

# Beginning Artificial Intelligence Through Neuroscience

(Synchronous E-Learning)



**REGISTER BY 3 SEPT 2021**

*(Class size is limited to 30 pax)*

**2 & 9 October 2021 (Saturdays) 9.00am – 12.30pm**

**This course will be conducted as two half-day online sessions via Zoom.**

**Programme Code: TGS-2020513214 (SSG-Approved Course)**

Neuroscience helped inspire deep learning, which is the basis of AI technologies such as speech recognition by personal digital assistants and face recognition for access control, and is being developed for applications such as assisted interpretation of medical images and scene analysis by self-driving cars.

Organised by the Department of Physiology, NUS Yong Loo Lin School of Medicine, this course introduces the relevant neuroscience, including the function and connectivity of the cerebral cortex, which is used to motivate the architecture of deep learning artificial neural networks. Participants will learn the mathematical and statistical concepts needed to fit models to data; beginning with simple examples such as linear regression and binary classification, followed by the application of these principles to train deep learning models.

There will be opportunities for participants to experience hands-on coding with some common AI tools and the potential dangers of AI will also be examined and discussed.

At the end of the course, participants will be able to:

- Appreciate fundamental AI concepts for managing AI technology
- Acquire basic coding skills for constructing simple AI systems
- Build and deploy a simple deep learning model

## Who Should Attend

Allied health professionals, nurses, doctors, teachers, managers, data analysts, IT professionals, technology officers, technical advisors, and anyone who is interested in gaining a basic understanding of AI



**For Self-Funded Participants**

**CLICK HERE TO REGISTER**

**For Enquiries & Corporate Registrations**

Contact Ms Evelyn at [nusmedcet@nus.edu.sg](mailto:nusmedcet@nus.edu.sg)

*Please note that the scheduled course run will proceed only if the minimum class size is met.*

## Course Outline

### Overview of AI Types and Applications

- Turing test, artificial general intelligence
- Symbolic AI, GOFAI, expert systems
- Machine learning, deep learning, reinforcement learning

### Training Artificial Neural Networks

- Introduction to calculus
- Fitting a straight line to data
- Binary classification
- Error minimization by gradient descent
- Training an artificial neural network by gradient descent

### Fooling and Being Fooled by AI

- Correlation is not causation
- Bias
- Collusive pricing
- Explainability, interpretability
- Vulnerability to noise, distortion, and adversarial examples
- Neural network uncertainty
- Generative adversarial networks, deepfakes, GPT-3

### Biological and Artificial Neural Networks

- Biological neurons and neural networks
- Edge detection in the visual system
- Object recognition in the brain
- Simple neuron models
- Artificial neural networks

### Hands-On Coding Workshop

- Simple machine learning models
- Training and deploying a deep learning neural network

## Course Requirements

A background knowledge in calculus at the level of H1 or AO-level mathematics, or equivalent will be helpful. However, those who have not studied calculus are also welcome to register, as we will give a beginner's introduction to calculus during the course.

## Assessment

Participants must pass the assessment component to be eligible for SSG funding



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## Trainers' Profile



### Dr Andrew Tan Yong-Yi

*Assistant Professor*

*Department of Physiology, NUS Yong Loo Lin School of Medicine*

- Member, Department of Physiology, Healthy Longevity, and Cardiovascular Disease Translational Research Programmes at NUS Medicine
- Member, Neurobiology Programme at Life Sciences Institute
- Studies how cortical processing and plasticity enables individuals to recognize complex sounds and learn new skills
- Hopes his research will contribute towards improving speech comprehension by cochlear implant users and better stroke rehabilitation



### M Ganeshkumar

*Neuroscience PhD Candidate*

*Integrative Sciences and Engineering Programme (ISEP)*

*(advised by Dr Andrew Tan and Dr Shih-Cheng Yen)*

- Key interest in modelling few shot learning in biological systems
- Hopes to build intelligent machines and explore avenues in education to improve human intelligence or alleviate psychiatric disorders
- Enjoys discourses in philosophy, politics and economics

## Hear from our Past Participants

" I joined with very minimal knowledge about AI and neuroscience, but learnt so much about both fields throughout this course. The team developing the course put in a great amount of effort and planning. There was a clear and logical progression from the fundamental concepts to the building up of more complex ideas. The slides were easy to follow and the use of graphical visuals were effective. I liked that case studies and links to additional resources were provided for learners to explore this topic further. "

*- Peh Enqi, School of Science and Technology*



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## Hear from our Past Participants



" This course provided a clear and concise overview on how the AI deep learning technology is based on our understanding of neuroscience. The practical sessions were engaging and fun! "

- Jocelyn Chew, National University Singapore

" It was an interesting introduction to the concepts of machine learning and the neuroscience models that underpin it. "

- Feb 2021 Participant

## Course Fees

	International Participants	Singapore Citizens <sup>1</sup>		Singapore PRs	Enhanced Training Support for SMEs <sup>3</sup>
		39 years old or younger	40 years old or older <sup>2</sup>		
<b>Full Course Fee</b>	\$850.00	\$850.00	\$850.00	\$850.00	\$850.00
<b>Less: SSG Grant Amount</b>	-	\$595.00	\$595.00	\$595.00	\$595.00
<b>Nett Course Fee</b>	\$850.00	\$255.00	\$255.00	\$255.00	\$255.00
<b>7% GST on Nett Course Fee</b>	\$59.50	\$17.85	\$17.85	\$17.85	\$17.85
<b>Total Nett Course Fee Payable, Including GST</b>	\$909.50	\$272.85	\$272.85	\$272.85	\$272.85
<b>Less Additional Funding if Eligible Under Various Schemes</b>	-	-	\$170.00	-	\$170.00
<b>Total Nett Course Fee Payable, Including GST, after additional funding from the various funding schemes</b>	<b>\$909.50</b>	<b>\$272.85</b>	<b>\$102.85</b>	<b>\$272.85</b>	<b>\$102.85</b>

<sup>1</sup>All self-sponsored Singaporeans aged 25 and above can use their \$500 SkillsFuture Credit to pay for the course. Visit <http://www.skillsfuture.sg/credit> to select the course.

<sup>2</sup>Mid-Career Enhanced Subsidy (MCES) - Singaporeans aged 40 and above may enjoy subsidies up to 90% of the course fee.

<sup>3</sup>Enhanced Training Support for SMEs (ETSS) - SME-sponsored employees (Singapore Citizens and PRs) may enjoy subsidies up to 90% of the course fee.



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