
- ★ Meal Service
- ★ Traffic Car
- ★ Drug Delivery

Long-term care integration-ABC location

基於文化脈絡發展失智症照護之人工智慧化輔助評估與處遇系統－黃敏偉 副院長



Long-term care integration- construction of long-term care building (Chiayi)

基於文化脈絡發展失智症照護之人工智慧化輔助評估與處遇系統－黃敏偉 副院長



PCM單位 | 大渡城鄉建築師事務所
統包廠商 | 永祥營造股份有限公司

長期照護大樓統包工程

- 工程為地上四層、地下一層之鋼筋混凝土建築
- 建築面積：3807 M²
- 總樓地板面積：16886 M²
- 109年7月開工，預計111年3月竣工

項次	項目	進度
1	建築執照取得	109/5/26已取得建照。
2	開工動土典禮	109/6/9輔導會馮主委蒞臨主持。
3	施工前協調會	109/6/22里民施工前說明會。 109/6/23施工前協調會。
4	工程管線審查申請	109/7/6五大管線審查通過。
5	開工	109/7/8申報開工。

層別	空間屬性用途	合計面積； 16886 m ² 合計床數： 274 床
B1F	防空避難室兼停車場、機房	
1F	住床74床/層、2個護理站/層	
2F	住床100床/層、2個護理站/層	
3F	住床100床/層、2個護理站/層	
4F	預留樓層(未來擴充使用)	
R1F	電梯機房	
R2F	電梯機房	
空橋	連接DE棟2、3F	

Long-term care integration- deployment of residential long-term care institution park (Luymo)

基於文化脈絡發展失智症照護之人工智慧化輔助評估與處遇系統 — 黃敬偉 副院長



層 別	空間屬性用途
RF	空橋、機房
2F	100床/2個護理站
1F	100床/2個護理站 行政辦公區

總經費約新台幣3億5仟萬元
衛福部補助金額3億元

- 萬事具備：工程PCM+監造技服案各項招標準備作業業已完成
- 待衛福部補助計畫經費核定及發文

Promote community health- Long-term care stronghold

24 community stronghold Egular care

基於文化、智慧、社區

嘉義市 福民社區	嘉義市 東川社區	嘉義市 磚寮社區	嘉義市 劉厝社區	嘉義市 育英社區	
嘉義市 紅瓦社區	量測服務106 年 每月提供血壓、血 糖、體脂及骨密檢 測服務104年 共服務12,283人次	嘉義市 水上退 宿	嘉義市 退休公 教		
嘉義市 北港建 國		嘉義市 退休公 教			
美源白 沙王文 教協會	嘉義市 保生里	嘉義市 北湖里	嘉義市 光路里	嘉義市 文化里	嘉義市 林森里
嘉義市 林森里	嘉義市 北湖里	港坪運 動公園	嘉義市 經國新城		

偉副院長



Disability Aid Center Established - Wangqiao Branch

2016.04.22 Disability Aid Center Opening ceremony

Providing a professional single accessory service window and a communication platform for the disabled and assisted devices for the citizens of Chiayi County, In addition, it also connects Longzhao 2.0 to provide physical and mental disabilities to the home service

基於文化脈



伯與處遇系統



Mountain line
Service Center

Sea line
stronghold

Two
Service
station

year	Auxiliary Recycling	Auxiliary Rent	Auxiliary Evaluation	Auxiliary advisory	Auxiliary service
2016	191	300	1080	1858	250
2017	489	441	1361	1853	355
2018	209	748	2044	2975	455

The establishment of Community Health Promotion in Long-term Care Base

基於文化脈絡發展失智症照護之人工智慧化輔助評估與處遇系統——黃敏偉 副院長



失智據點帶活動-中埔鹽館村



健康促進活動



居家服務-協助復健



失智據點帶活動-灣橋村



居家服務-陪伴服務



居家護理



Taking Patient Needs as the Core Value

1

獲獎

2018 第十五屆國家新創獎 - 學研新創獎 運用懷舊體驗之認知偵測 及情緒抒發系統



1

獲獎

第十六屆國家新創獎

CERTIFICATE OF THE 16th NATIONAL INNOVATION AWARD

臺中榮民總醫院嘉義分院、南臺科技大學、國立中正大學、長榮大學

黃敏偉、黃基哲、陳彥廷、侯春茹、胡雅涵、王獻章

在宅或機構式銀髮族活動行為能力之主動式智慧監測及訓練系統

參加第十六屆國家新創獎 學術新創組 經評審團評鑑獲獎，特此證明。

Chia-Yi Branch, Taichung Veterans General Hospital, Southern Taiwan University of Science and Technology, National Chung Cheng University, Chang Jung Christian University

Min-Wei Huang, Ji-Jer Huang, Yen-Ting Chen, Chun-Ju Hou, Ya-Han Hu, Hsien-Chang Wang

This certifies that Active Monitoring and Training System for the Behavior Pattern of Senior Citizens at Home or Homecare System has been awarded the 16th National Innovation Award in the Academic Research Category by the Research Center for Biotechnology and Medicine Policy.

財團法人生物醫療科技政策研究中心
Research Center for Biotechnology and Medicine Policy
董事長 王金平 Chairperson Ging-Ping Wang
中華民國一〇八年十二月六日 Dec. 6, 2019

國家新創獎

NATIONAL INNOVATION AWARD

茲證明以下項目申請國家新創 2019 年度續獎，
經審確有持續精進新創及具體推進研發進程事蹟，
特此授予 新創精進獎，以茲鼓勵。

This is to certify the completion of the National Innovation Award renewal and issue the Excelsior Award in recognition of continuing innovations and advancements in R&D to the project indicated below.

項目名稱：運用懷舊體驗之認知偵測及情緒抒發系統

團隊成員：黃敏偉、陳彥廷、侯春茹、黃基哲、胡雅涵、王獻章

單位名稱：臺中榮民總醫院嘉義分院、南臺科技大學、
國立中正大學、長榮大學

Project: Cognitive Detection and Emotional Express System by Nostalgic Experiences

Members: Min-Wei Huang, Yen-Ting Chen, Chun-Ju Hou, Ji-Jer Huang,
Ya-Han Hu, Hsien-Chang Wang

Institute: Chia-Yi Branch, Taichung Veterans General Hospital
Southern Taiwan University of Science and Technology
National Chung Cheng University
Chang Jung Christian University

財團法人生物醫療科技政策研究中心
Research Center for Biotechnology and Medicine Policy

董事長 王金平 Chairperson Ging-Ping Wang

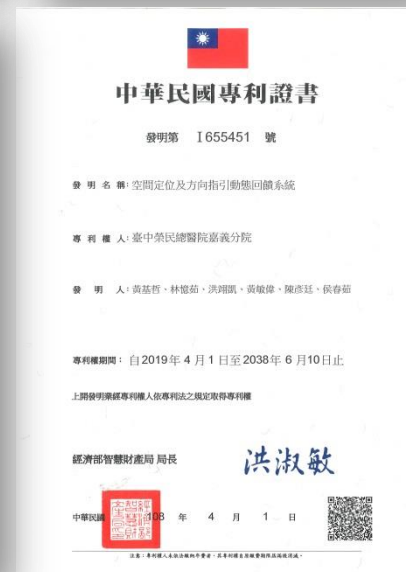
中華民國一〇八年十二月六日 Dec. 6, 2019

2

專利

已通過 4 件發明專利

- 發明第 I603303 號
 - 運用懷舊體驗之認知偵測及情緒抒發系統
- 發明第 I605862 號
 - 可偵測認知功能的個人化遊戲系統
- 發明第 I661402 號
 - 空間定位及方向指引系統
- 發明第 I655451 號
 - 空間定位及方向指引動態回饋系統



3

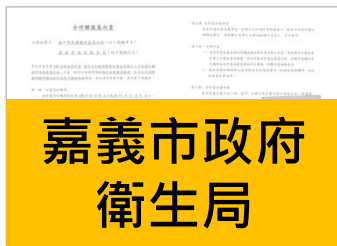
合作

合作意向書



臺南市照護科技與
福祉促進協會

白永恩神父
社會福利基金會



日本國立長壽醫療研究中心參訪



基於文化脈絡發展失智症照護之人工智慧化輔助評估與處遇系統——黃敏偉 副院長

成果展示

• 參展

- 108/10/31 2019亞洲樂齡智慧生活展參展
- 108/12/05 台灣醫療科技展

• 外賓參訪

- 108/04/10 政治大學公共行政系陳敦源教授、
- 108/04/10 臺中榮總許惠恒院長蒞臨場域參觀
- 108/04/16 中正大學犯罪防治學系林明潔教授蒞臨場域參觀
- 108/04/17 奧迪特管理顧問有限公司張興聰總顧問
- 108/04/17 **華碩電腦**股份有限公司許萬寶協理蒞臨場域參觀
- 108/04/18 退輔會長官蒞臨場域參觀
- 108/06/14 科技部人工智慧生技醫療創新研究中心訪視
- 108/09/04 **宇峻奧汀**參訪
- 108/11/19 衛福部食藥署醫療器材審查員培訓計畫參訪活動
- 109/01/03 天主教若瑟醫療財團法人**若瑟醫院**參訪
- 109/02/07 中國醫藥大學健康科學院參訪
- 109/04/30 **工業技術研究院**參訪



社區推廣

• 白永恩基金會台南關懷據點

- 108/02/28 老人照護科技與健康樂活
- 108/03/23 老化?失智?
- 108/04/20 兒童發展初步篩檢
- 108/04/27 活力老化-強化反應力及注意力之認知能力
- 108/05/25 牽起人際線-不讓老後難溝通找上身
- 108/06/15 兒童發展初步篩檢
- 109/07/04 演講【老化?失智?】與收案



• 白永恩神父社會福利基金會高雄分事務所

- 108/08/13 照護科技促進跨齡健康樂活活動及收案
- 108/08/20 照護科技促進跨齡健康樂活活動及收案

• 台南市私立老吾老養護中心

- 108/09/28 照護科技促進跨齡健康樂活活動及收案