

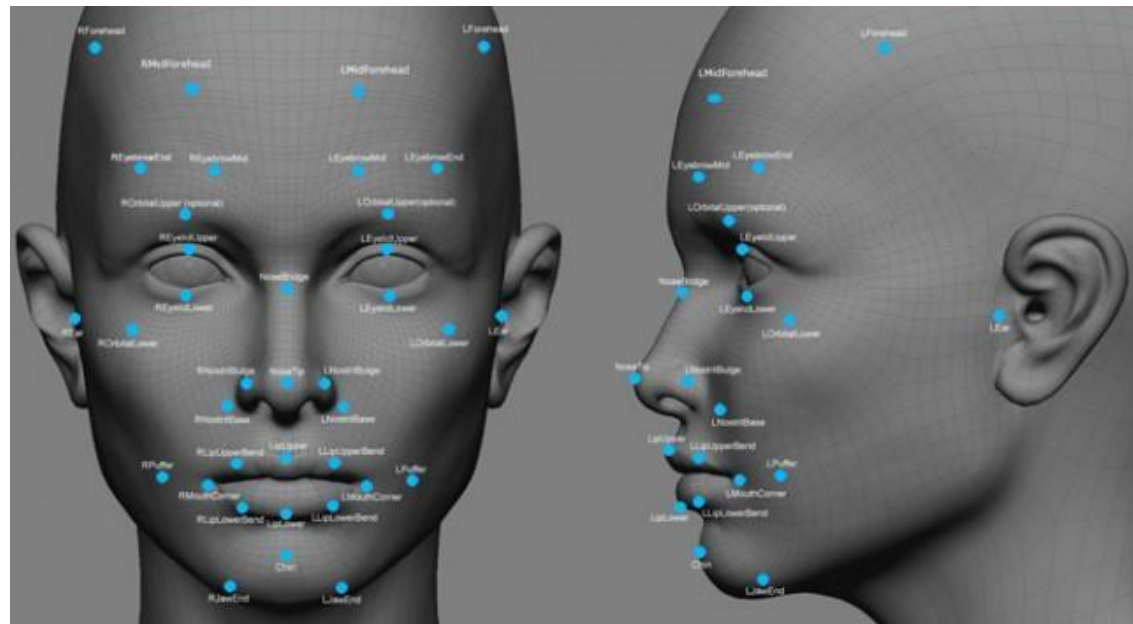
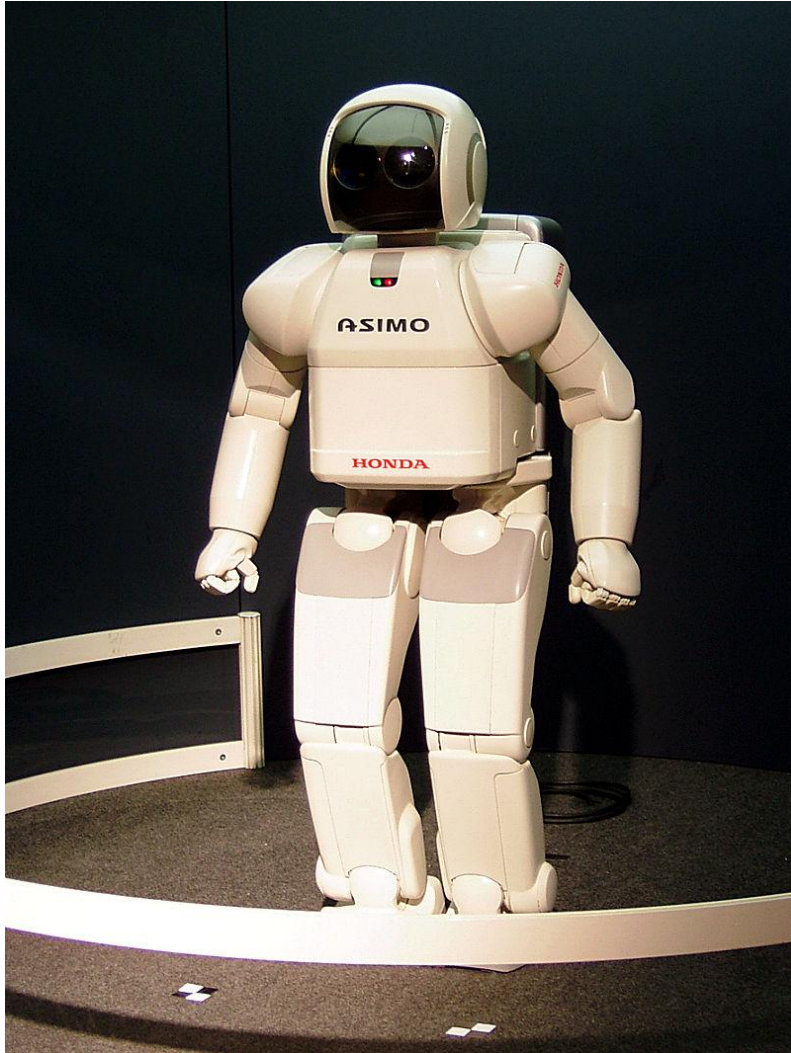
Specialisation options in the new curriculum:

Cognitive and Intelligent Systems (CIS)

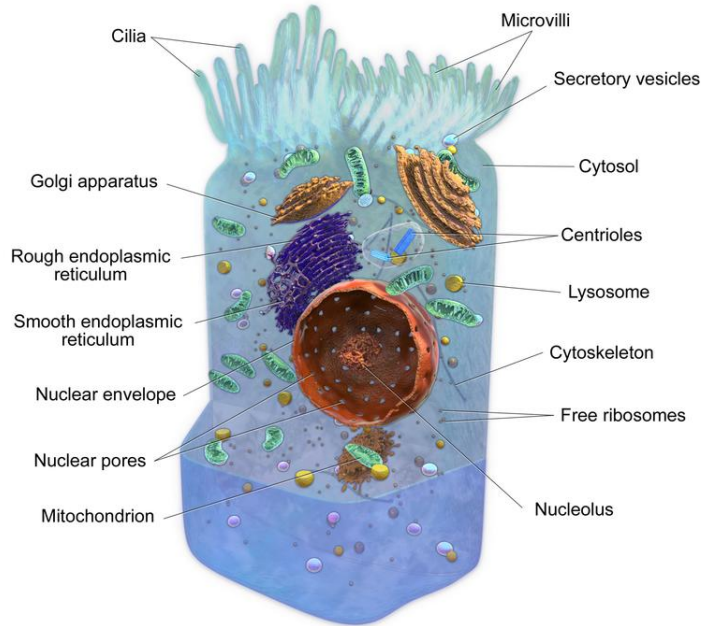
What are cognitive and intelligent systems?

- Systems (i.e., machines) that can in some way(s) replicate intelligent human behaviour
- May also be used to refer to natural systems, i.e., humans themselves or other animals
- What is intelligence/cognition? A loaded question; but we can identify certain characteristics like goal-driven behaviour and learning from error feedback
- Example domains: Vision, Language, Abstract Reasoning, Social Cooperation
- Overlapping areas: Artificial Intelligence, Machine Learning, Pattern Recognition, Data Analytics, Neural Networks, Computer Vision, Natural Language Processing, Robotics

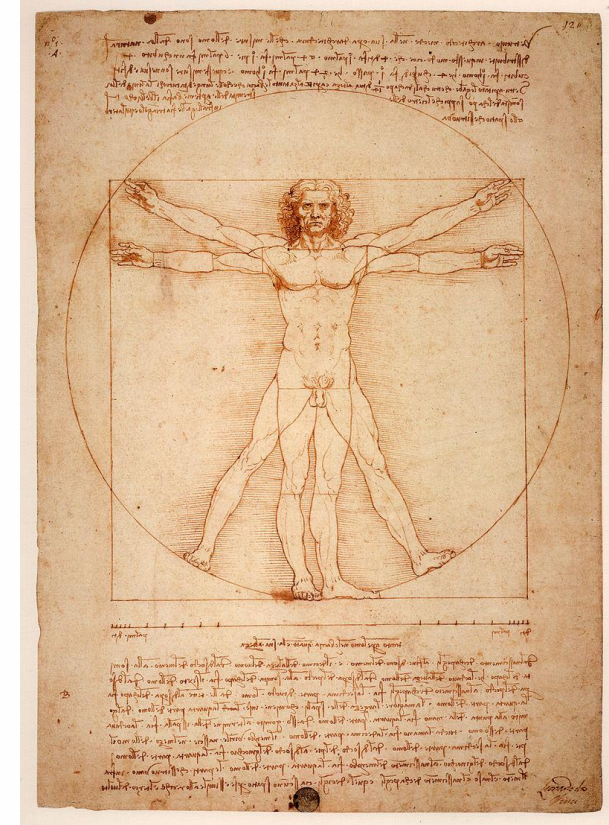
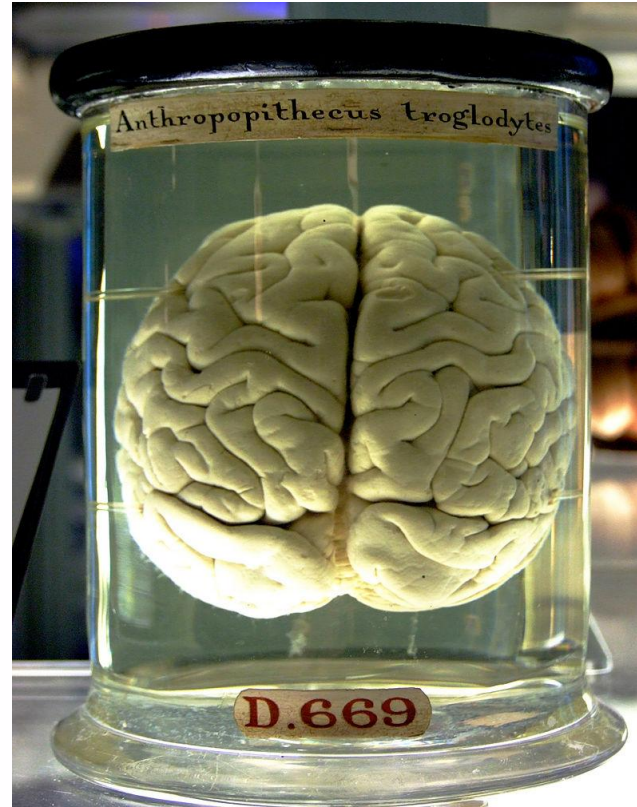
Engineered systems



Natural systems



Anatomy of a Cell



What options do I have?

- B.Tech. (EE1 and EE3) students
 - Do a **departmental specialisation** in CIS
 - Do a **dual degree** with an M.Tech. in Computer Technology, specialising in CIS (also open to CS1, MT1, PH1 students)
- M.Tech. (EET) students
 - Choose the CIS stream for a **dissertation-based M.Tech.**
 - Choose the CIS stream for a **course-based M.Tech.**

Departmental specialisation in CIS (EE1/EE3)

- Do **20 credits in CIS**; 10 OC, plus 10 extra
- So minimum number of credits goes up from 150 to 160
- Will be stated on degree certificate
- 8 credits of BTP Part II (Sem VIII) plus 12 credits of lecture courses
- Recommended to start doing the lecture courses from Sem IV or V
- Key course: **ELL409 Machine Intelligence and Learning** OR **ELL784 Introduction to Machine Learning**. You can do only ONE of these two. **ELL409** is more broad-based, less mathematical; **ELL784** has a stronger emphasis on machine learning algorithms, including modelling and optimisation

Current Semester

Next Semester

Current & Next Semester

Specialisation electives

- 1 ELL409 Machine Intelligence and Learning 3-0-2 4 SDR/Seshan Slot C
- 2 ELL704 Advanced Robotics 3-0-0 3 SJ Slot B
- 3 ELL715 Digital Image Processing 3-0-0 3 BL Slot D
- 4 ELL741 Neuromorphic Engineering 3-0-0 3
- 5 ELL786 Multimedia Systems 3-0-0 3 SC Slot C
- 6 ELL784 Introduction to Machine Learning 3-0-0 3 SA Slot H
- 7 ELL799 Natural Computing 3-0-0 3
- 8 ELL779 Forecasting Techniques for Power Systems 3-0-0 3
- 9 ELL789 Intelligent Systems 3-0-0 3
- 10 ELL793 Computer Vision 3-0-0 3
- 11 ELL794 Human-Computer Interface 3-0-0 3

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Current & Next Semester

Specialisation electives

- 12 ELL796 Signals and Systems in Biology 3-0-0 3
- 13 ELL797 Neural Systems and Learning Machines 3-0-2 4
- 14 ELL798 Agent Technology 3-0-0 3
- 15 ELL762 Intelligent Motor Controllers 3-0-0 3
- 16 ELL788 Computational Perception and Cognition 3-0-0 3 TKG Slot B
- 17 ELL795 Swarm Intelligence 3-0-0 3
- 18 ELL707 Systems Biology 3-0-0 3
- 19 ELL457 Special Topics in C&IS –I 3-0-0 3 SA/RR(HSS) Slot M
- 20 ELV780 Special Modules in C&IS –I 1-0-0 1 SC/Samsung TBA
- 21 ELD457 BTP Part II 0-0-16 8

Current Semester

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Current & Next Semester

Dual degree w/ M.Tech. in Computer Technology (EE1, EE3, CS1, MT1, PH1)

- Do **51 PG credits**; 10 OC, plus 41 extra (in 5 years)
- Minimum number of credits: $150+41=191$
- Decide by end of Sem VI
- 20-credit M.Tech. Project (2+6+12 in Sems VIII, IX, X) plus 31 credits of lecture/lab courses
- Exact M.Tech. Programme Core (PC) depends on background
- For EE1/EE3, only PC lecture course is **ELL783 Operating Systems 3-0-2 4 SDR Slot A**. If already done **EEL358/ELL405 Operating Systems 3-0-0 3**, then even this is not needed, and all 31 credits become Programme Electives (PE)

Current Semester

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Current & Next Semester

Suggested distribution of PG credits for dual degree

- Sem VII*: **9**
- Sem VIII*: **12** (including 2-credit Minor Project)
- Sem IX: **18** (including 6-credit Major Project Part I)
- Sem X: **12** (entirely Major Project Part II)

* In these semesters you will also be doing some UG credits, around 20 in total (assuming 120 done by end of Sem VI)

PE courses (for both dual degree and EET)

- The Computer Technology M.Tech. Programme has 5 streams to choose from:
 - CIS
 - Embedded Intelligent Systems
 - Computer Communication and Networks
 - Multimedia Information Processing
 - Internet Technologies
- Each stream has two *essential electives*. For CIS, these are [ELL784 Introduction to Machine Learning](#) and [ELL786 Multimedia Systems](#)

Current Semester

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PE courses for CIS

- All 700-level courses in earlier list, plus:
 - ELL785 Computer Communication Networks 3-0-0 3 RB
Slot F
 - ELL787 Embedded Systems and Applications 3-0-0 3
 - ELL884 Information Retrieval 3-0-0 3
 - ELL882 Large-Scale Machine Learning 3-0-0 3
 - ELL891 Computational Linguistics 3-0-0 3
 - ELL886 Big Data Systems 3-0-0 3
 - ELL887 Cloud Computing 3-0-0 3
 - ELL888 Advanced Machine Learning 3-0-0 3 J Slot J

Current Semester

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PE courses for CIS

- ELL893 Cyber-Physical Systems 3-0-0 3
- ELL883 Embedded Intelligence 3-0-0 3 SC Slot D
- ELL885 Machine Learning for Computational Finance 3-0-0 3
- ELL890 Computational Neuroscience 3-0-0 3
- ELL880 Special Topics in Computers 1 3-0-0 3 SC/IBM TBA
- ELL881 Special Topics in Computers 2 3-0-0 3
- ELS880 Independent Study 0-3-0 3

Current Semester

Next Semester

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For EET students

- In Sem II: Take **ELL783 Operating Systems**, plus **ELD780 Minor Project 0-0-4 2**, plus 2 PEs
- For CIS, remember to take essential electives **ELL784** and **ELL786**, and then others from the PE lists shown
- At the end of Sem II, you and supervisor can decide by mutual agreement for a **dissertation-based M.Tech.**:
 - Sem III: 6-credit Major Project Part I, 2 PEs (can do one OE)
 - Sem IV: 12-credit Major Project Part II
- Otherwise, do a **course-based M.Tech.**:
 - Sem III: 4 PEs*
 - Sem IV: 6-credit Major Project Part I, 2 PEs*

* Can do total of 2 OEs

Current Semester

Next Semester

Current & Next Semester