Deep Learning
COMP 5329

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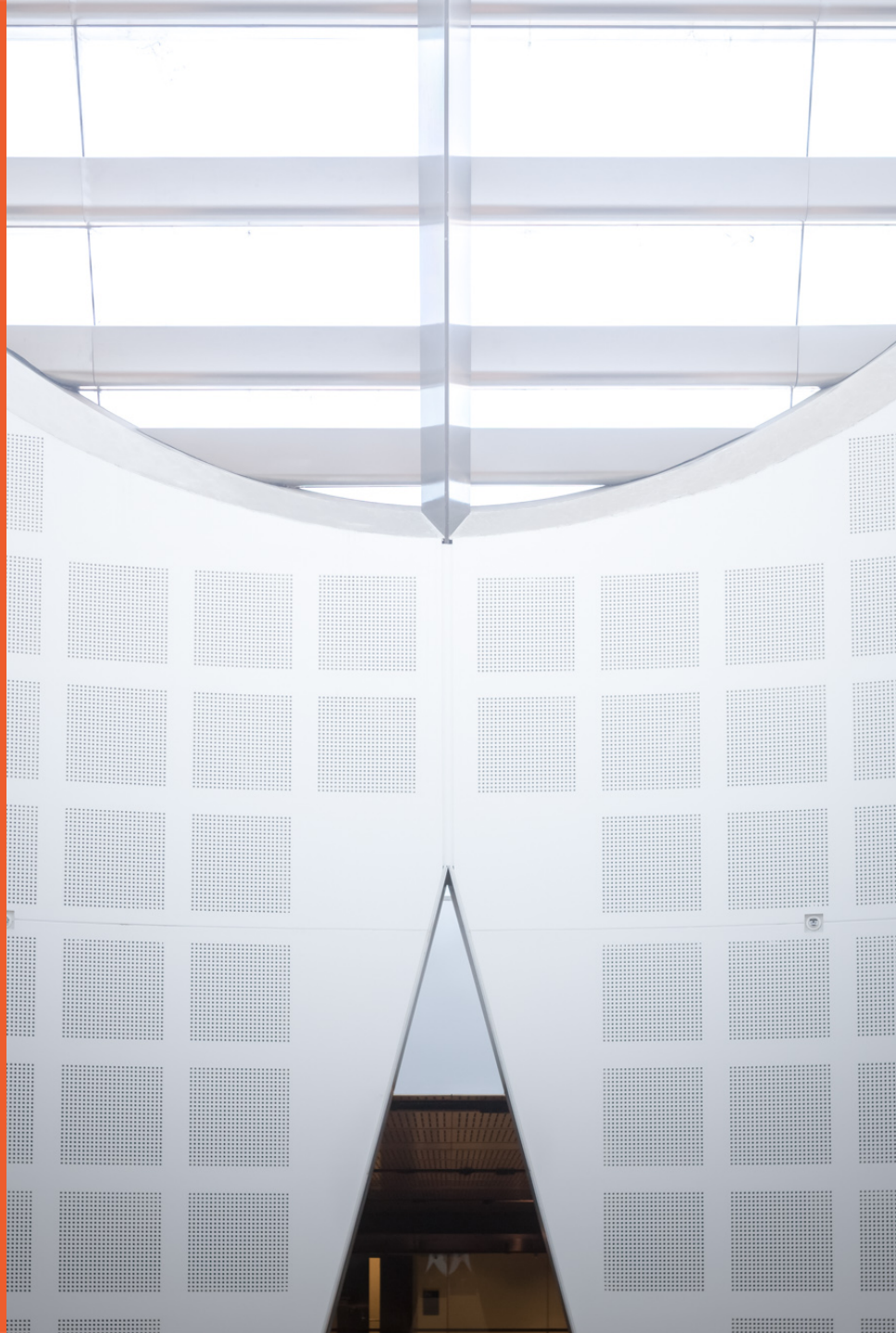
School of Computer Science

THE UNIVERSITY OF SYDNEY

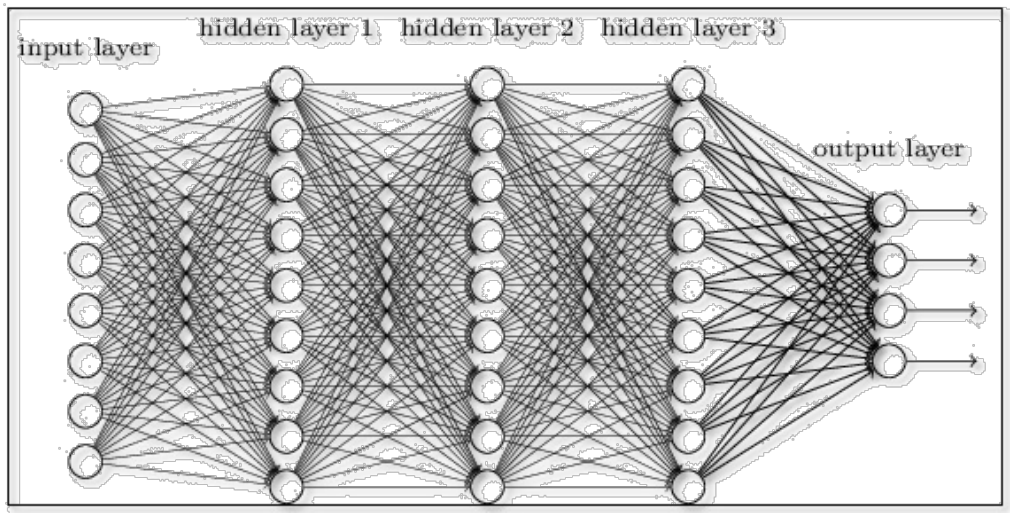


What is Deep Learning?

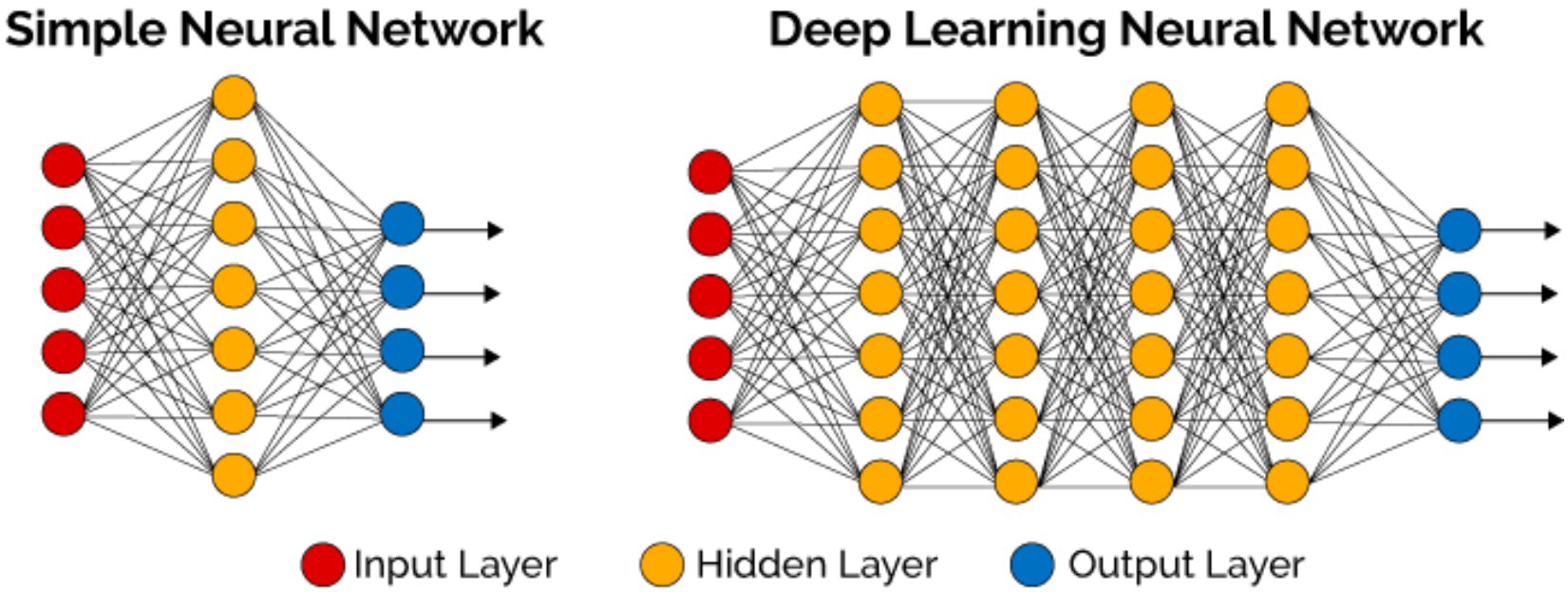
The short answers

1. **'Deep Learning' means** using a **neural network** with **several layers of nodes** between input and output

2. **the series of layers between input & output to do feature identification and processing in a series of stages, just as our brains seem to.**



What is Deep Learning?

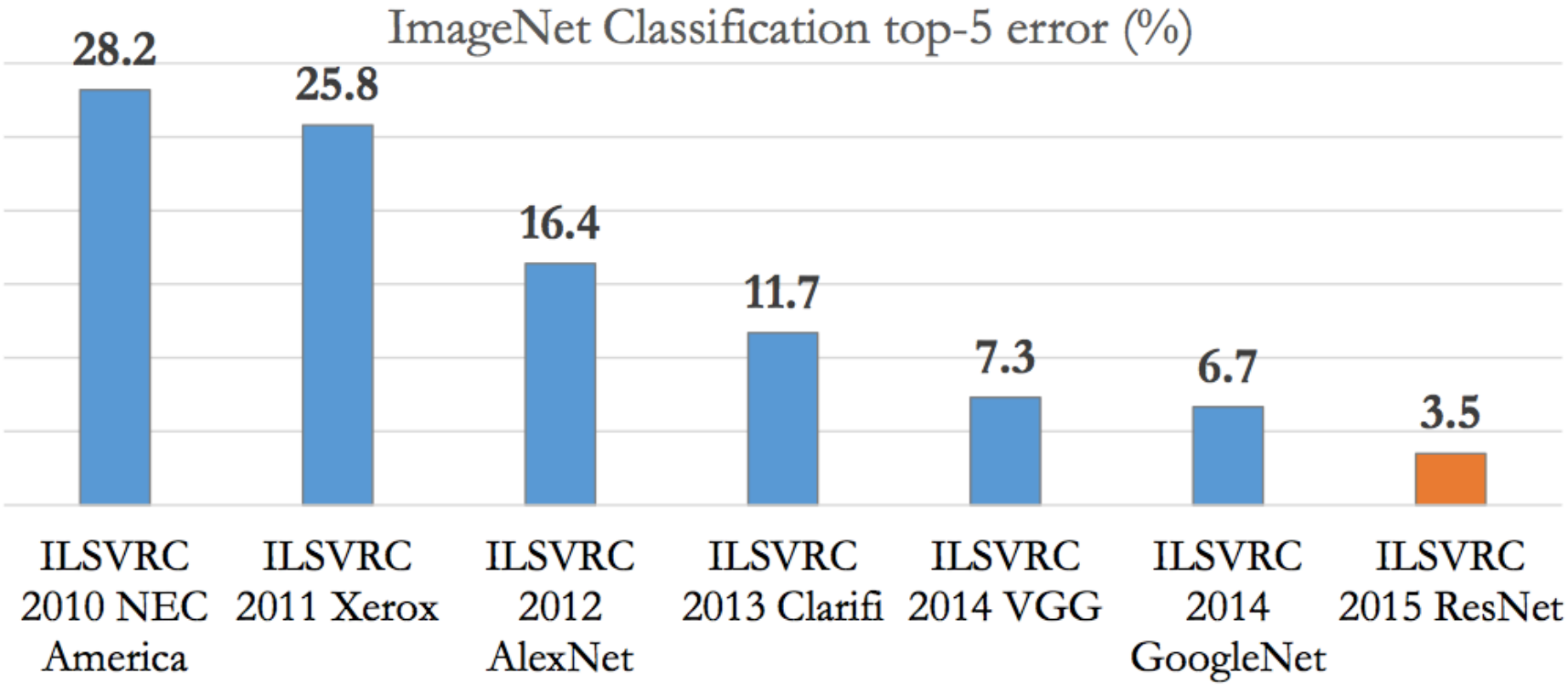


We have always had good algorithms for learning the weights in networks with 1 hidden layer;

But these algorithms are not good at learning the weights for networks with more hidden layers

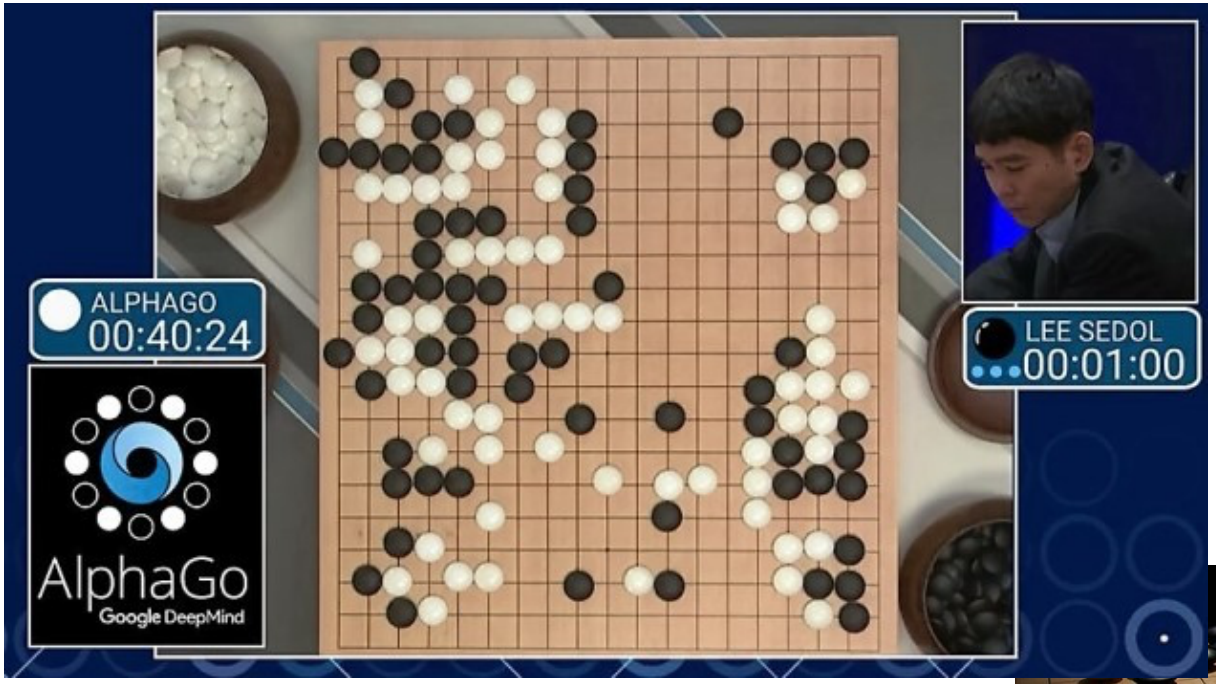
Image credit to becominghuman.ai

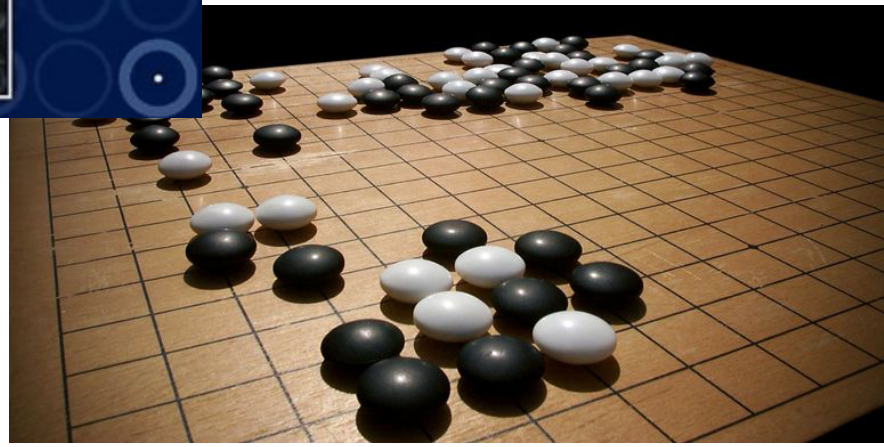
Why to Study Deep Learning?



Human: 5.1% Top-5 error rate.

Why to Study Deep Learning?





Google Deep Mind

AlphaGO defeats world champion

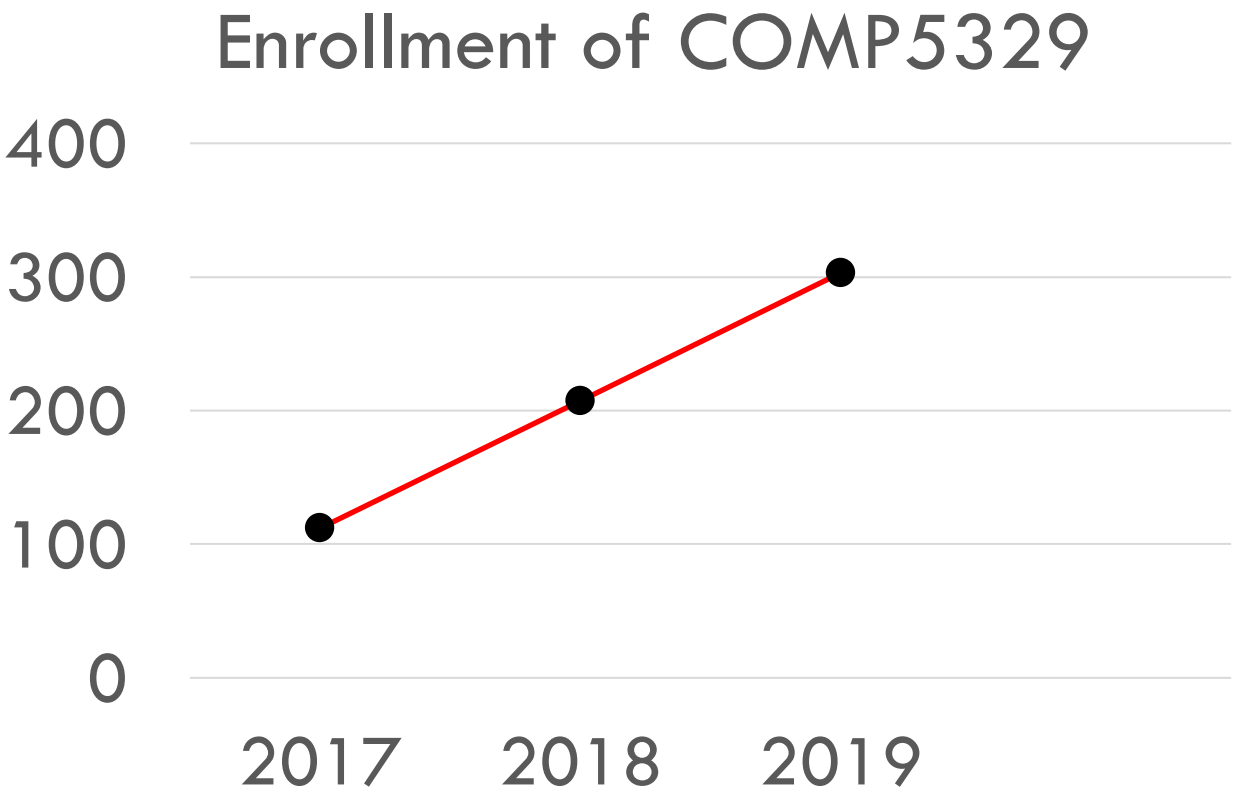
Why to Study Deep Learning?

What to Learn?

Week	Topic
1	Introduction to Deep Learning
2	Multilayer Neural Network
3	Optimization for Deep Models
4	Regularization for Deep Models
5	Quiz
6	Convolutional Neural Networks
7	Holiday
8	Neural Network Architectures
9	Recurrent Neural Network and LSTM
10	Graph Neural Networks
11	Deep Learning Applications
12	Deep Generative Models
13	Review

Call for a "student representative group"

- It was a volunteering activity for the students. Total number of students in the group is limited to 5.



Call for a "student representative group"

- It is a volunteering activity for the students. Total number of students in the group is limited to 5.

- The group meets with the teaching team twice; in weeks 3 and 10.

- No formal feedback form or interview is provided rather they are informal meetings to probe how the students feel throughout the course and what are the main concerns of the bulk of the class who cannot or do not want to communicate with the teaching team directly.

* We expect diverse background of members in the group.

* Make an application at https://bit.ly/2ThR3nj

Places

- **Lecture: every Friday, 18:00 – 20:00**

  Carslaw Lecture Theatre 157

- **Consultation: Friday, 15:00-16:00 316, Level 3, J12**

- **Online Consultation: Friday, 14:00-15:00.**

  * This is mainly for off-campus students who are influenced by Australia's coronavirus travel ban. Please book a slot via https://bit.ly/2P5vhSp

- **Teaching Assistant: Shumin Kong <shumin.kong@sydney.edu.au>**

Labs : every Friday 20:00 – 21:00 (from the 2nd week)

See Unit Information on Canvas:

School of Information Technologies Laboratory 114	https://uni-sydney.zoom.us/j/6131711717?pwd=K3lENldHaURNRUZsWDE1M0J3YVNLZz09
School of Information Technologies Laboratory 115	https://uni-sydney.zoom.us/j/879937958?pwd=YlhVaisyVU9rMnRXbUMrNUhrOEQrUT09
School of Information Technologies Laboratory 116	https://uni-sydney.zoom.us/j/534177774?pwd=YTFOU3hIdlFzTGJKcFA5RFIzYmVhdz09
School of Information Technologies Laboratory 117	https://uni-sydney.zoom.us/j/624698524?pwd=QnozWGh3djJHMVQvYlFHV2dtQ00rUT09
School of Information Technologies Laboratory 118	https://uni-sydney.zoom.us/j/3190594343?pwd=TkpFL3FNSWtuZVZ0TXc5cXNKTURYUT09
School of Information Technologies Laboratory 130A	https://uni-sydney.zoom.us/j/5511759961?pwd=emVXTnluOEk5TjBoR1Z6TDlxY3NhQT09
School of Information Technologies Laboratory 130B	https://uni-sydney.zoom.us/j/2660685272?pwd=aFJ0MmFHdERmZXdtTGRMZWdmaGlVQT09
Madsen Computer Lab 300	https://uni-sydney.zoom.us/j/6078603560?pwd=ck1jZUlCM1QwL2FiVDViaGwxR3NRQT09
Madsen Computer Lab 211	
Madsen Computer Lab 226	
Madsen Computer Lab 302	
CS Lab 457	
ABS Interactive Learning Studio 1090	https://uni-sydney.zoom.us/j/9541660210?pwd=MEdoa3ltMTZXbWhyY25NODA4ZHpmdz09

1. Review the lecture slides (around 20 mins)
2. Q&A

* Tutors will use zoom for tutorials in labs.

Expectations

- Students attend scheduled classes, and devote an *extra* 6-9 hrs per week
  - doing assessments
  - preparing and reviewing for classes
  - revising and integrating the ideas
  - practice and self-assess
- Students are responsible learners
  - Participate in classes, constructively
    - Respect for one another (criticize ideas, not people)
    - Humility: none of us knows it all; each of us knows valuable things
  - Check Canvas site at least once a week!
  - Notify academics whenever there are difficulties
  - Notify group partners honestly and promptly about difficulties

Special Consideration (University policy)

- If your performance on assessments is affected by illness or misadventure
- Follow proper bureaucratic procedures
  - Have professional practitioner sign special USyd form
  - Submit application for special consideration online, upload scans
  - Note you have only a quite short deadline for applying
  - http://sydney.edu.au/current_students/special_consideration/
- Also, notify coordinator by email *as soon as anything begins to go wrong*
- There is a similar process if you need special arrangements eg for religious observance, military service, representative sports

Late assessments in COMP5329

- Suppose you hand in work after the deadline:
- If you have not been granted special consideration or arrangements
  - A penalty of 5% of the maximum marks will be taken per day (or part) late. After ten days, you will be awarded a mark of zero.
- *e.g. If an assignment is worth 40% of the final mark and you are one hour late submitting, then the maximum marks possible would be 38%.*
- *e.g. If an assignment is worth 40% of the final mark and you are 28 hours late submitting, then the maximum marks possible marks would be 36%.*
- Warning: submission sites get very slow near deadlines
- Submit early; you can resubmit if there is time before the deadline

Academic Integrity (University policy)

- "The University of Sydney is unequivocally opposed to, and intolerant of, plagiarism and academic dishonesty.
  - Academic dishonesty means seeking to obtain or obtaining academic advantage for oneself or for others (including in the assessment or publication of work) by dishonest or unfair means.
  - Plagiarism means presenting another person's work as one's own work by presenting, copying or reproducing it without appropriate acknowledgement of the source." [from site below]
- http://sydney.edu.au/elearning/student/EI/index.shtml
- Submitted work is compared against other work (from students, the internet, etc)
  - TurnitIn for textual tasks (through Canvas), other systems for code
- Penalties for academic dishonesty or plagiarism can be severe
- Complete self-education AHEM1001 (required to pass INFOxxxx)

COMP5329: Resources

- Canvas: https://canvas.sydney.edu.au/
  - Login using Unikey and password
  - Link to Units website: https://sydney.edu.au/units/
    - Official schedule, list of learning outcomes, etc
  - Copies of slides
  - Lab instructions
  - Assignment instructions
  - Lecture videos
  - *Submit official assignment work here*;
  - see your grades; etc

  - Discussion forum: on edstem

COMP5329 Reference book

Goodfellow I J, Bengio Y, Courville A, *Deep Learning*. MIT Press, 2016.

LeCun Y, Bengio Y, Hinton G. Deep learning[J]. nature, 2015, 521(7553): 436-444.

- **We will use PyTorch in labs.** PyTorch documentation can be found at https://pytorch.org/docs/stable/index.html

COMP5329 Reference book

Applied Math and Machine Learning Basics:

Goodfellow I J, Bengio Y, Courville A, *Deep Learning*. MIT Press, 2016.

Assessment Overview

- **Quiz: 10%**
  - Week 5 (27-March) in-lab, 20:00 - 21:00
  - Individual on Canvas

- **Assignment 1: 15%**
  - Week-9 (1-May) 18:00
  - Groups of 2 or 3 students
  - Classification task

- **Assignment 2: 15%**
  - Week 13 (29-May), 18:00
  - Groups of 2 or 3 students for Competition Track
  - Groups of 2 or 3 students for Research Track

- **Final exam: 60%**
  - June 2020 (date to be defined)

Call for research track abstracts for Assignment 2 (see Canvas)

- This research track calls for brave new ideas on deep learning. In this track, you are encouraged to propose and investigate new algorithms or problems in deep learning.
- You must not use the project (e.g. your capstone or SSP project) that you have already done or are currently doing in other units to participate in this track.
- An extended abstract (up to one page) to highlight the importance and novelty of your research problem, the major idea of your candidate solution, the feasibility of the proposed research, and the expected experimental achievements (if applicable).
- 10 groups will be selected.
- Abstract Submission Deadline: Week 5 (27 March, 18:00)
  Abstract Decision: Week 6 (3 April)

Coronavirus (COVID-19)

- We can protect ourselves by following good hygiene, for example:
  - **Washing our hands regularly**, for at least 20 seconds with soap and water, or by using an alcohol-based hand rub
  - **Applying good cough etiquette** - covering your mouth when coughing and sneezing with a tissue or a flexed elbow
  - **Avoiding close contact with anyone with cold or flu symptoms**, e.g. fever, cough, runny nose or shortness of breath

Coronavirus (COVID-19)

- **All staff and students who have cold or flu symptoms should isolate themselves from others**

- If you have a non-infectious condition such as asthma or hayfever please let your teacher and classmates know

- If you are otherwise unwell with cold or flu symptoms please excuse yourself from this class and **we will support you to continue the work remotely**

- Make sure you read the information on **special consideration in the unit outline.**

Coronavirus (COVID-19)

- The University is following advice from the government and related public health authorities
  - For the latest information, see the advice on the University website
- It's important to remember that the University is a **respectful environment and that racism won't be tolerated** in the classroom, online or on campus
  - Student video
- Please take care of each other and yourselves and if you need support reach out to your unit coordinator or the health and wellbeing area of the Current Student website

Coronavirus (COVID-19)

- The risk of contracting coronavirus (COVID-19) remains very low. This may change and the University is still monitoring the situation closely.
  - For the latest information, see the advice on the University website
- Remember good hygiene practices: -
  - Frequent handwashing
  - Cough etiquette
  - Cough or sneeze into a tissue or your flexed elbow.

Coronavirus (COVID-19)

- If you have a known medical condition that is not infectious, but have respiratory symptoms, such as asthma or hayfever, please be open with the people around you, they will be understanding
- If you are otherwise unwell or exhibiting respiratory symptoms (e.g. fever, cough, runny nose) we ask that you please exclude yourself from the class (even if you are wearing a surgical mask) and we will support you to continue the work remotely or bring you up to speed asap
- Make sure you read the information on special consideration in the unit outline

Coronavirus (COVID-19)

- The University is a respectful environment and that racism won't be tolerated in the classroom, online or on campus
  - Student video

WHS Induction

School of Computer Science

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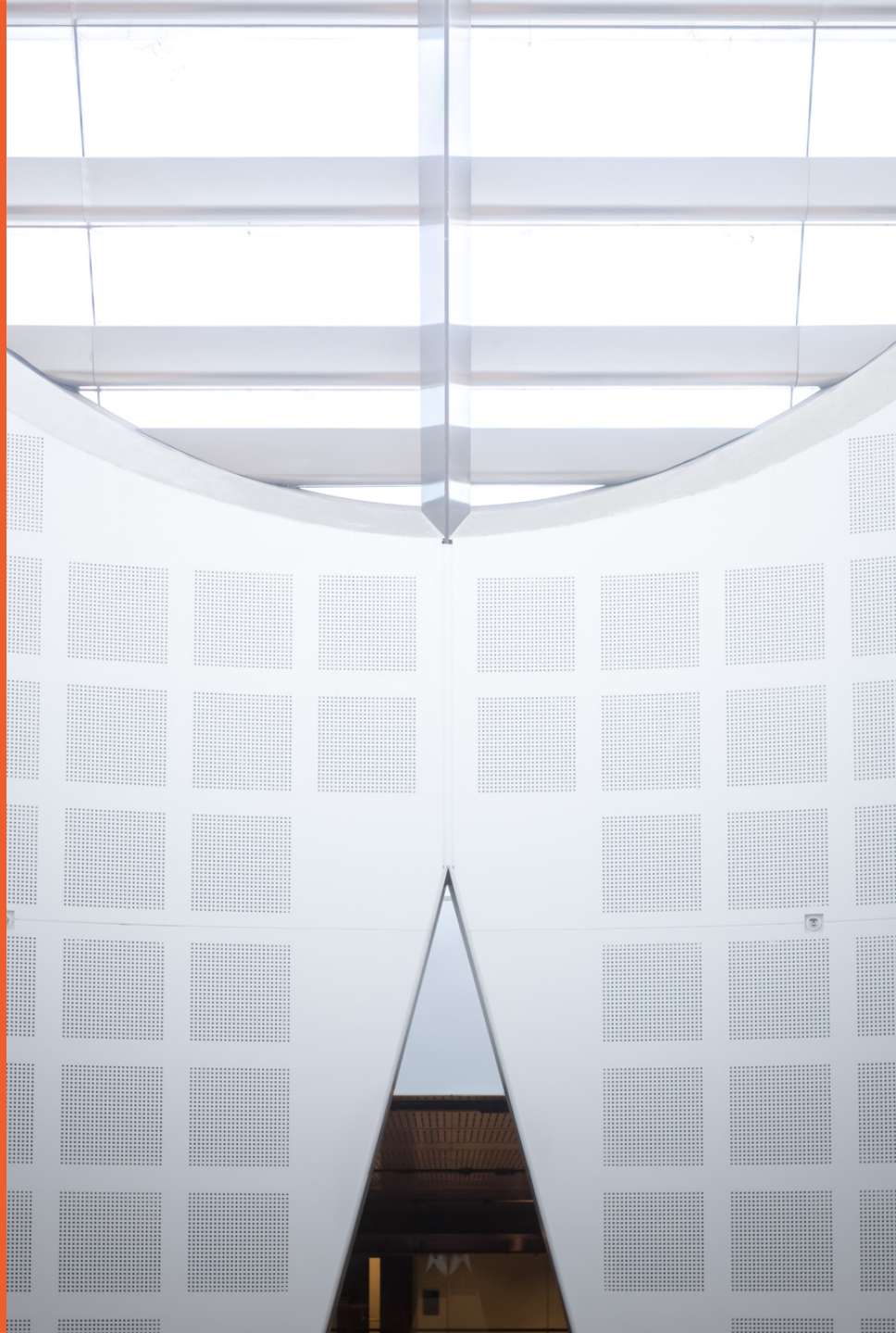


General Housekeeping – Use of Labs

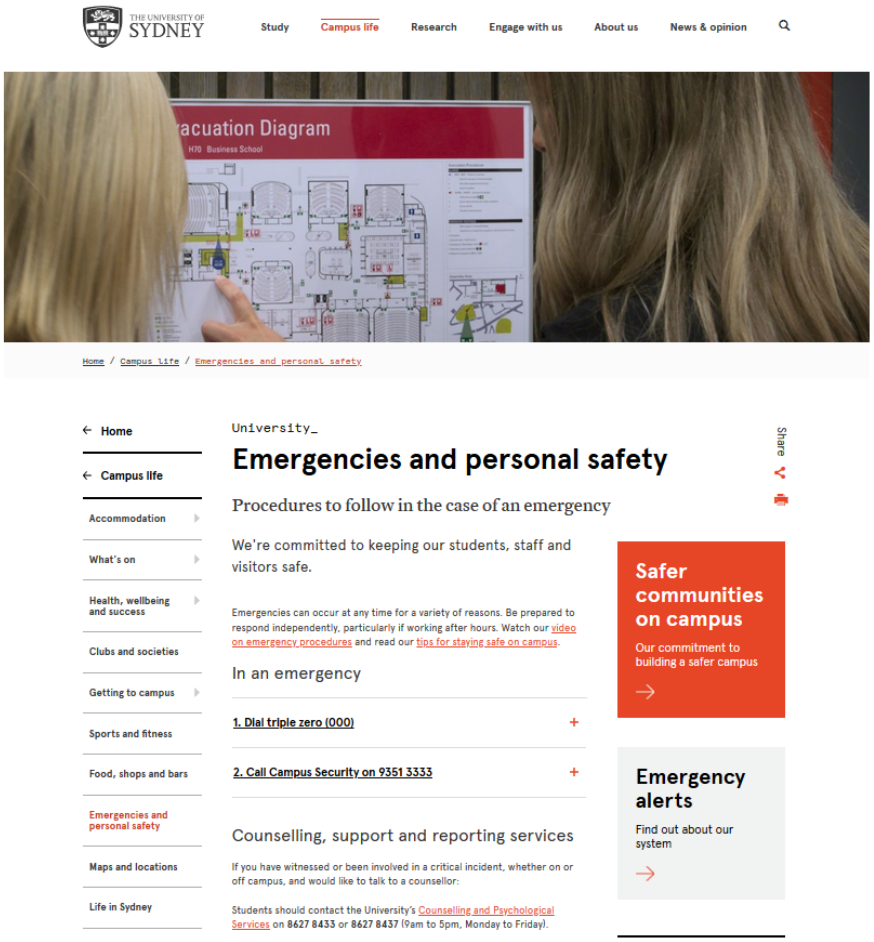
- Keep work area clean and orderly
- Remove trip hazards around desk area
- No food and drink near machines
- No smoking permitted within University buildings
- Do not unplug or move equipment without permission





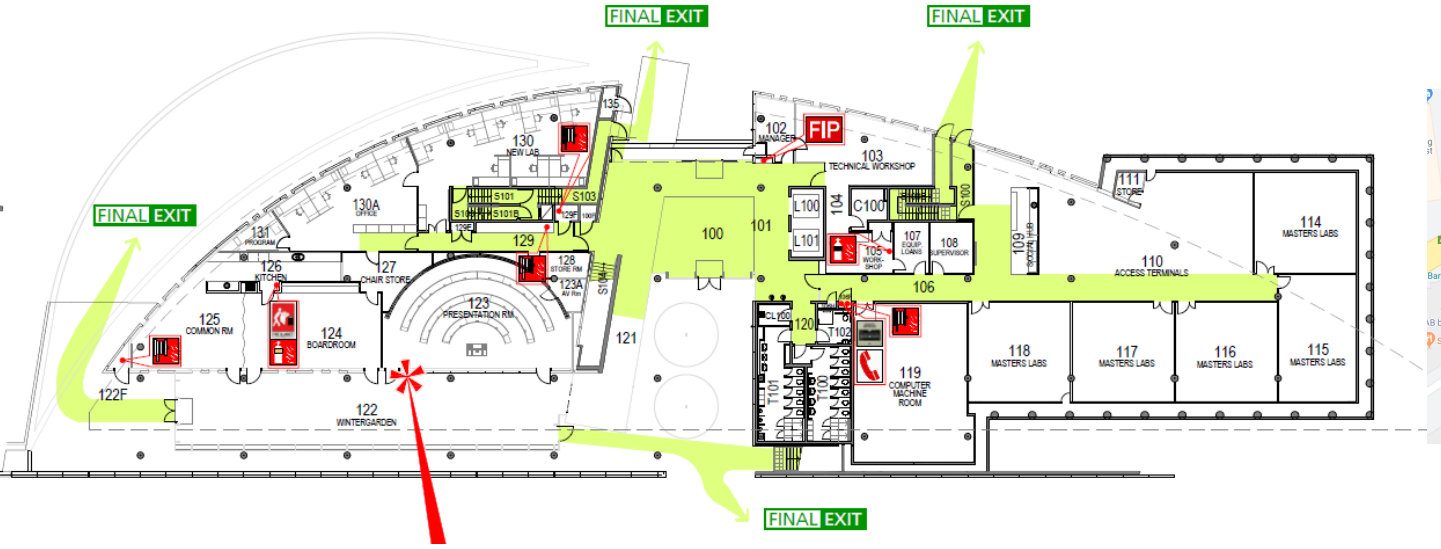
EMERGENCIES – Be prepared

https://sydney.edu.au/campus-life/safety-security.html

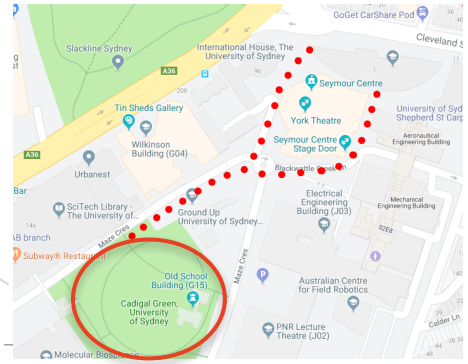


EMERGENCIES

WHERE IS YOUR CLOSEST SAFE EXIT ?



Assembly Area:
Cadigal Green



EMERGENCIES

Evacuation Procedures

ALARMS

BEEP... BEEP... Prepare to evacuate

1. Check for any signs of immediate danger.
2. Shut Down equipment / processes.
3. Collect any nearby personal items.

WHOOP... WHOOP... Evacuate the building

1. Follow the EXIT exit signs.
2. Escort visitors & those who require assistance.
3. DO NOT use lifts.
4. Proceed to the assembly area.

EMERGENCY RESPONSE

1. Warn anyone in immediate danger.
2. Fight the fire or contain the emergency, if safe & trained to do so.

If necessary...

3. Close the door, if safe to do so.
4. Activate the "Break Glass" Alarm  or 
5. Evacuate via your closest safe exit. EXIT 
6. Report the emergency to 0-000 & 9351-3333

MEDICAL EMERGENCY

- If a person is seriously ill/injured:
  1. **call an ambulance 0-000**
  2. **notify the closest Nominated First Aid Officer**

     If unconscious– send for Automated External Defibrillator (AED)
     AED **locations**.

     NEAREST to CS Building (J12)
     - Electrical Engineering Building, L2 (ground) near lifts
     - Seymour Centre, left of box office
     - Carried by all Security Patrol vehicles

  3. **call Security -** 9351-3333
  4. **Facilitate the arrival of Ambulance Staff (via Security)**

Nearest Medical Facility
University Health Service in Level 3, Wentworth Building

First Aid kit – SIT Building (J12)
kitchen area adjacent to Lab 110

School of Computer Science Safety Contacts

CHIEF WARDEN

Greg Ryan
Level 1W 103
9351 4360
0411 406 322

FIRST AID OFFICERS

Julia Ashworth
Level 2E Reception
9351 3423

Will Calleja
Level 1W 103
9036 9706
0422 001 964

Katie Yang
Level 2E 237
9351 4918

Orally REPORT all INCIDENTS & HAZARDS to your SUPERVISOR

OR

Undergraduates:	to Katie Yang 9351 4918
Coursework Postgraduates:	to Cecille Faraizi 9351 6060 or Keiko Narushima 8627 0872
CS School Manager:	Priyanka Magotra 8627 4295

Assistance

- There are a wide range of support services available for students: https://sydney.edu.au/campus-life/health-wellbeing-success.html
- Please make contact, and get help
- You are not required to tell anyone else about this
- If you are willing to inform the unit coordinator, they may be able to work with other support to reduce the impact on this unit
  - eg provide advice on which tasks are most significant

DISABILITY SERVICES

Do you have a disability?

- You may not think of yourself as having a 'disability' but the definition under the **Disability Discrimination Act** is broad and includes temporary or chronic medical conditions, physical or sensory disabilities, psychological conditions and learning disabilities.
- The types of disabilities we see include:
- anxiety, arthritis, asthma, asperger's disorder, ADHD, bipolar disorder, broken bones, cancer, cerebral palsy, chronic fatigue syndrome, crohn's disease, cystic fibrosis, depression, diabetes, dyslexia, epilepsy, hearing impairment, learning disability, mobility impairment, multiple sclerosis, post traumatic stress, schizophrenia , vision impairment, and much more.
- Students needing assistance must register with Disability Services –
  - it is advisable to do this as early as possible.
- http://sydney.edu.au/study/academic-support/disability-support.html

Do you have a disability?

You may not think of yourself as having a ‘disability’ but the definition under the **Disability Discrimination Act (1992)** is broad and includes temporary or chronic medical conditions, physical or sensory disabilities, psychological conditions and learning disabilities.

The types of disabilities we see include:
Anxiety // Arthritis // Asthma // Autism // ADHD
Bipolar disorder // Broken bones // Cancer
Cerebral palsy // Chronic fatigue syndrome
Crohn’s disease // Cystic fibrosis // Depression
Diabetes // Dyslexia // Epilepsy // Hearing impairment // Learning disability // Mobility impairment // Multiple sclerosis // Post-traumatic stress // Schizophrenia // Vision impairment
and much more.

Students needing assistance must register with Disability Services. It is advisable to do this as early as possible. Please contact us or review our website to find out more.

THE UNIVERSITY OF SYDNEY

Disability Services Office
sydney.edu.au/disability
02-8627-8422

Other support

- Learning support
  - http://sydney.edu.au/study/academic-support/learning-support.html
- International students
  - http://sydney.edu.au/study/academic-support/support-for-international-students.html
- Aboriginal and Torres Strait Islanders
  - http://sydney.edu.au/study/academic-support/aboriginal-and-torres-strait-islander-support.html
- Student organization (can represent you in academic appeals etc)
  - http://srcusyd.net.au/ or http://www.supra.net.au/
- Please make contact, and get help
- You are not required to tell anyone else about this
- If you are willing to inform the unit coordinator, they may be able to work with other support to reduce the impact on this unit
  - eg provide advice on which tasks are most significant

Advice

- Metacognition
  - Pay attention to the learning outcomes in Canvas
  - Self-check that you are achieving each one
  - Think how each assessment task relates to these
- Time management
  - Watch the due dates
  - Start work early, submit early
- Networking and community-formation
  - Make friends and discuss ideas with them
  - Know your tutor, lecturer, coordinator
  - Keep them informed, especially if you fall behind
    - Don’t wait to get help
- Enjoy the learning!