Department of Computer Science and Engineering
計算機科學與工程學系

Computer Engineering (CENG)
Computer Science (CSCI)
(JS4401 / BERGN)

Computer Engineering (CENG) or Computer Science (CSCI) ?

Difference between CENG and CSCI

- Computer Engineering is more about building things
  - » To take care of design and hardware/software integration (*e.g.*, lower cost, higher speed, more energy efficient)

- Computer Science is more about designing software solutions
  - » To take care of coding, software architecture, and the underlying theory

Growing Demand and Opportunities

- Skills in computer software, industrial automation, machine learning, network and security, robotics, *etc.* are of keen demand in many emerging jobs, according to LinkedIn 2020 Emerging Jobs Report

> Engineering isn't a new profession by any means, but engineering roles across the board are still seeing tremendous growth. More than 50% of this year's list was made up of roles related to engineering or development, with the emerging field of robotics appearing for the first time.

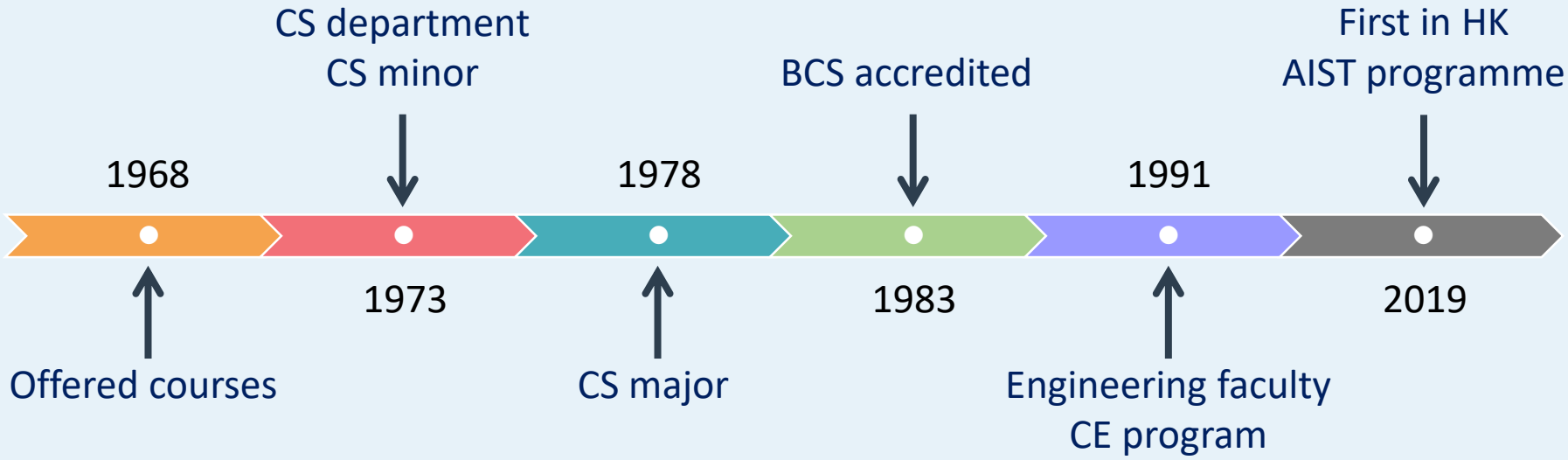
Reference:
https://business.linkedin.com/content/dam/me/business/en-us/talent-solutions/emerging-jobs-report/Emerging_Jobs_Report_U.S._FINAL.pdf

Department of Computer Science and Engineering

https://www.youtube.com/watch?v=fTq4tUMftw0&t=51s

A Long History

- The first “Computer Science” department in Hong Kong
- Both CSCI and CENG are accredited by HKIE
- A strong alumni network



Excellence in Teaching and Research

AI 2000 Most Influential Scholar Annual List

Prof. Michael Lyu, Prof. Irwin King and several professors in our CSE dept are named in the list, recognizing their research excellence in AI fields

ACM Fellows

Prof. Andrew Yao, Prof. Benjamin Wah, Prof. Martin Wong, Prof. Michael Lyu and Prof. John Lui

IEEE Fellows

Prof. Benjamin Wah, Prof. Martin Wong, Prof. Michael Lyu, Prof. Irwin King, Prof. John Lui and Prof. Leo Jia


Prof. Andrew Yao


Prof. Benjamin Wah


Prof. Martin Wong


Prof. Michael Lyu


Prof. Irwin King


Prof. John Lui


Prof. Leo Jia

CUHK University Education Award 2017

Prof. Jimmy Lee received this award for his outstanding commitment to teaching excellence


Prof. Jimmy Lee

Soaring High in the International

A strong "Computer Engineering" Group in the world:

#2 in Design Automation (CSRankings)

Prof. Martin Wong, Prof. Evangeline Young, Prof. Xu Qiang, Prof. Shao Zili, Prof. Yu Bei, Prof. Yang Ming-Chang, and alumni Lam Tak Kei


Prof. Martin Wong


Prof. Evangeline Young


Prof. Xu Qiang


Prof. Shao Zili


Prof. Yu Bei


Prof. Yang Ming-Chang

QS TOPUNIVERSITIES

QS World University Rankings by Subject

#30 in Computer Science & Information Systems

THE WORLD UNIVERSITY RANKINGS

THE Rankings by Subject

#36 in Computer Science

References:
CSRankings: *http://csrankings.org/*
CUHK Rankings:
https://www.cuhk.edu.hk/english/aboutus/cuhk-rankings.html

Recent Achievements in International Competitions

International Collegiate Programming Contest (ICPC)
(formerly named as ACM Programming Competition)

- 2019: ranked 12th *(over 3000 universities)*
- 2012: ranked 8th
- 2011: ranked 13th
- 2001: ranked 8th

Asia Student Supercomputer Challenge

- 2015: won the 1st prize
- 2013: ranked 7th out of 43

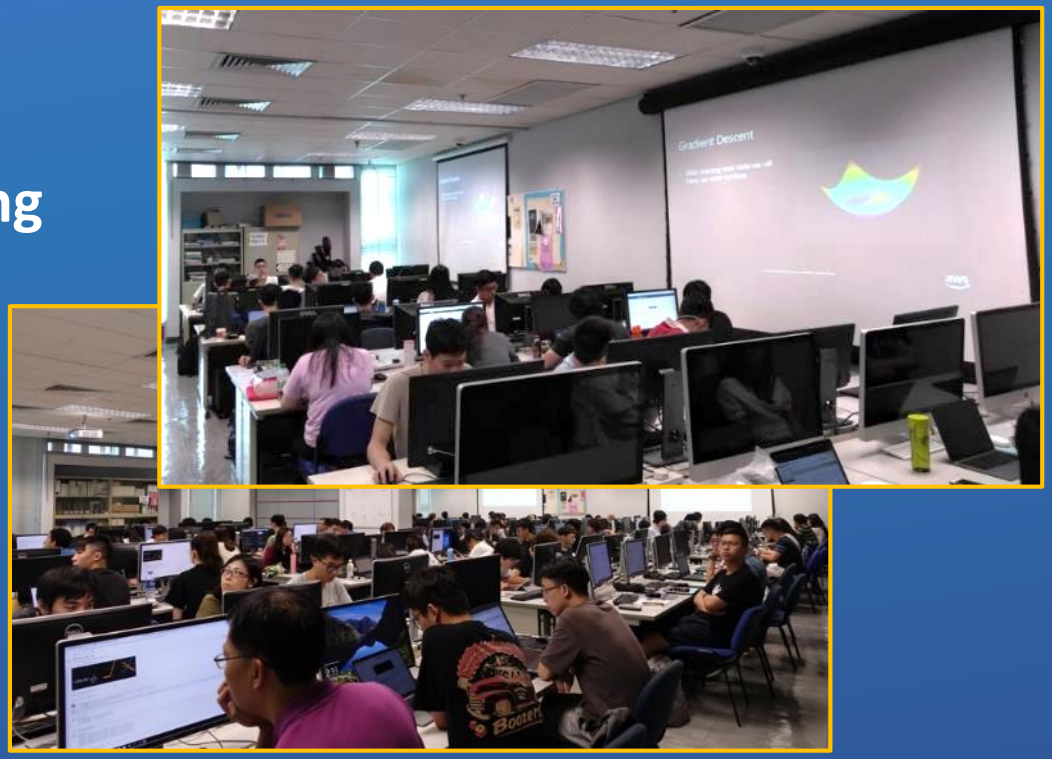
Intel Cup Undergraduate Electronic Design Contest

- 2012: won the champion
- 2010: won the top two prizes

Student Training

CUHK Amazon Deep Learning Workshop 2019

Cooperated with Amazon to offer student training in deep neural networks and machine learning



City Challenge – Bridge to a Smarter City 2016

Designed technology-based living applications for the elderly and won the second runner-up

Industrial Visits

- Visit to companies to learn latest development in industry

Work-Study Scheme

- One-year placement and internship for students to gain practical experience in a real working environment

Google

Microsoft

hp

HSBC

恒生銀行 HANG SENG BANK

新鴻基地產 Sun Hung Kai Properties

ASM Pacific Technology

HKSTP 香港科技園

FUJITSU

Strong Alumni Network

IT Industry

Microsoft

Google

IBM

NOKIA

amazon.com

facebook

Education

NUS National University of Singapore

Georgia Tech

Banking

HSBC

citibank

Morgan Stanley

Deutsche Bank

Deloitte.

Goldman Sachs

Sharing from Our CSE Students

The CSCI programme allowed a high degree of flexibility in learning. I could have a try in different fields, such as artificial intelligence, database, rich media, network security, etc., to explore my study interest and strengthen the relevant technical skills. I could then proceed to the more advanced topics for in-depth learning. The courses were challenging and demanding, yet helped me to build up a problem-solving mindset and self-confidence.

Maxwell CHAN,
CSCI Graduate of 2019

Sharing from Our CSE Students

Alvin LUK,
CENG Graduate of 2019

The CENG programme helped me to build up a solid foundation in logic, systems, and theories. It also places equal emphasis on providing practical experience. I am able to implement the knowledge and create my own projects. In my final year project, after repeated trials and adjustments in both the algorithm and hardware design, I am able to find out an optimized way to improve the precision and efficiency of an obstacle avoidance motor car.

Sharing from Our CSE Students

I feel extremely grateful to join the CUHK and AIST family with utmost grace and positivity. I am thankful to the professors, who have been very supportive throughout the year and are the reason behind my academic success.

Also, I have participated in many career guidance programmes, such as the CUHK Mentorship Programme, which helped me to grow professionally and understand the industry in Hong Kong. The experience and ongoing learning will definitely continue to widen my horizons.

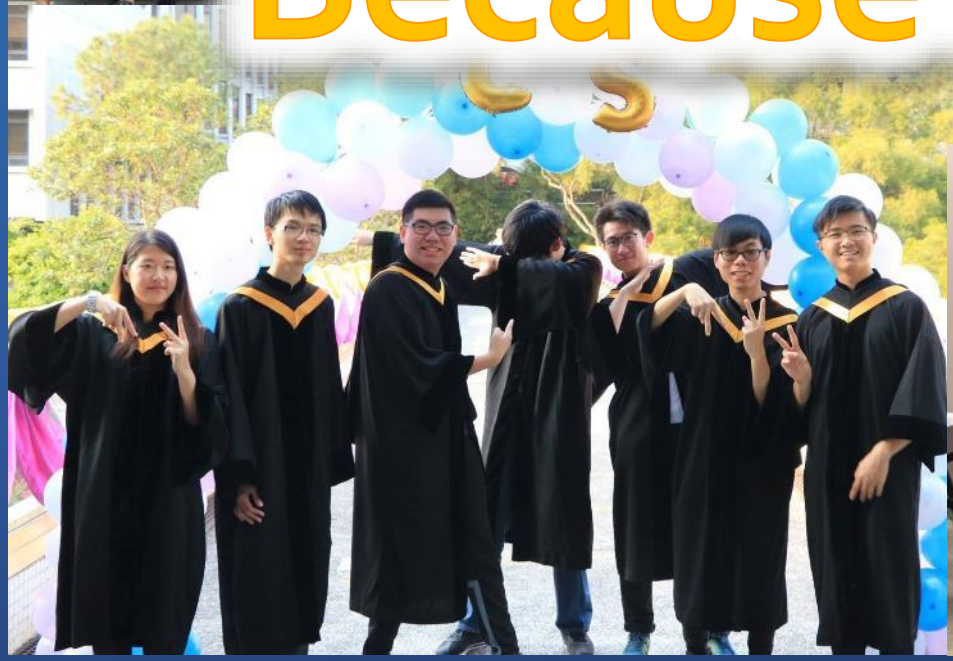
Aditi SINGH,
AIST Year 2 Student

What's More?

- Chances to create your own project and innovation with support and advice from CSE teachers
- Exchange opportunities to world-class universities
- High competitiveness in job market with 90% of CSE graduates employed within one month of graduation
- CSE teachers usually have the highest teaching evaluation scores

Why CSE Department?

Because it is fun!



Admission Arrangement and Requirements (First Year Entry)

Admission Arrangement (First Year Entry)

- Broad-based admission through Engineering (JS4401)

- Students will be allocated into one of the major programmes in Major Allocation after Year 1
  - » Computer Engineering (CENG)
  - » Computer Science (CSCI)
  - » Information Engineering (IE)
  - » Mathematics and Information Engineering (MIE)
  - » Mechanical and Automation Engineering (MAE)
  - » Systems Engineering and Engineering Management (SEEM)

Students with good admission grades may opt for "Priority Allocation" to guarantee their first choice!

Major Allocation: https://www.erg.cuhk.edu.hk/erg/UndergraduateProgrammes

Admission Requirements (For JUPAS Applicants)

HKDSE Subject	*Minimum Level*	*Subject Weighting*
HKDSE Core Subjects		
English Language	3	1
Chinese Language	3	1
Mathematics (Compulsory Part)	3	1.5
Liberal Studies	2	0.5
HKDSE Elective Subjects		
One specific science subject ^	3	1.5 – 1.75
Any one other subject #	3	1 – 1.75

^ *Specific science subjects include Maths M1/M2, Biology, Chemistry, Physics and Combined Science.*

\# *Preferred subjects include Maths M1/M2, Biology, Chemistry, Physics, Combined Science, DAT and ICT. Please refer to https://www.erg.cuhk.edu.hk/erg/Jupas for details of subject weighting.*

Selection is based on the Best 5 HKDSE subjects with subject weighting applied. Bonus points will be awarded to the 6th and 7th subjects, if any.

Admission Requirements (for Non-JUPAS & International Applicants)

- Applicants seeking admission on the strength of qualifications other than HKDSE examination results (*e.g.*, IB, GCE-AL, overseas qualifications) can apply through Non-JUPAS channels

- Will be considered on the basis of their education background and academic achievements

- Can apply for "Admission with Advanced Standing" *(for particular qualifications only)*

Check more details at OAFA's website!

Non-JUPAS Applications: http://admission.cuhk.edu.hk/non-jupas-yr-1/requirements.html
International Applications: http://admission.cuhk.edu.hk/international/requirements.html


Admission Arrangement
and Requirements
(Senior Year Entry)

Admission Arrangement (Senior Year Entry)

- Applicable for local applicants with Associate Degree or Higher Diploma qualifications only

- To meet the entrance requirements, you need to have,
  - » successfully completed a local course of study leading to the qualification of associate degree / higher diploma, preferably with overall CGPA ≥ 3.0 or equivalent, AND
  - » attained an acceptable level of proficiency in English and Chinese languages

Admission Arrangement (Senior Year Entry)

- To make your application competitive, you need to demonstrate capabilities in mathematics, programming and communication skills

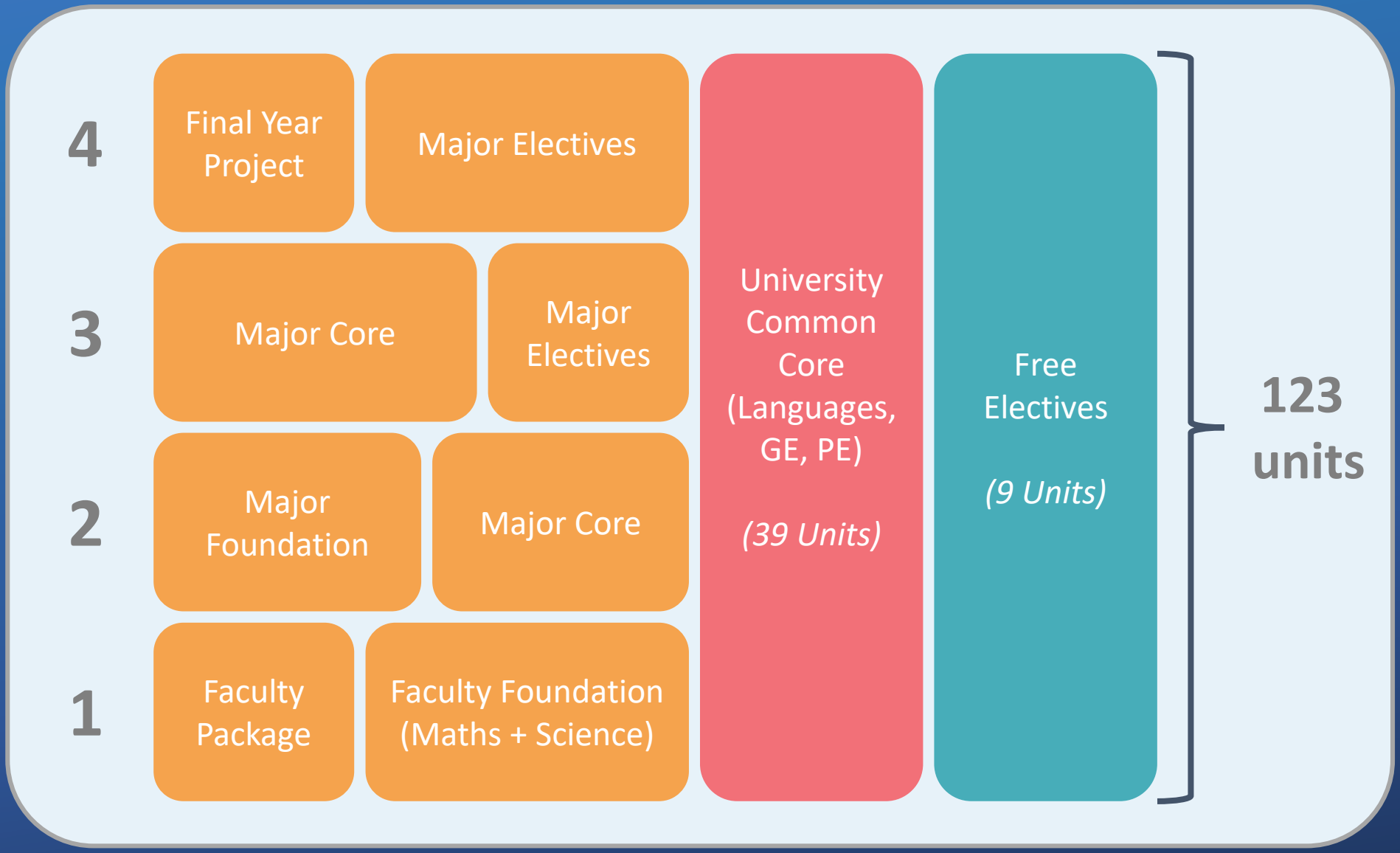
- If you are unsuccessful for the Senior Year Entry, you will be considered for the Broad-based Engineering (BERGN) First Year Entry with Advanced Standing

Check more details at OAFA's website!

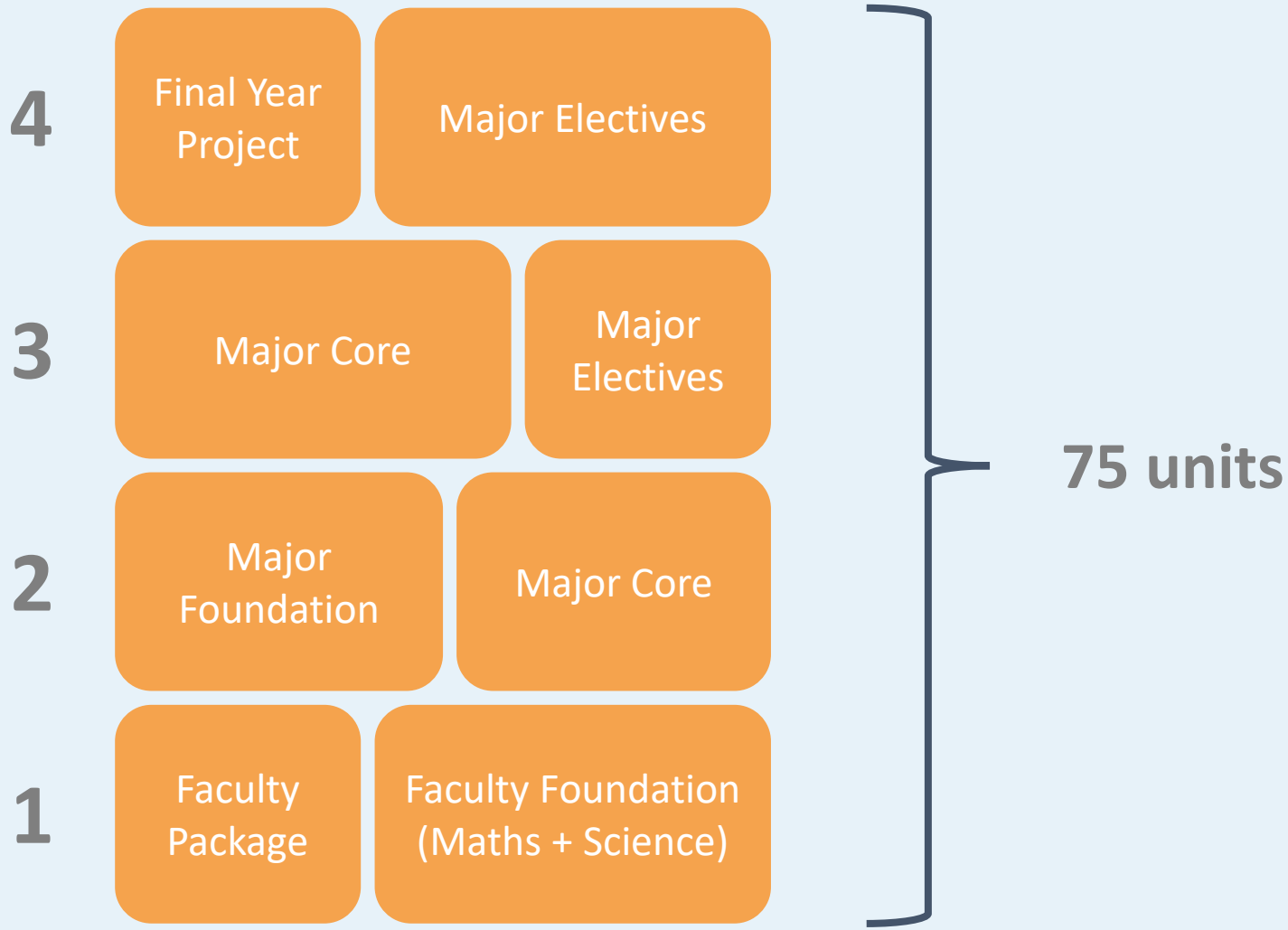
Senior Year Applications:
http://admission.cuhk.edu.hk/non-jupas-senior/requirements.html

Curriculum Structure
CENG & CSCI

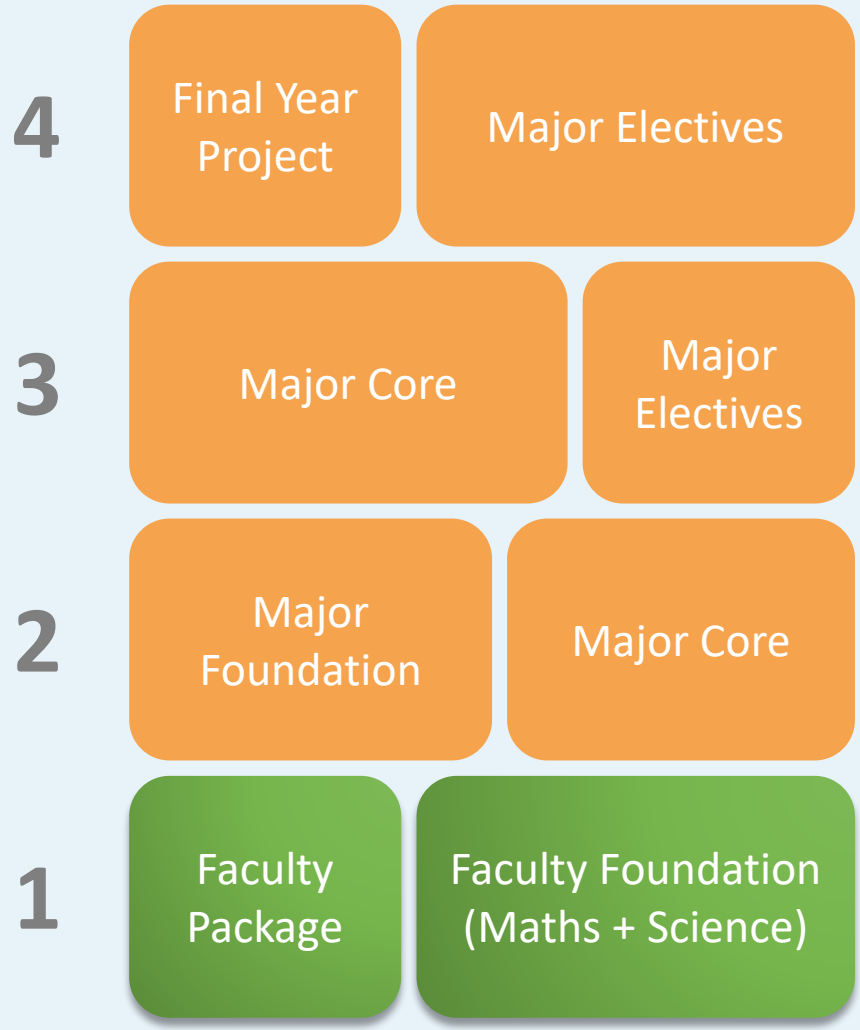
Curriculum – Overview



Curriculum – Major Requirements



Curriculum – Faculty Package and Foundation



Faculty Package and Foundation (15 units)

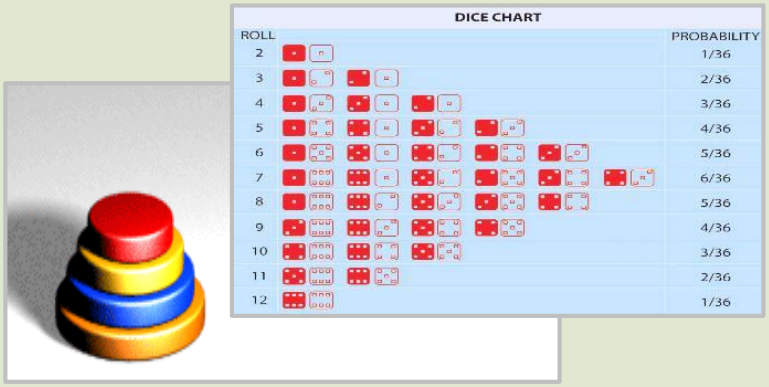
- Programming (ENGG1110)
- Linear Algebra (ENGG1120)
- Multivariable Calculus (ENGG1130)
- Calculus for Engineers (MATH1510)
- Foundation Science

Curriculum – Major Foundation *(for CENG)*

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Faculty Foundation (Maths + Science)

Major Foundation (11 units)

- C++ (CSCI1120)
- Complex Variables (ENGG2720)
- Differential Equations (ENGG2740)
- Probability (ENGG2760)
- Statistics (ENGG2780)



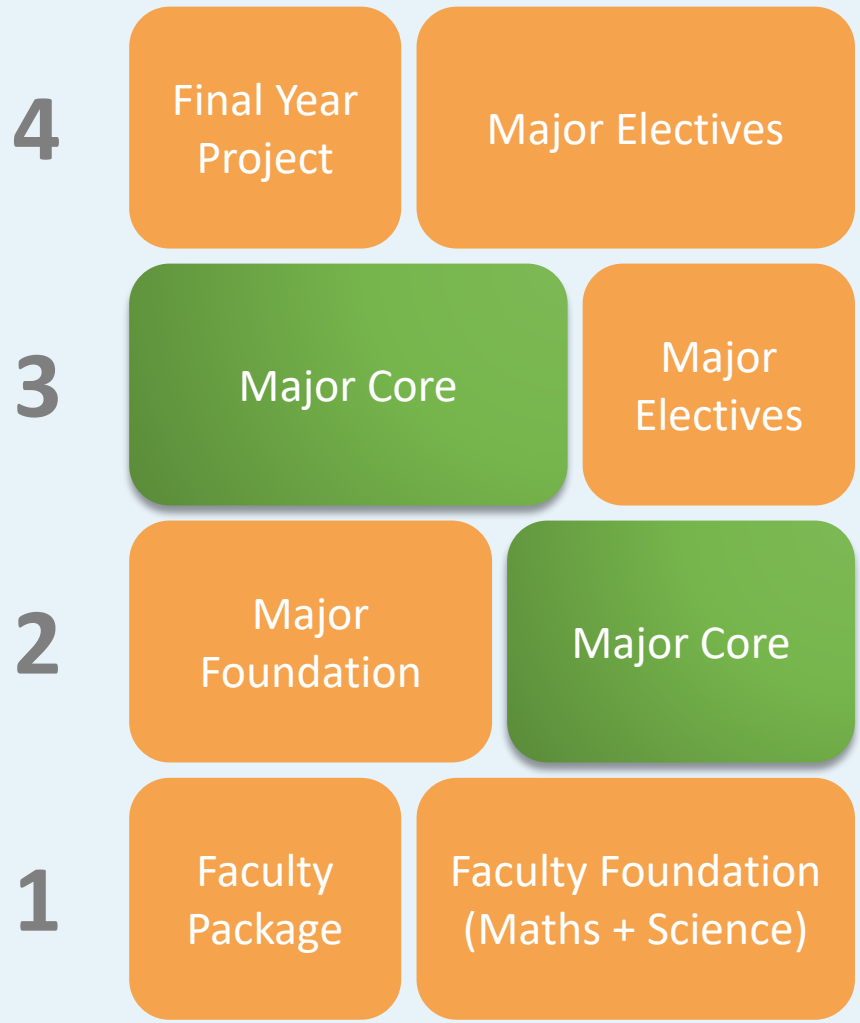
Curriculum – Major Core *(for CENG)*

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Faculty Foundation (Maths + Science)

Major Core (31 units)

- Digital Logic Design Laboratory (CENG2010)
- Fundamentals of Embedded Systems (CENG2030)
- Embedded System Design (CENG2400)
- Computer Organization and Design (CENG3420)

Curriculum – Major Core *(for CENG)*



Major Core (31 units)

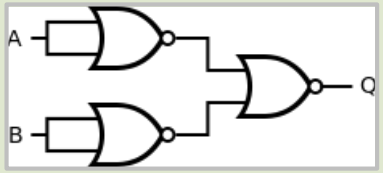
- Data Structures (CSCI2100)
- Software Engineering (CSCI3100)
- Intro to Operating Systems (CSCI3150)
- Discrete Mathematics and Algorithms (CSCI3190)
- Computers and Society (CSCI3250)
- Engineering Practicum (CSCI3251)

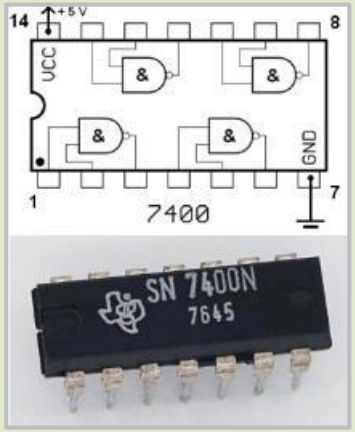
Curriculum – Major Core *(for CENG)*

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Faculty Foundation (Maths + Science)

Major Core (31 units)

- Fundamental of Electric Circuits (ELEG2202)
- Digital Logic and Systems (ENGG2020)





Curriculum – Major Electives *(for CENG)*

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Faculty Foundation (Maths + Science)

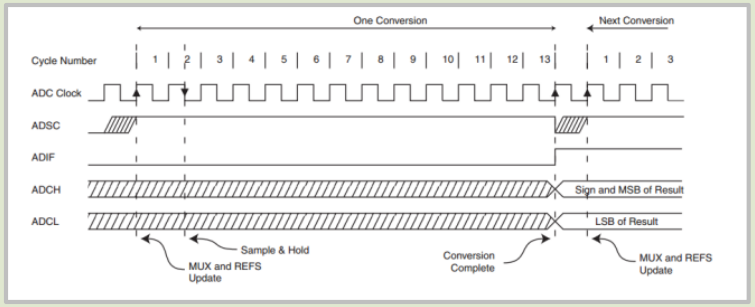
Major Electives (12 units)

Streams

1. Embedded Systems
2. VLSI Design and EDA

Non-Stream

3. General Computer Engineering

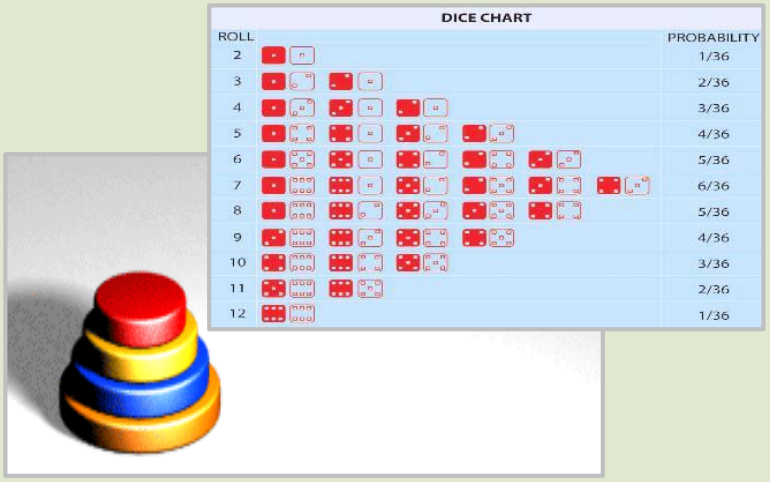


Curriculum – Major Foundation *(for CSCI)*

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Faculty Foundation (Maths + Science)

Major Foundation (10 units)

- Java (CSCI1130)
- Discrete Maths (ENGG2440)
- Probability (ENGG2760)
- Statistics (ENGG2780)

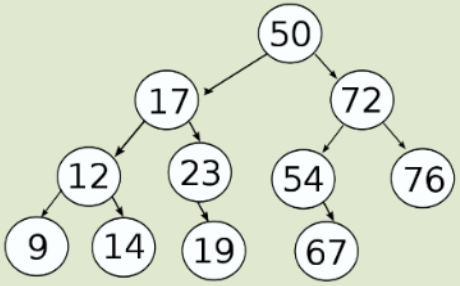


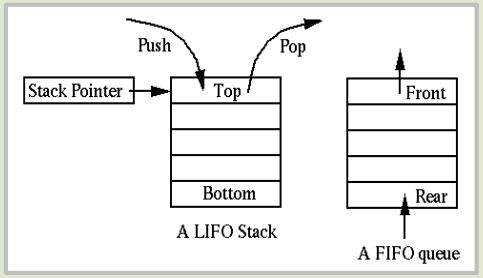
Curriculum – Major Core *(for CSCI)*

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Faculty Foundation (Maths + Science)

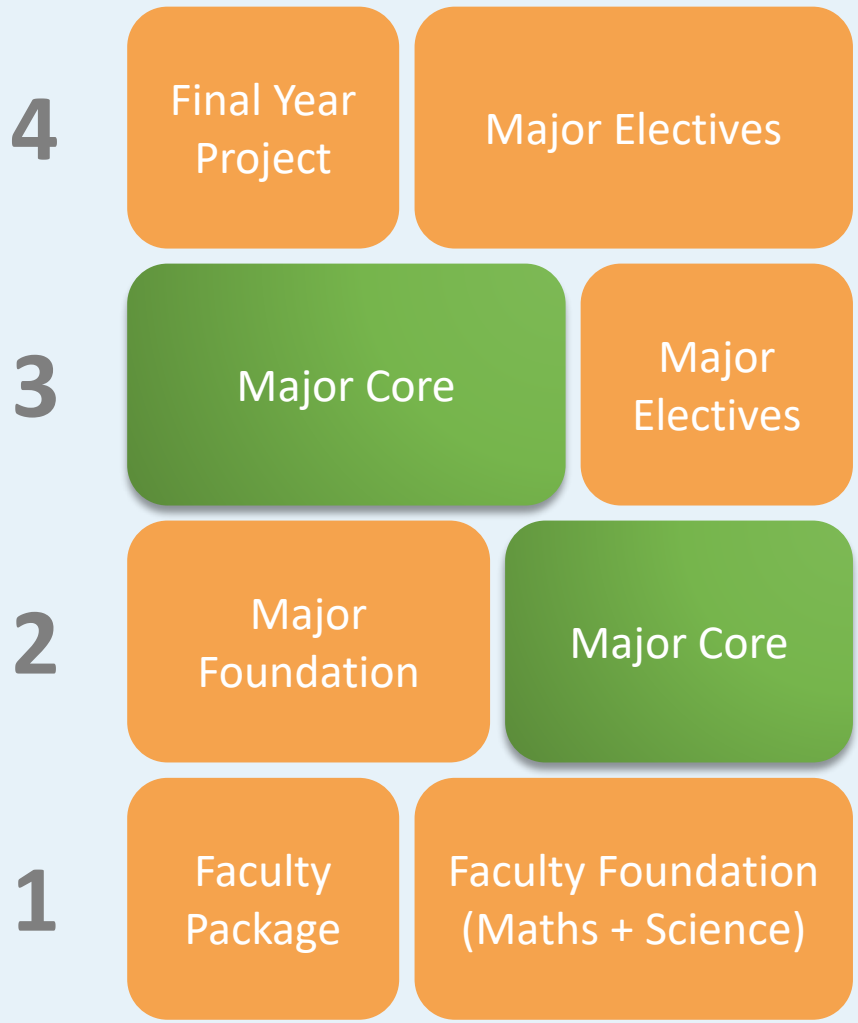
Major Core (27 units)

- Computer Organization and Design (CENG3420)
- Data Structure (CSCI2100)





Curriculum – Major Core *(for CSCI)*



Major Core (27 units)

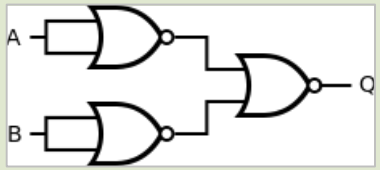
- Software Engineering (CSCI3100)
- Formal Languages and Automata Theory (CSCI3130)
- Intro to Operating Systems (CSCI3150)
- Design and Analysis of Algorithms (CSCI3160)
- Principles of Programming Languages (CSCI3180)

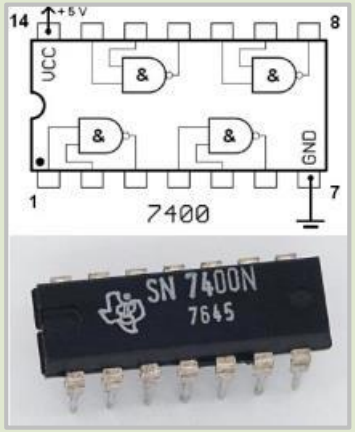
Curriculum – Major Core *(for CSCI)*

4	Final Year Project	Major Electives
3	Major Core	Major Electives
2	Major Foundation	Major Core
1	Faculty Package	Faculty Foundation (Maths + Science)

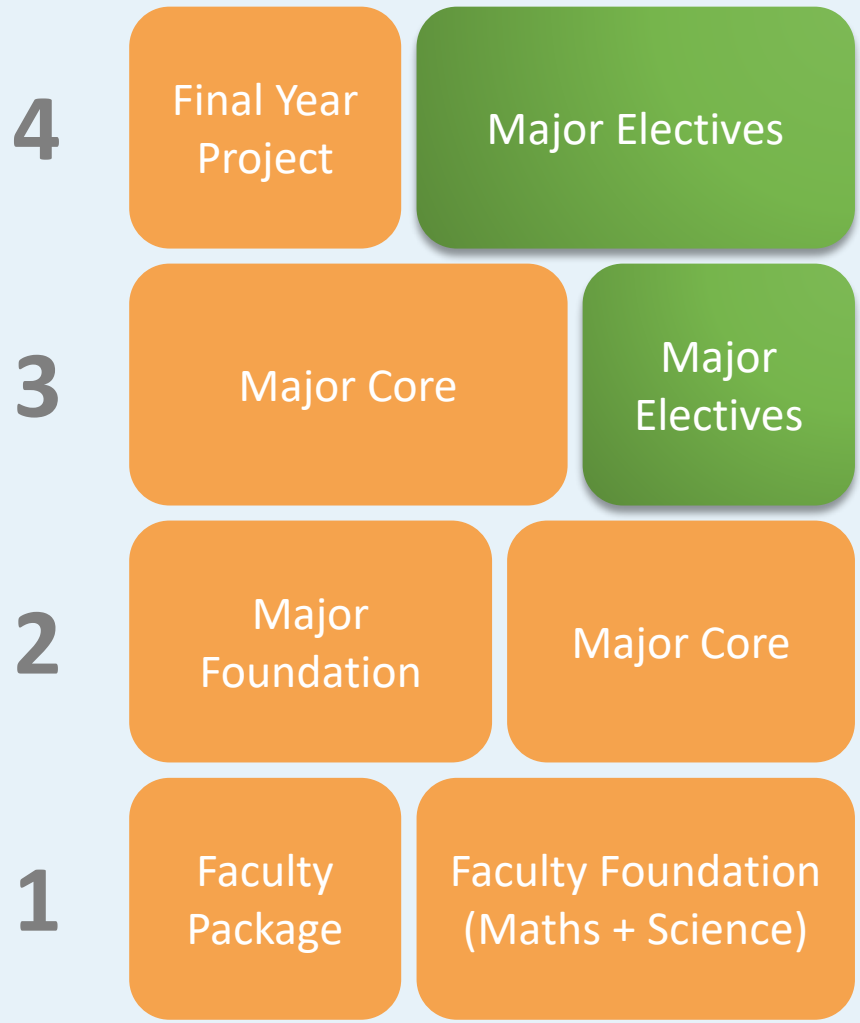
Major Core (27 units)

- Computers and Society (CSCI3250)
- Engineering Practicum (CSCI3251)
- Digital Logic and Systems (ENGG2020)





Curriculum – Major Electives *(for CSCI)*



Major Electives (17 units)

Streams

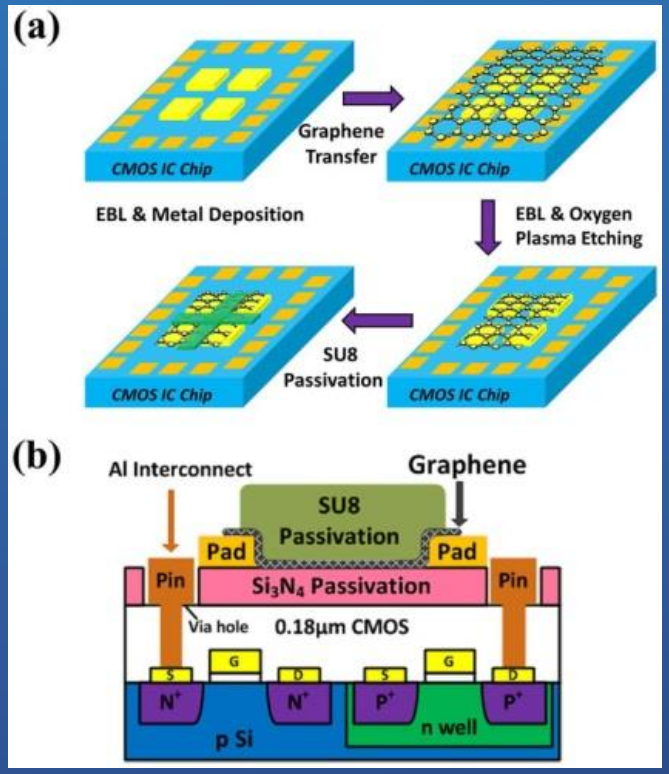
1. Intelligence Science
2. Database and Information Systems
3. Rich Media
4. Distributed Systems, Networks and Security
5. Algorithms and Complexity
6. Data Analytics

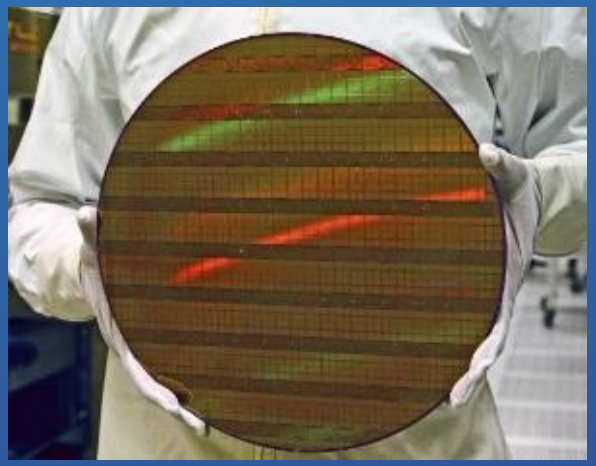
Non-Stream

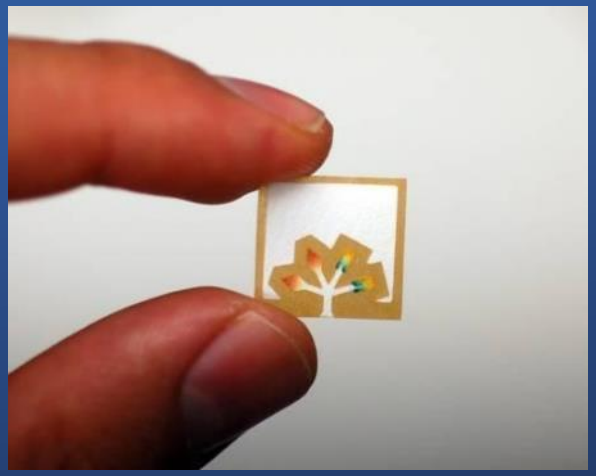
7. General Computer Science

Curriculum – Distinct Topics

- Computer-aided Design for Very Large Scale Integrated Circuits (CENG4120/CENG5030/CENG5270)

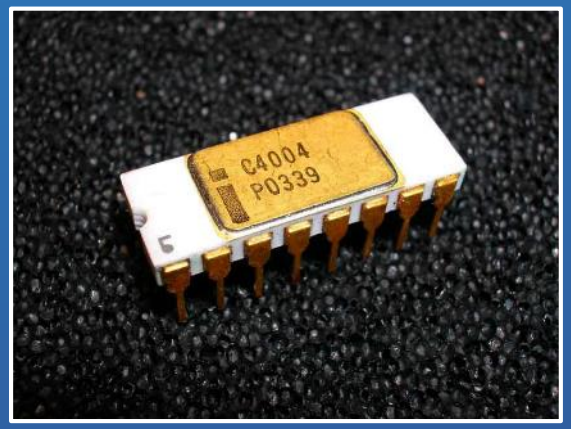






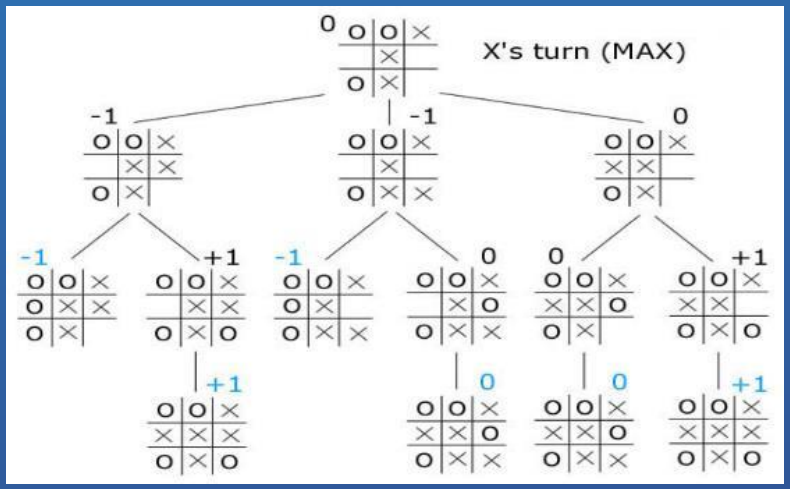
Curriculum – Distinct Topics

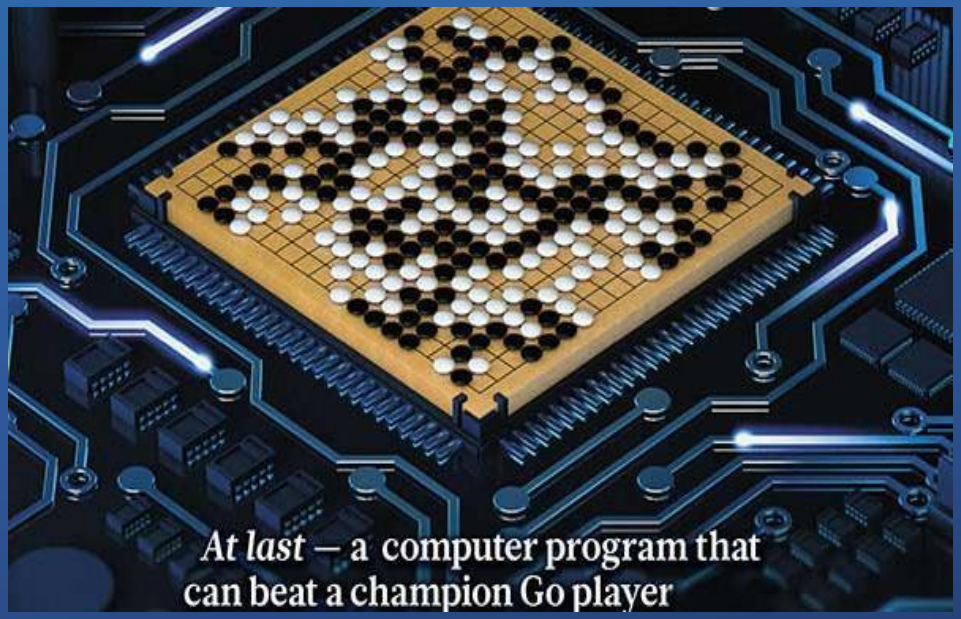
- Embedded System Development and Applications (CENG4480)

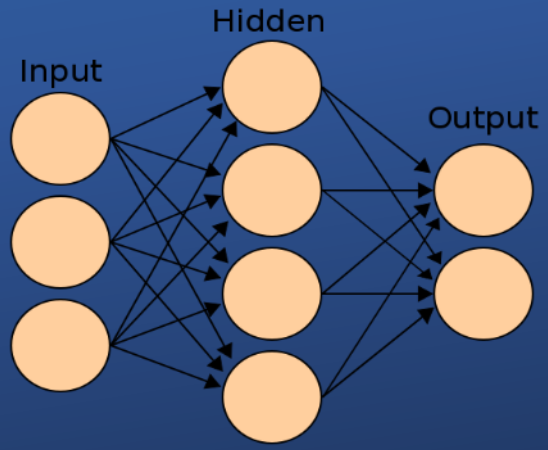


Curriculum – Distinct Topics

- Artificial Intelligence (CSCI3230/ESTR3108)
  - » Create computer software that are capable of intelligent behavior
    - ✓ Searching
    - ✓ Pattern recognition
    - ✓ Genetics algorithms
    - ✓ Artificial neural networks
    - ✓ Deep learning

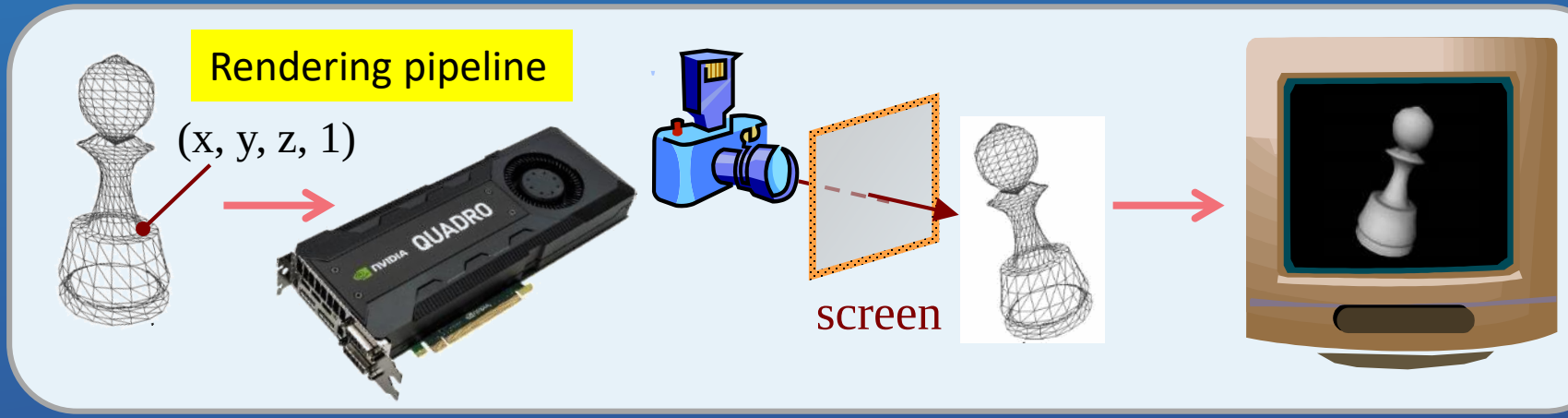


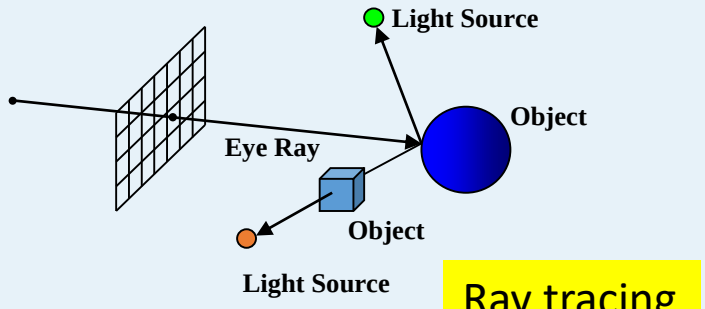




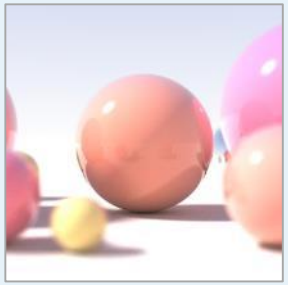
Curriculum – Distinct Topics

- Computer Graphics and Multi-media (CSCI3260/CSCI3280/CSCI3290)
  - » Use graphics cards to create photorealistic images and movies





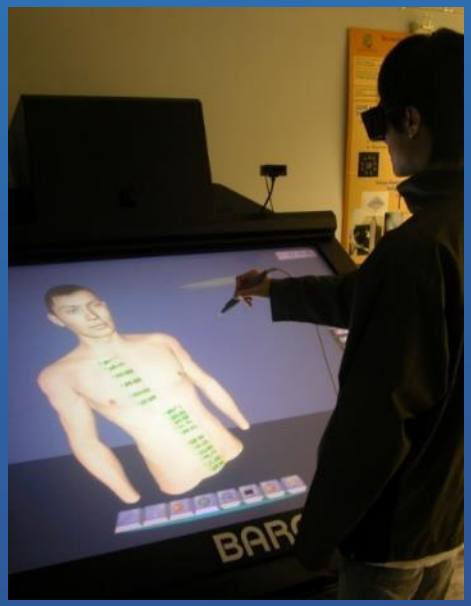
Ray tracing

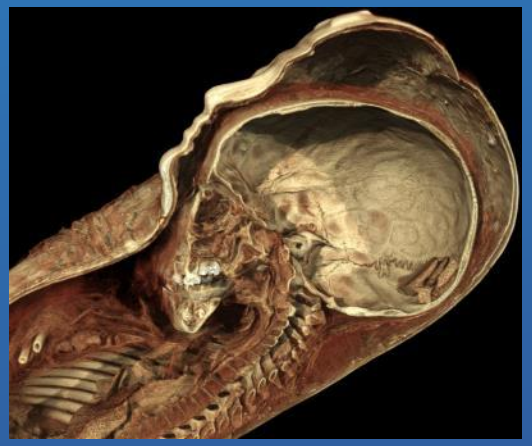


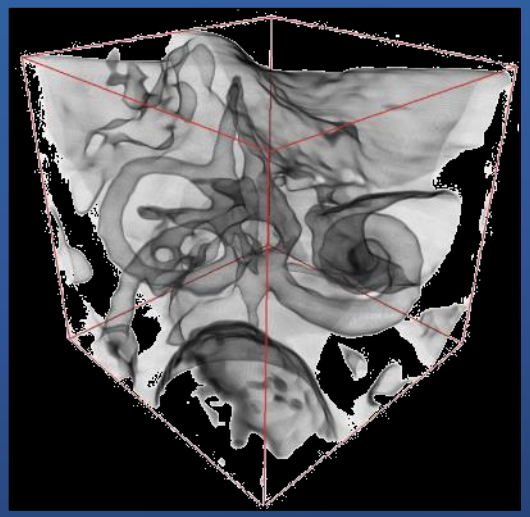
Is it real?

Curriculum – Distinct Topics

- Computer Graphics and Multi-media (CSCI3260/CSCI3280/CSCI3290)



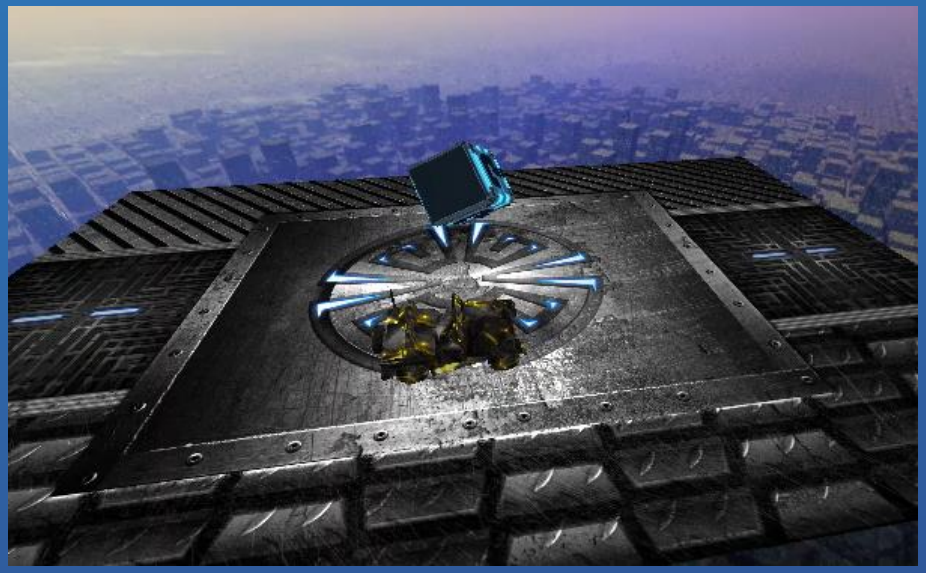




Film & visual effects & data visualization

Curriculum – Distinct Topics

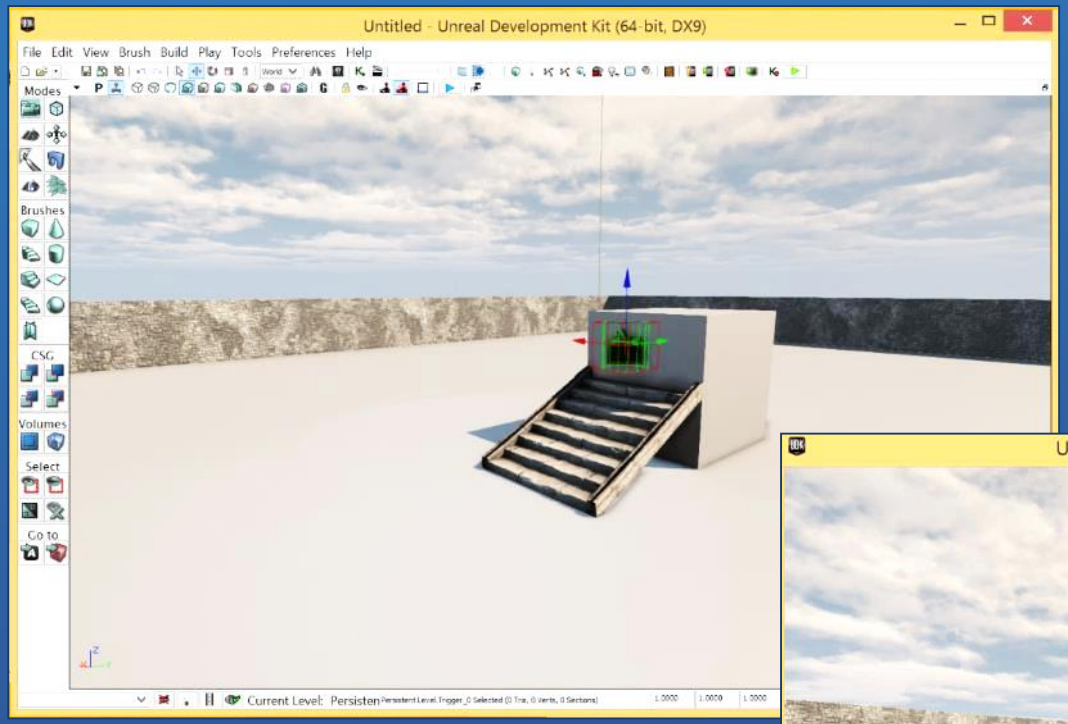
- Computer Graphics and Multi-media (CSCI3260/CSCI3280/CSCI3290)



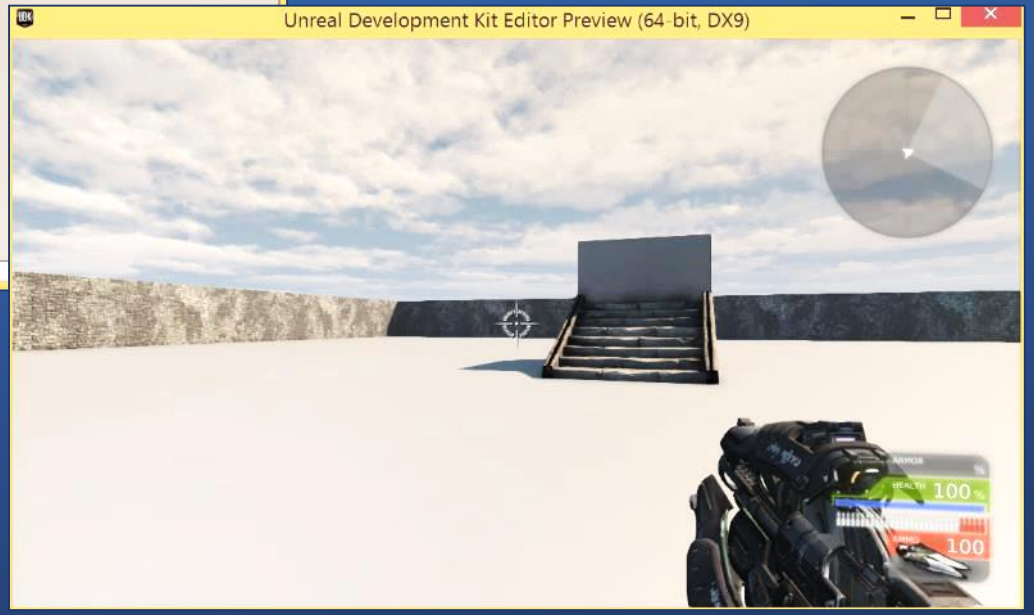
Students' course projects

Curriculum – Distinct Topics

- Computer Game Software (CSCI4120)



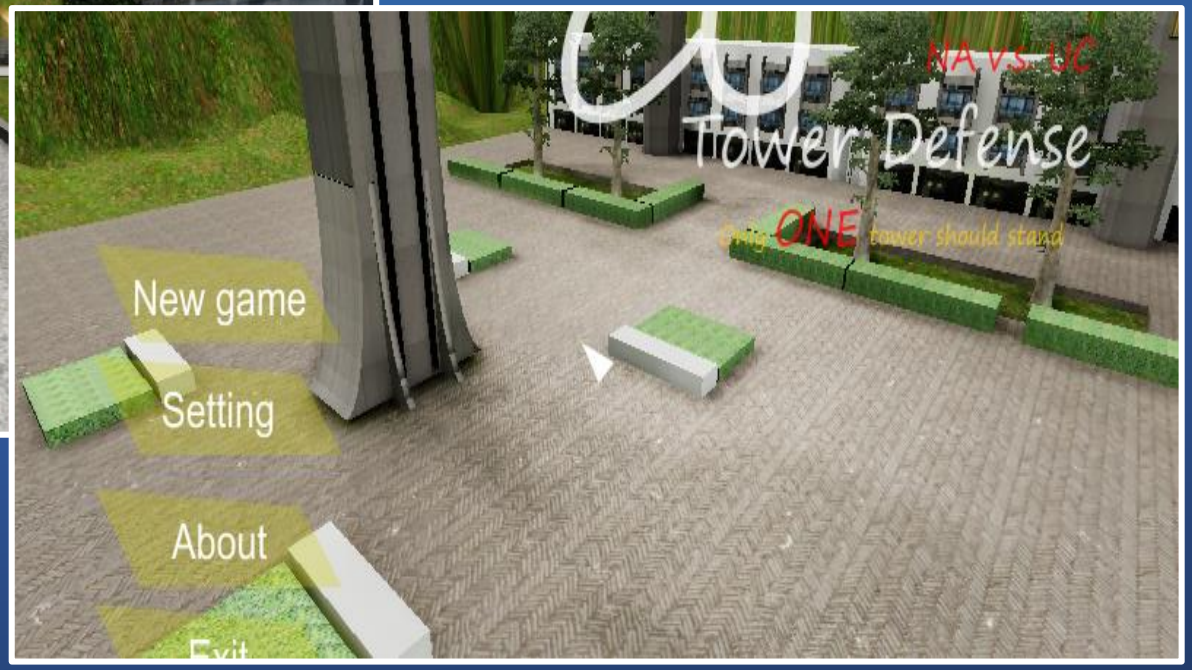
Learn how to develop a game



Curriculum – Distinct Topics

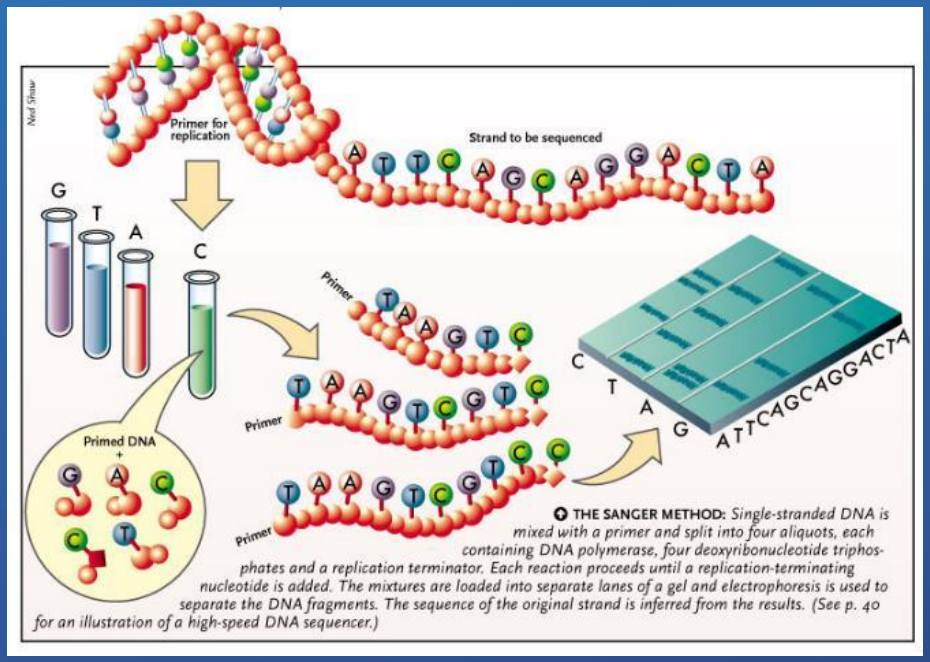
- Computer Game Software (CSCI4120)

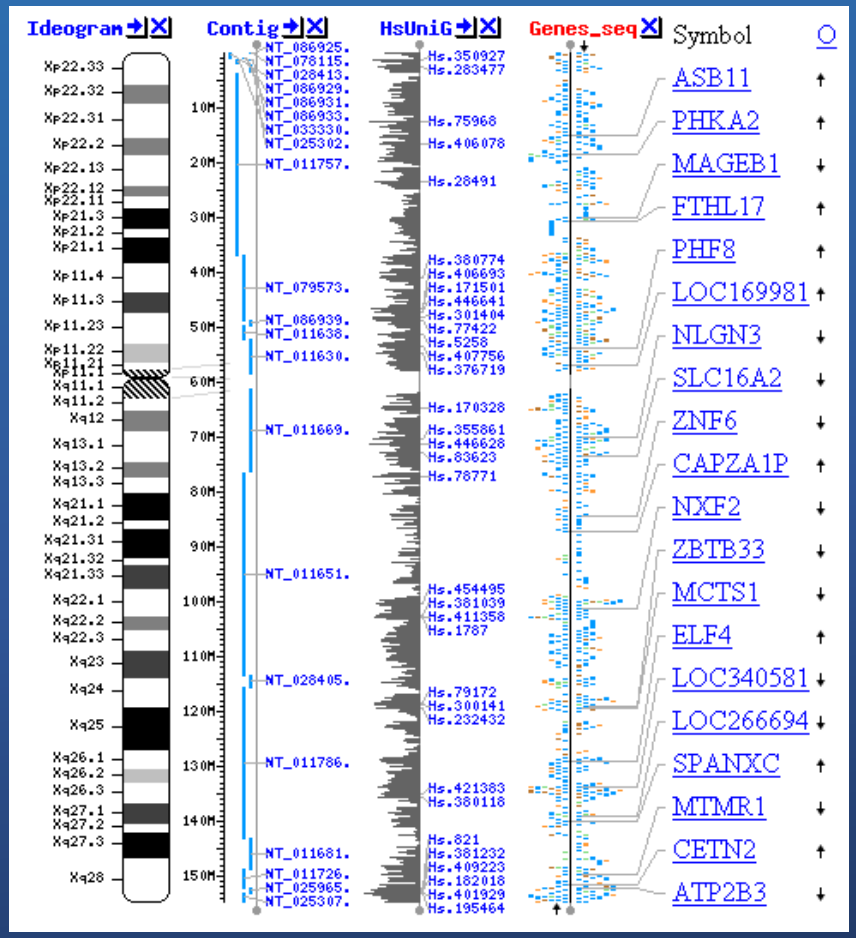
Students' course projects



Curriculum – Distinct Topics

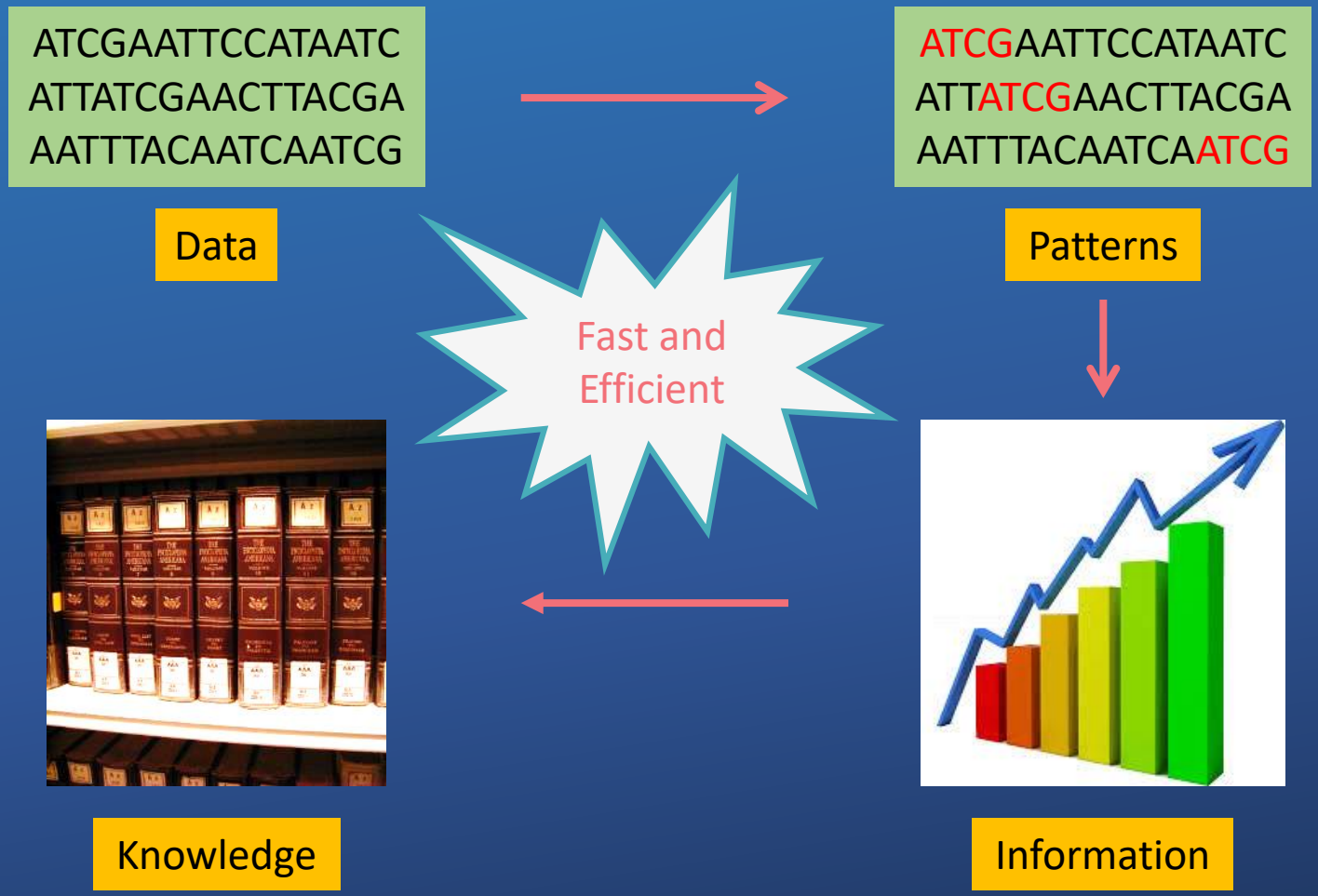
- Algorithms for Bioinformatics (CSCI3220)
  - » Use computer to model and interpret biological data
  - » DNA mutation ↔ diseases





Curriculum – Distinct Topics

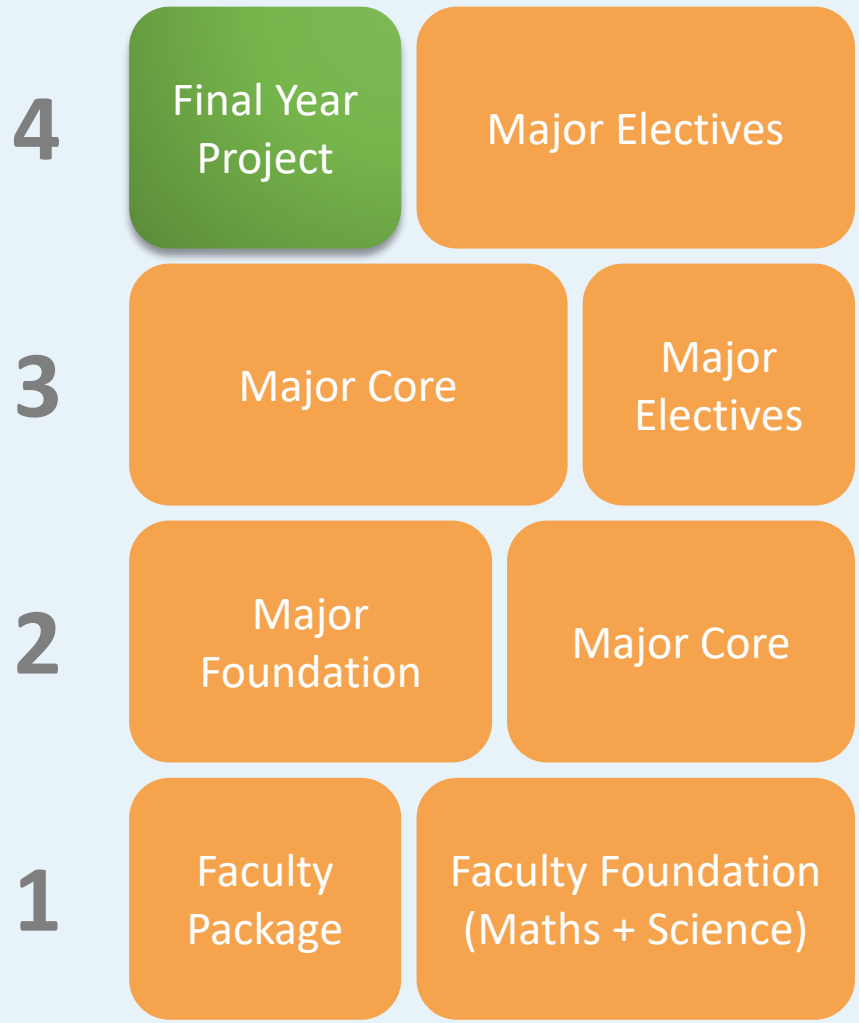
- Big Data Analytics and Machine Learning (CSCI3170/CSCI3320/CSCI4180/CSCI5510)



Curriculum – Distinct Topics

- Many other practical and interesting courses:
  - » Algorithms
  - » Cloud Computing
  - » Computational Finance
  - » Computer and Network Security
  - » Databases
  - » Energy Efficient Computing
  - » Networks
  - » Operating Systems
  - » Rapid Prototyping of Digital Systems
  - » Smart Hardware Design
  - » ……

Curriculum – Final Year Project (FYP)



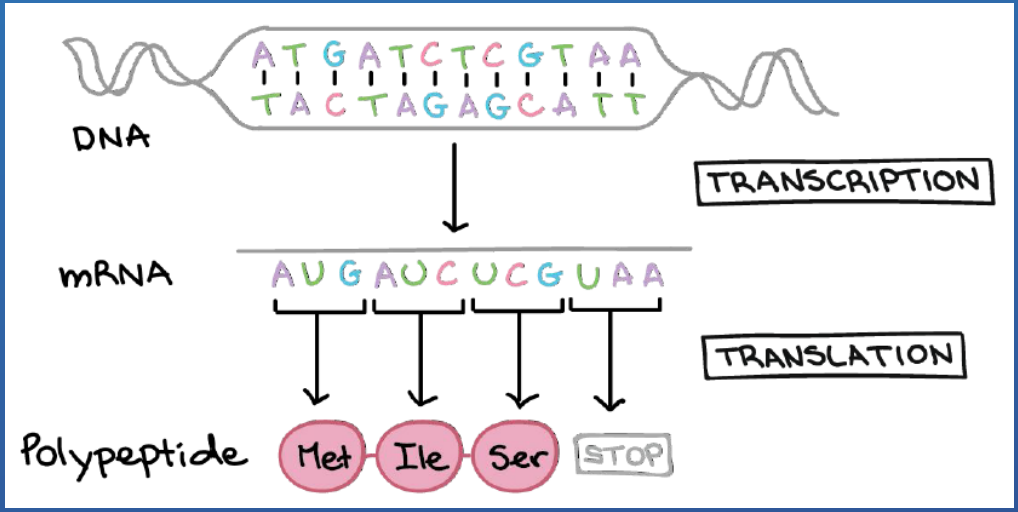
Final Year Project (6 units)

- Pick an interesting topic
- Interdisciplinary nature
- Apply the knowledge learnt in the previous courses
- Many open topics. Your creativity and discussion with the supervisor
- Complete a project under the supervision of an advisor

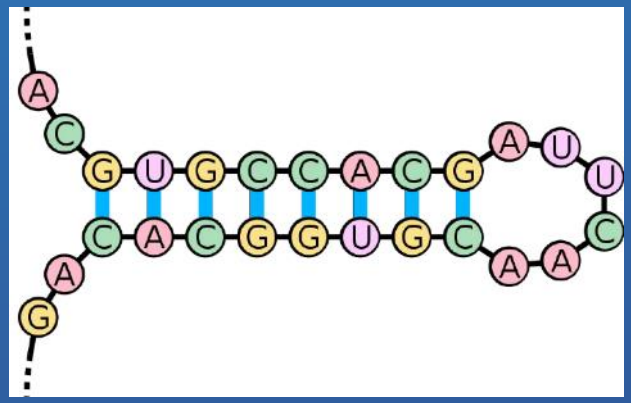
Open topic FYP – you may also propose a project to a professor

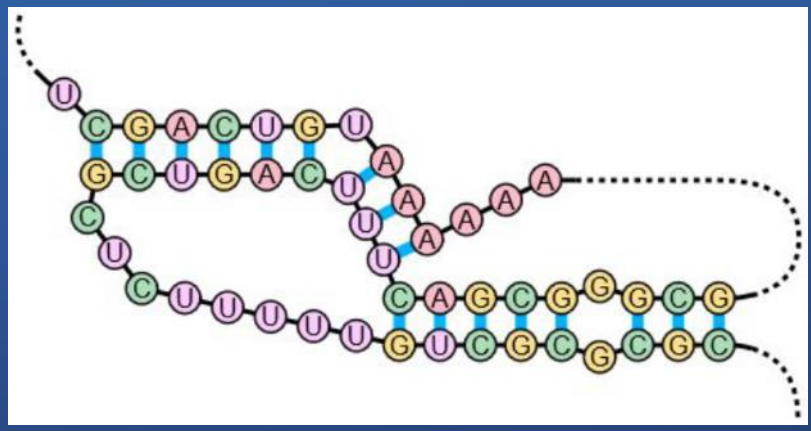
FYP (AI + Bioinformatics)

- Apply machine learning to predict RNA-protein interaction



RNA-binding protein (RBP)



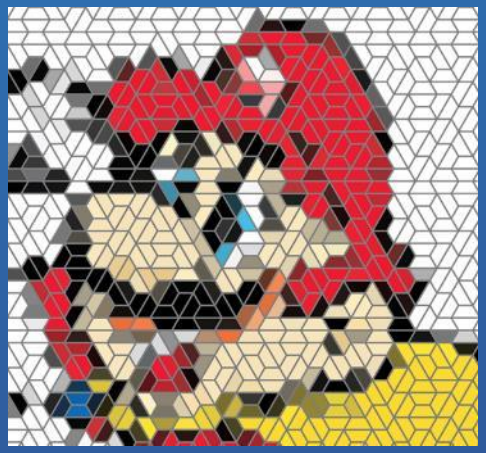


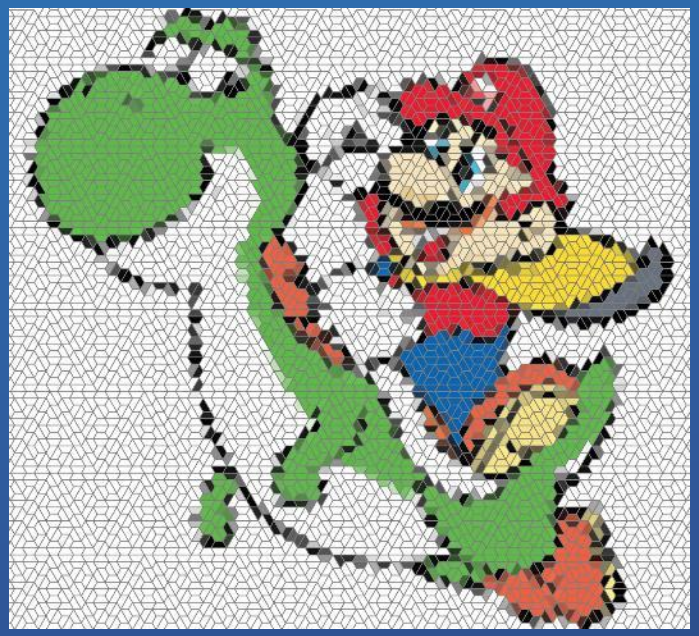
RNA folds to a specific structure to fit into the protein binding site

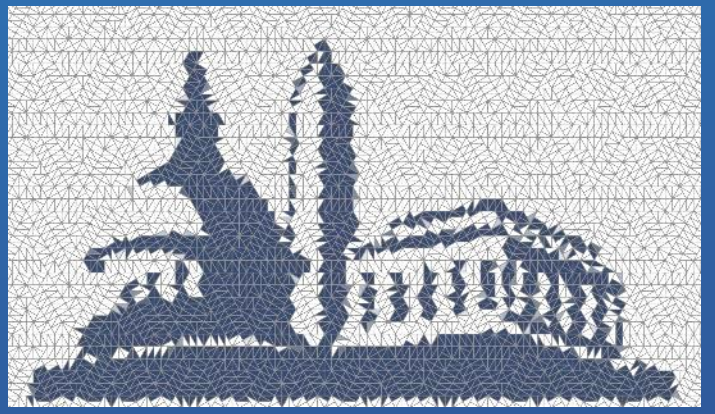
From FYP KY1804

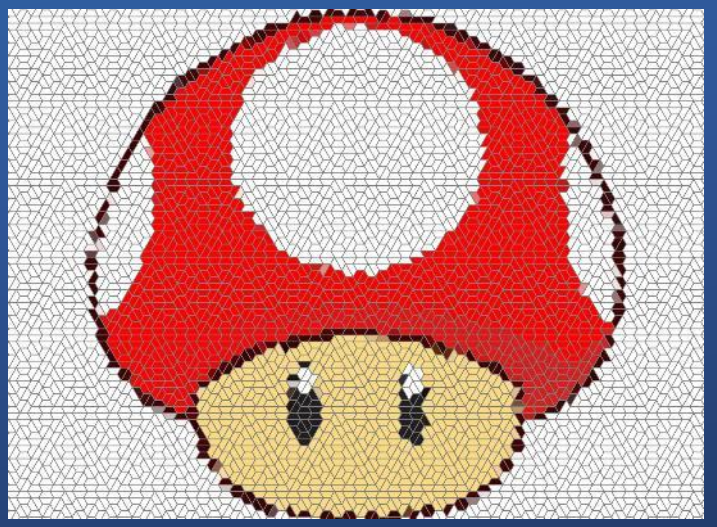
FYP (AI + Multimedia)

- Design a neural network that learns to produce a tiling





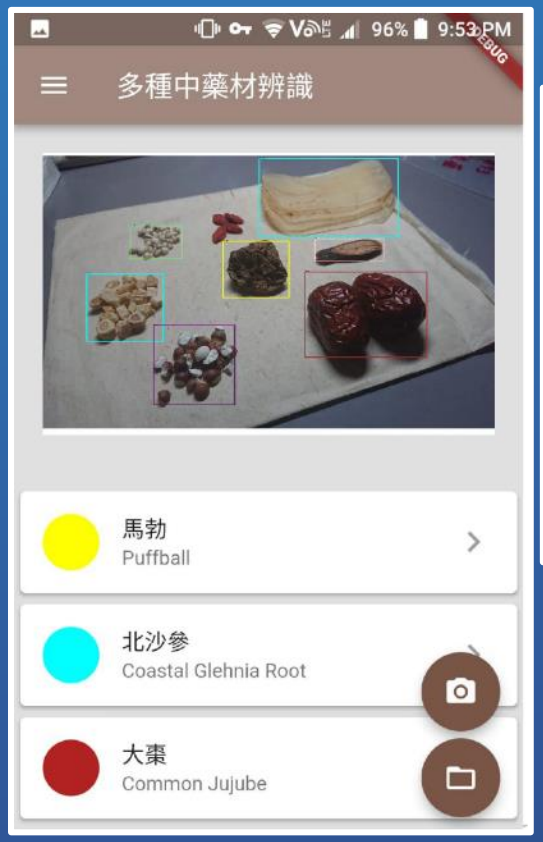


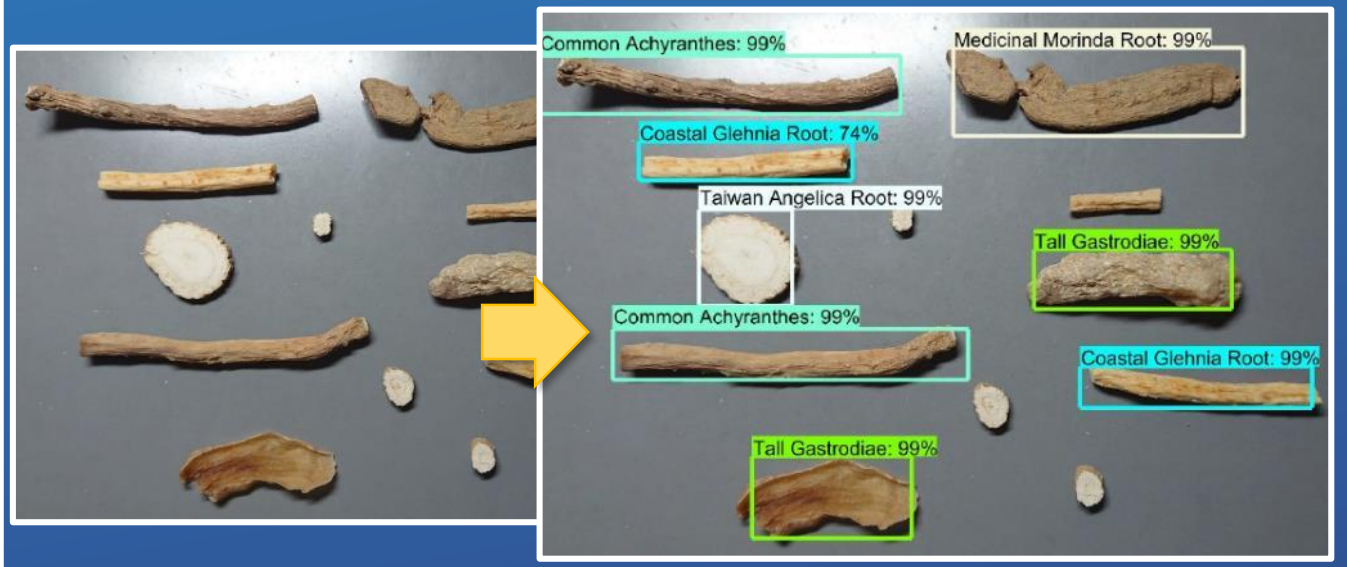


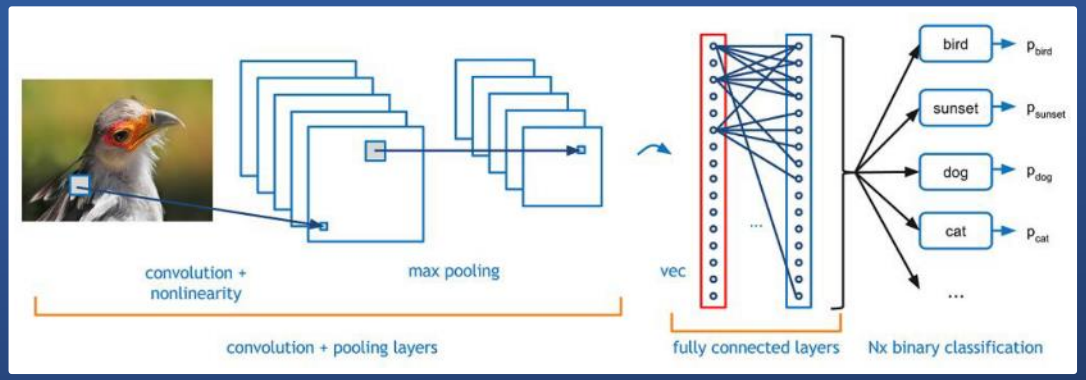
From FYP CWF1902

FYP (AI + Computer Vision)

- Chinese Medicinal Herb Recognizer



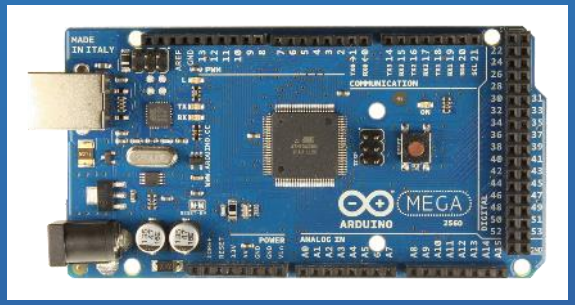




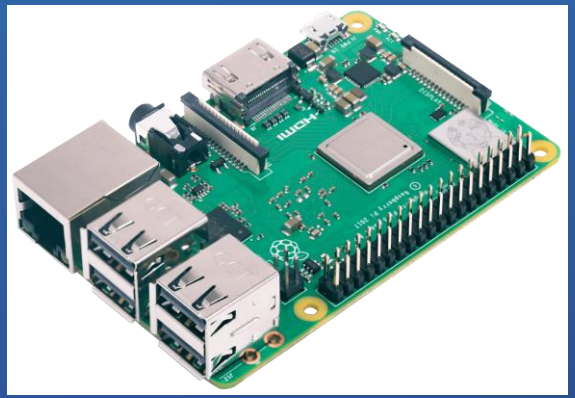
From FYP MHW1804

FYP (Self-driving Robots)

- Controls: Serial, Bluetooth, and Raspberry Pi, *etc.*

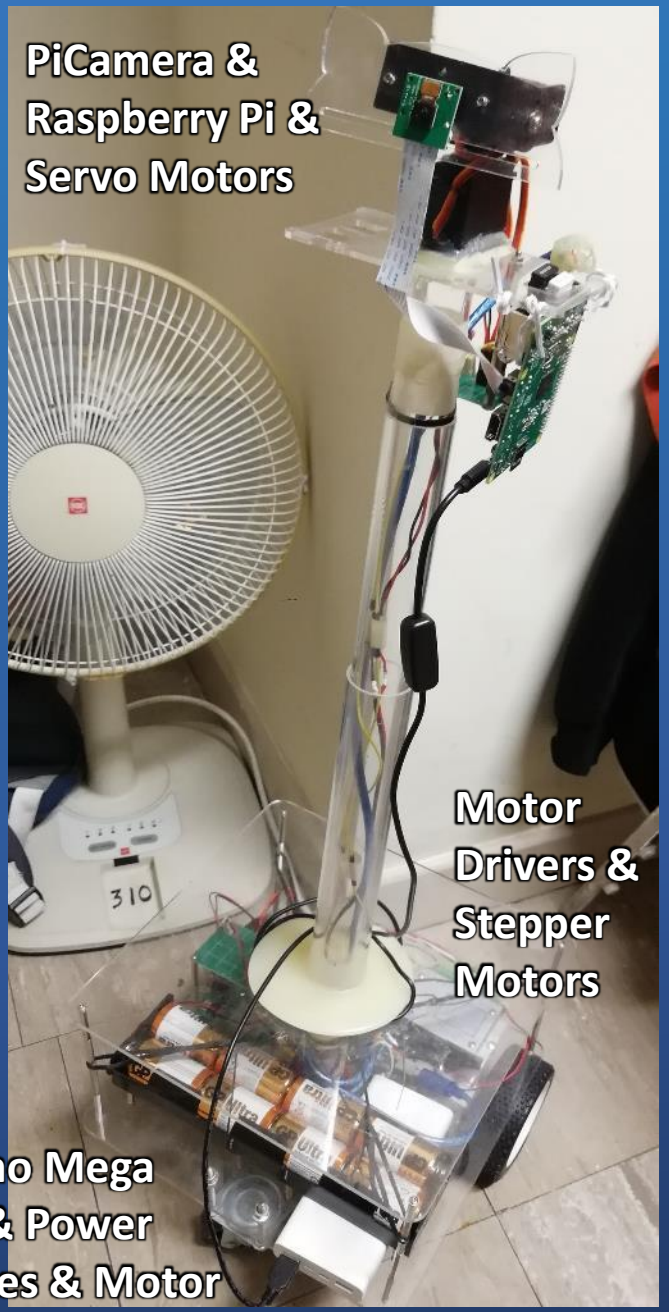


Arduino Mega 2560



Raspberry Pi 3b+

Camera module



From FYP MCY1801

FAQs

FAQ Contents:

Q: Will there be any interview?

Q: Will there be any exchange opportunity?

Q: Will there be any scholarship or financial aid?

Q: What is ELITE Stream? How can I join it?

Q: How can I declare a stream?

Q: Can I transfer to AIST or other majors in Year 2?

Q: Can I declare AIST / CSCI / CENG as second major or minor?

Q: I am still struggling to choose AIST / CSCI / CENG. What can I do?

Q: Will there be any interview?

Interview Arrangement (Non-JUPAS)

- Interviews (mainly for Non-JUPAS applicants such as senior year entry) will be conducted in batches from ~Jan. 2021.

- You are encouraged to attach adequate supporting documents, *e.g., transcripts, predicted grade, certificates, etc.,* in your application for our holistic review.

- Shortlisted applicants will receive an invitation email for the details, *e.g., date, time, format, etc.*

- Stay tuned! Check your email regularly for the latest update!

Q: Will there be any exchange opportunity?

Exchange to Overseas Universities

- You are encouraged to join the exchange programme to broaden your horizon and learn with peers from diverse background

- List of some overseas universities for the exchange
  - Macquarie University, Australia
  - University of Toronto, Canada
  - Shanghai Jiao Tong University, China
  - Telecom & Management SudParis, France
  - Royal Institute of Technology (KTH), Sweden
  - University of California, Davis, USA
  - …

Submit you application via Office of Academic Links (OAL)!

Q: Will there be any scholarship or financial aid?

Scholarships and Financial Aids

- The Government and the University offer various scholarships and financial aids depending on student's financial situation, or their outstanding performance in academic or other areas

- List of some scholarships and financial aids
  - » Admission Scholarships
  - » Scholarships for Overseas Studies
  - » Government or University Financial Aid
  - » Summer Subsistence and Travel Loan Scheme
  - » Student Residence Bursary Scheme
  - …

Check out more details at
the Office of Admissions and Financial Aid (OAFA)!

Q: What is ELITE Stream? How can I join it?

Engineering Leadership, Innovation, Technology and Entrepreneurship Stream (ELITE Stream)

- Offered by the Faculty of Engineering to students with excellent academic performance.

- Challenge yourself with additional coursework, invaluable extra-curricular activities, exclusive stimulating and inspiring courses, special exchange opportunities, *etc.*!

Check out more details at the Faculty of Engineering!

Q: How can I declare a stream?

Stream Declaration

- You should check and complete the required courses of the respective stream.
- You will be invited for the stream declaration in the final year of study.
- You can declare in at most one stream

CENG Streams

1. Embedded Systems
2. VLSI Design and EDA

CSCI Streams

1. Intelligence Science
2. Database and Information Systems
3. Rich Media
4. Distributed Systems, Networks and Security
5. Algorithms and Complexity
6. Data Analytics

Q: Can I transfer to AIST or other majors in Year 2?

If you look for AIST / other majors instead…

- You may submit application for change of major (to AIST or other majors), subject to prevailing regulations stipulated by RES and approval by relevant unit(s).

- If you are determined to go for AIST, you may choose JS4468 / AISTN as your first choice directly.

Q: Can I declare AIST / CSCI / CENG as second major or minor?

Declare Second Major / Minor

- You are not allowed to declare AIST / CSCI / CENG as your second major or minor if you are a CSE student.
- However, you are encouraged to broaden your horizons and declare second major / minor offered by other departments.



Q: I am still struggling to choose AIST / CSCI / CENG. What can I do?

If you are still struggling to choose…

- You can go through our website and admission materials for a better understanding before submission, and write to us via email to ug-admiss@cse.cuhk.edu.hk whenever you have any queries.

- You can join our outreach activities in the future and chat with our teachers and student ambassadors.

- You can also subscribe our social media channels to receive the latest updates from us! Stay tuned!

Contact Us

(852) 3943 4269

ug-admiss@cse.cuhk.edu.hk

www.cse.cuhk.edu.hk

cuhkcse

cuhkcsedept

www.youtube.com/channel/UCI0dSTad1sZkh5W3rVE3A6w

See you in Fall 2021 !