

INTEGRATING SOCIAL SCIENCES RESEARCH WITH ARTIFICIAL INTELLIGENCE (AI): A Case Study From The Great Barrier Reef

Dr (Jenny) Dung Le

Prof Susanne Becken

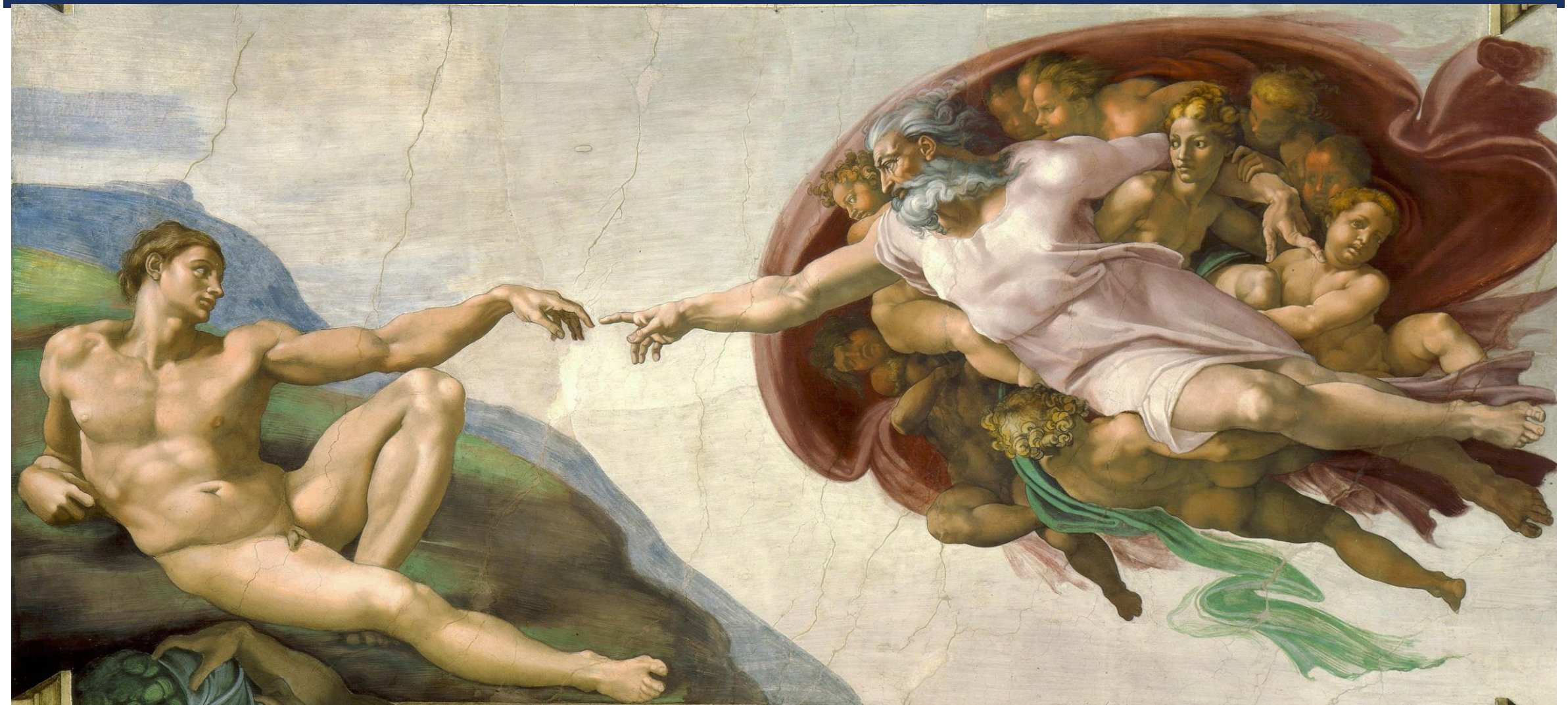
Prof Bela Static

Dr Ranju Mandal

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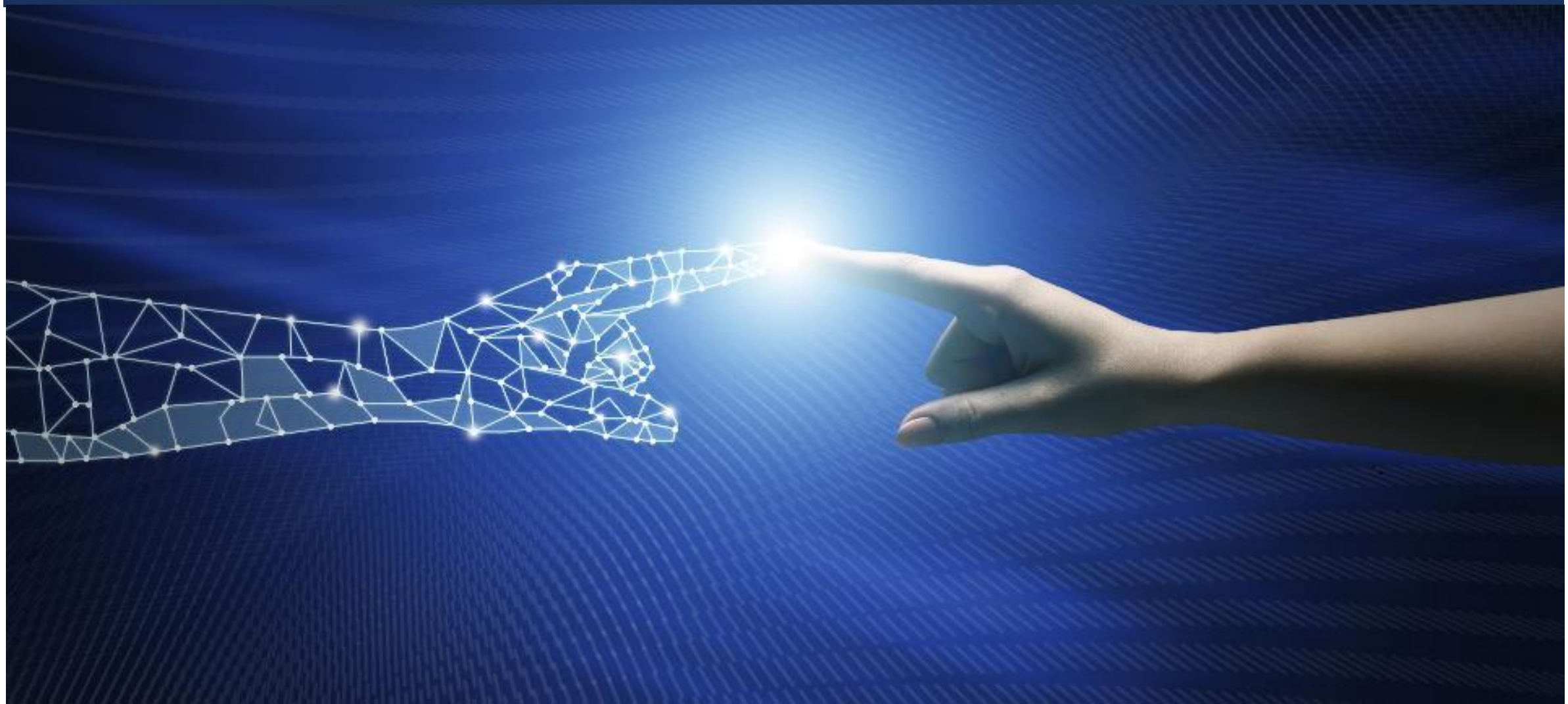
MICHELANGELO'S CREATION OF ADAM (1508–1512)



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THE EVOLUTION OF ARTIFICIAL INTELLIGENCE

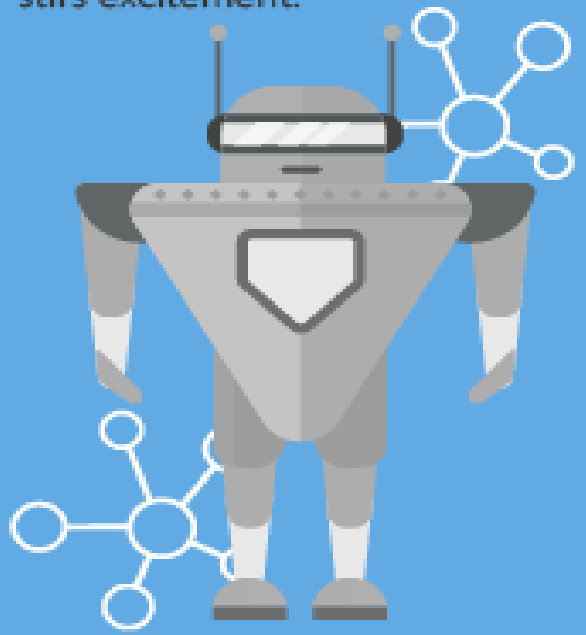


THE EVOLUTION OF ARTIFICIAL INTELLIGENCE

"The science and engineering of making intelligent machines, especially intelligent computer programs" (Skilton & Hovsepian, 2018).

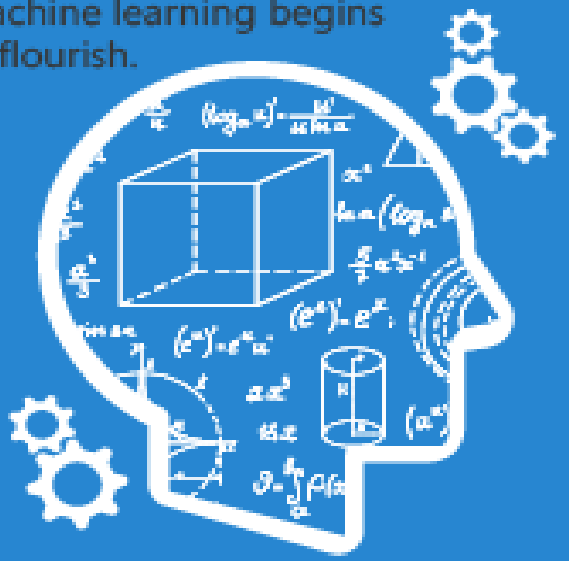
ARTIFICIAL INTELLIGENCE

Early artificial intelligence stirs excitement.



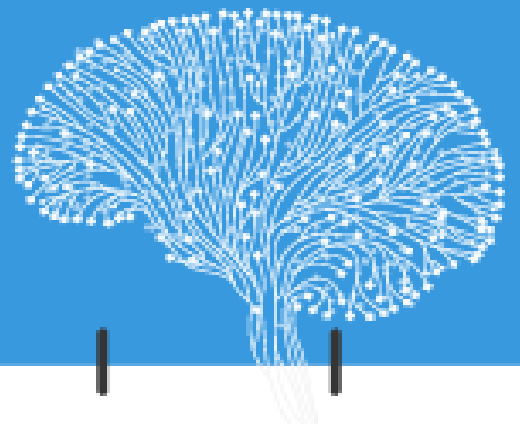
MACHINE LEARNING

Machine learning begins to flourish.



DEEP LEARNING

Deep learning breakthroughs drive AI boom.



1950's 1960's 1970's 1980's 1990's 2000's 2010's

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AI APPLICATIONS IN TOURISM AND HOSPITALITY



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IS AI CLOSED OFF TO JUST MATHS AND COMPUTER SCIENCE???



What about social sciences???

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AI-BASED AESTHETIC MONITORING SYSTEM FOR THE GREAT BARRIER REEF (NESP 3.2.3)







6.4 billions
64 thousand jobs
2 million visitors

AESTHETIC BEAUTY, OBJECTIVE OR SUBJECTIVE

Objective beauty
Beauty is an objective and
intrinsic characteristic of an object





Subjective beauty
Beauty is in the eyes
of the beholder

AI-BASED AESTHETIC MONITORING SYSTEM FOR THE GREAT BARRIER REEF

Based on object recognition

Objective AI

Subjective AI

Tourist aesthetic evaluations



PeerJ

Can we measure beauty? Computational evaluation of coral reef aesthetics

Andreas F. Haas[1], Marine Guibert[2], Anja Foerschner[3], Tim Co[4], Sandi Calhoun[1], Emma George[1], Mark Hatay[1], Elizabeth Dinsdale[1], Stuart A. Sandin[5], Jennifer E. Smith[5], Mark J.A. Vermeij[6,7], Ben Felts[4], Phillip Dustan[8], Peter Salamon[4] and Forest Rohwer[1]

AI-BASED AESTHETIC MONITORING SYSTEM FOR THE GREAT BARRIER REEF

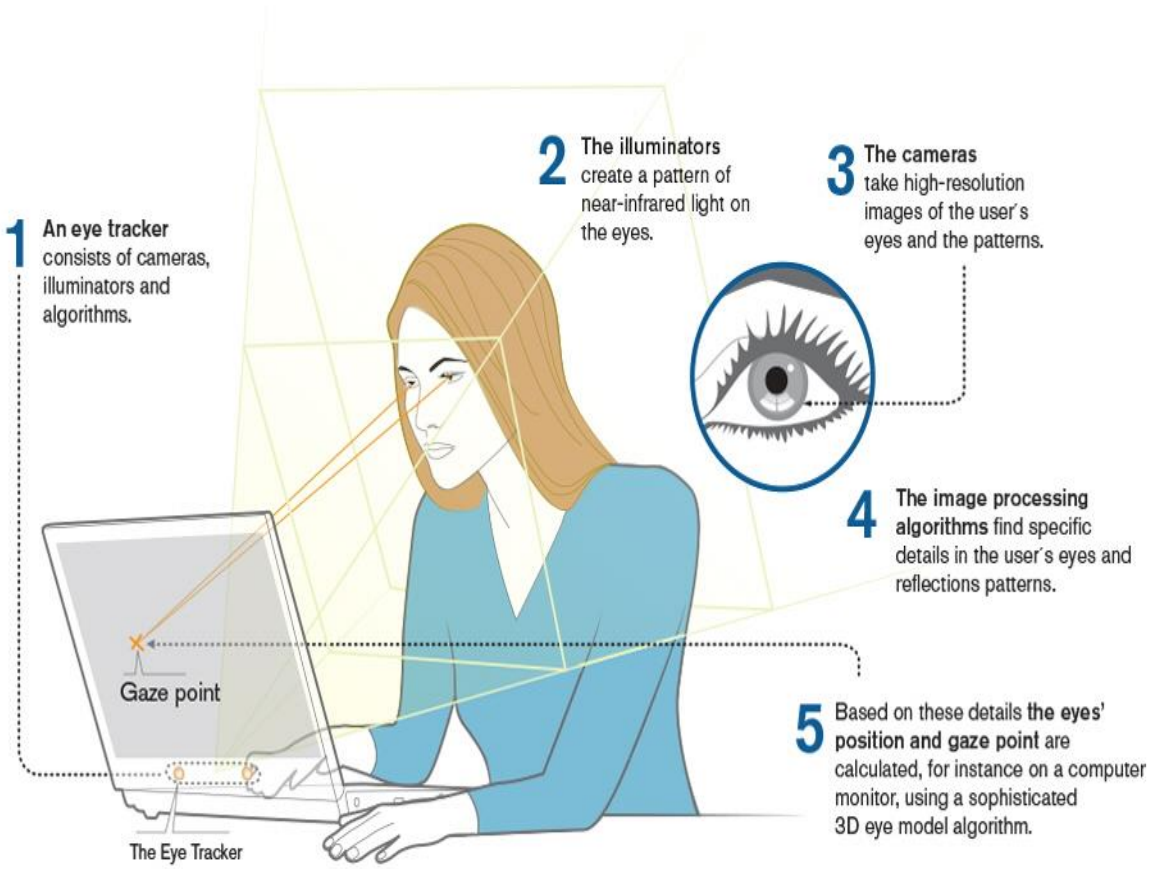
(1) Identifying aesthetic attributes using eye-tracking research



Scott, N., Le, D., Becken, S., & Connolly, R. (2019). Measuring perceived beauty of the Great Barrier Reef using eye-tracking technology. Current Issues in Tourism. doi:10.1080/13683500.2019.1626812

BEAUTY IN THE EYES OF THE BEHOLDER



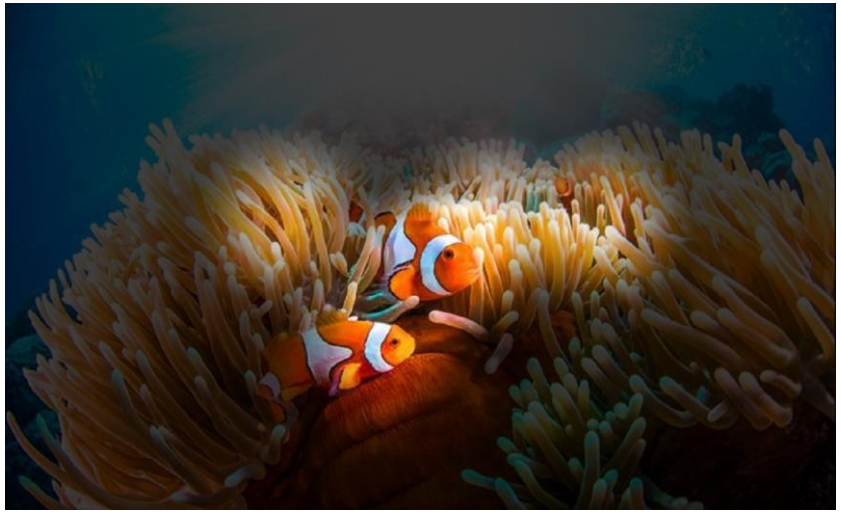


BEAUTY IN THE EYES OF THE BEHOLDER

- Viewers' attention reflects their aesthetic assessment.
- Key areas of interests play more important roles in determining the total beauty score.









AI-BASED AESTHETIC MONITORING SYSTEM FOR THE GREAT BARRIER REEF

(2) Understanding human aesthetic evaluations by a quantitative survey

Table 1. Results of the conjoint analysis ($n = 705$).

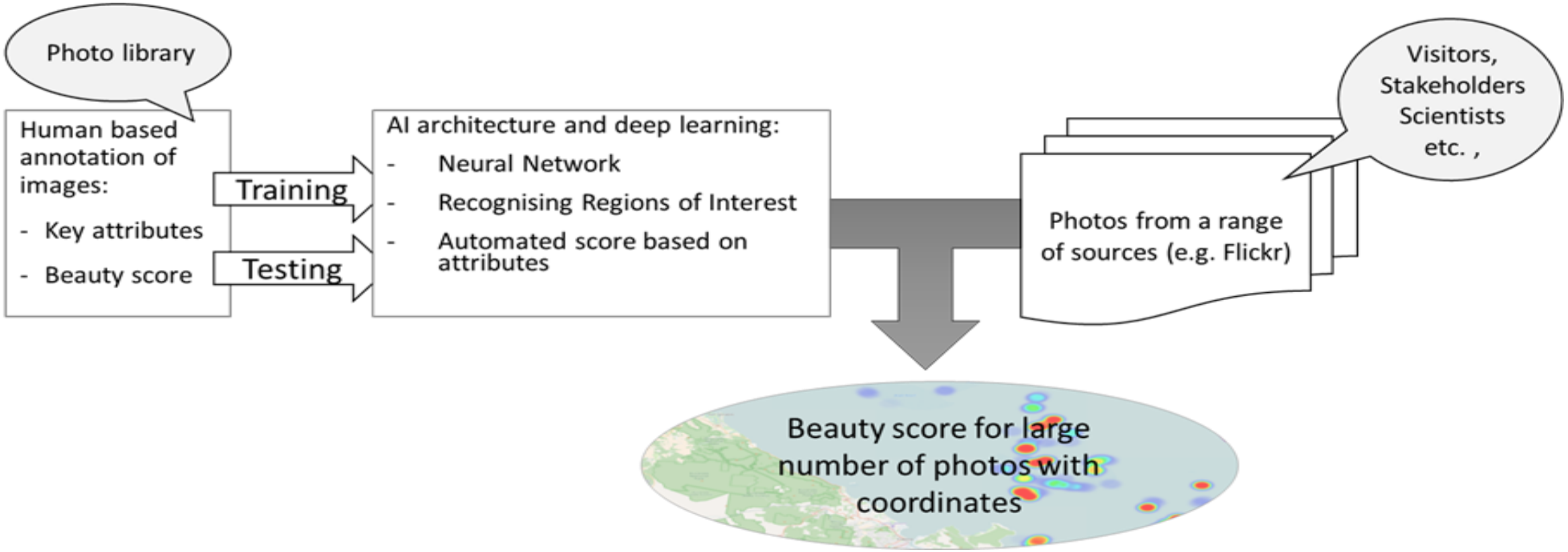
Attribute	Level	Utility score	Importance value (%)
Fish	No fish	−1.191	32.03
	Non-colourful fish	−0.630	
	Colourful fish	1.822	
Coral	No coral	−1.080	25.10
	Non-colourful coral	.043	
	Colourful coral	1.037	
Contrast	High	1.114	22.23
	Low	−1.114	
Turtle	No turtle	−1.012	20.64
	Turtle	1.012	

Le, D., Scott, N., Becken, S., & Connolly, R. (2019). Tourists' aesthetic assessment of environmental changes, linking conservation planning to sustainable tourism development. *Journal of Sustainable Tourism*, *27*(10), 1477-1494. doi:10.1080/09669582.2019.1632869.



AI-BASED AESTHETIC MONITORING SYSTEM FOR THE GREAT BARRIER REEF

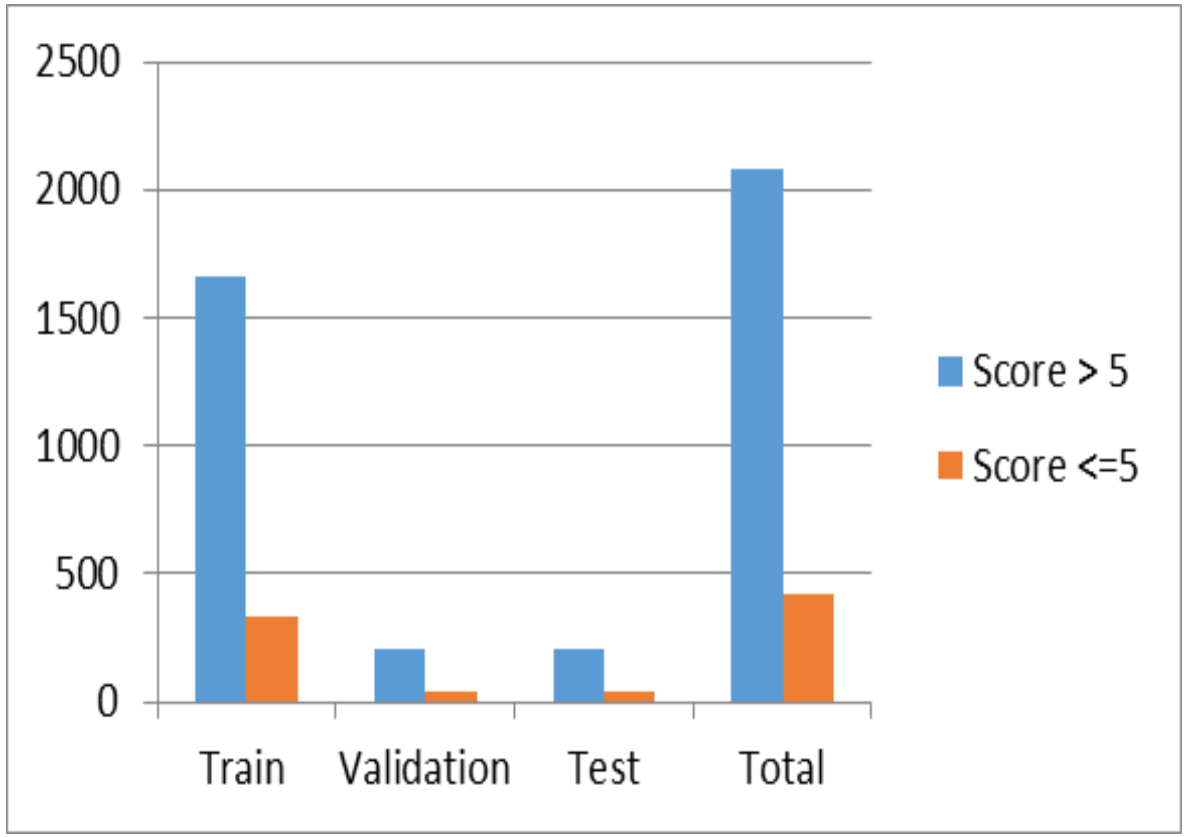
(3) Developing the AI system (training and testing)



Accuracy achieved: 84.8%

AI-BASED AESTHETIC MONITORING SYSTEM FOR THE GREAT BARRIER REEF

(4) Interpreting AI outcomes





BENEFITS OF INTEGRATING TOURISM RESEARCH WITH AI DEVELOPMENT

- Provide more accurate predictions of **tourist aesthetic assessment** (i.e. the gap between changes in coral reef and tourist aesthetic assessment of the GBR sceneries)

- Offer more **explanatory power** (i.e. What visual features are more important? Why the database is unbalanced?)

CHALLENGES OF INTEGRATING TOURISM RESEARCH WITH AI DEVELOPMENT

- **Multi-disciplinary research team** (tourism researchers & IT experts)

- **Financial investment**






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Human-centred AI

NESP 5.5
MEASURING AESTHETIC & EXPERIENCE VALUES USING BIG DATA APPROACHES



(*) This project is supported with funding from the Australian Government's National Environmental Science Program.



Please contact me for any further information: d.le@griffith.edu.au