

GRADUATE CERTIFICATE IN PATTERN RECOGNITION SYSTEMS

PRACTICE MODULE

Stackable Graduate Certificate Programme in Artificial Intelligence

Intelligent Reasoning Systems	Pattern Recognition Systems	Intelligent Sensing Systems	Intelligent Software Agents	Practical Language Processing	Intelligent Robotic Systems
NICF - Machine Reasoning (SF)	NICF - Problem Solving using Pattern Recognition (SF)	NICF - Vision Systems (SF)	NICF- RPA and IPA - Strategy and Management (SF)	NICF - Text Analytics (SF)	NICF - Robotic Systems (SF)
4 Days	5 Days	5 Days	2 Days	3 Days	5 Days
NICF - Reasoning Systems (SF)	NICF - Intelligent Sensing and Sense Making (SF)	NICF - Spatial Reasoning from Sensor Data (SF)	NICF- Software Robots - Best Practices (SF)	NICF - New Media and Sentiment Mining (SF)	Autonomous Robots & Vehicles*
5 Days	4 Days	3 Days	2 Days	4 Days	5 Days
NICF - Cognitive Systems (SF)	NICF - Pattern Recognition and Machine Learning Systems (SF)	NICF-Real Time Audio-Visual Sensing and Sense Making (SF)	NICF- Intelligent Process Automation (SF)	NICF - Text Processing using Machine Learning(SF)	Human-Robot System Engineering*
3 Days	5 Days	4 Days	3 Days	5 Days	4 Days
			NICF- Self-Learning Systems (SF)	NICF- Conversational UIs (SF)*	
			4 Days	4 Days	
Practice Module (10 man days)	Practice Module (10 man days)	Practice Module (10 man days)	Practice Module (10 man days)	Practice Module (10 man days)	Practice Module (10 man days)
Graduate Certificate in Intelligent Reasoning Systems	Graduate Certificate in Pattern Recognition Systems	Graduate Certificate in Intelligent Sensing Systems	Graduate Certificate in Intelligent Software Agents	Graduate Certificate in Practical Language Processing	Graduate Certificate in Intelligent Robotic Systems

Graduate Certificate in Pattern Recognition systems

This graduate certificate teaches how to design and build systems that make decisions by recognising complex patterns in data. Examples are robotic systems and smart city applications that take as input diverse sensor data streams. These systems will utilise the latest pattern recognition, machine learning and sensor signal processing techniques.

Key Takeaways:

- Build intelligent pattern recognition systems
- Understand core and advanced pattern recognition techniques and gain experience applying these techniques in practical systems and applications
- Understand and apply advanced signal processing techniques to sensor data
- Be familiar with current best practices and tools for building pattern recognition systems

Practice Module : Objectives

The objective of this practice module is threefold:

- Firstly, to expose participants in a supervised manner to real world problems so that they may practice the use of the skills they have learned during the individual course modules in a real world setting and obtain expert advice and guidance when needed.
- Secondly, to enable participants to demonstrate their proficiency across all of the skills that they have learned in the course modules and hence be certified as competent at the Certificate level.
- Thirdly, to provide a formal grading mechanism so that the certificate may be used as one component in the NUS-ISS Stackable Master of Technology (MTech) in Intelligent Systems.

Graduate Cert: Assessment Components

- The graduate cert assessment comprises the assessment components below:

Assessment Component	Weight
Practice Module Project work (documentations and MVP* deliverables)	50%
Examination	50%

* MVP: minimal viable product of pattern recognition system

Standard Grading Scheme		CAP
A+	85 - 100	5.0
A	80 - 84	5.0
A-	75 - 79	4.5
B+	70 - 74	4.0
B	65 - 69	3.5
B-	60 - 64	3.0
C+	55 - 59	2.5
C	50 - 54	2.0
D+	45 - 49	1.5
D	40 - 44	1.0
F (Fail)	0 - 39	0.0

- A participant must attain a minimum overall score of **50%** in order to pass the practice module and hence be awarded the Graduate Certificate in Pattern Recognition Systems.

Project Work: Assessment

Project Work Assessment Component	Weight
First Presentation	5%
Final Presentation	10%
Final Report	15%
Final System	15%
Peer Review	5%
Total	50%

Practice Module : Timeline

The practice module will take an estimated 10 days of effort by participants. These days are not expected to be continuous and may stretch over many weeks. The overall agenda is shown below.

- Day 1:** Introduction, project initialization
- Day 2 to 9:** First presentation, project work, supervision and feedback
- Day 10:** Project final video presentation and report submission

Written examination (3 hours open book)

Practice Module : Timeline : Activities

Day	Activities	Remarks
Day 1	<p>Introduction to the practice module</p> <ul style="list-style-type: none"> Participants will be made fully aware of the practice module requirements and assessment process. 	
Days 2 - 9	<p>Project work, supervision and feedback</p> <ul style="list-style-type: none"> Participants will work on their projects independently. Participants will be able to meet with ISS course lecturers to obtain advice and guidance. <p>First Presentation</p> <ul style="list-style-type: none"> Participants will make a presentation in which they outline the goals of their projects along with details of the data resources required/available, techniques/tools used, progress, etc. 	<p>Submission of Project Proposal to LumiNUS (Deadline: 15 Sep 2021)</p> <p>First Presentation (Date: 12 Oct Evening)</p>
Day 10	<p>Project final video presentation</p> <ul style="list-style-type: none"> Participants will submit a final project video presentation in which they describe fully the project they have undertaken and the methods and metrics they have used to evaluate its success. <p>Project Work Assessment</p> <ul style="list-style-type: none"> Participants will submit a final project report including other relevant project deliverables, e.g. runnable software system. 	<p>Submission of final deliverables to LumiNUS (Deadline: 14 Nov 2021)</p>
Exam Day	<p>Written Examination</p> <ul style="list-style-type: none"> Participants will undertake a formal written examination with a scope covering all of the topics taught in the course modules. 	<p>Examination 6 Nov 2021</p>

Practice Module : Project Work

Requirements:

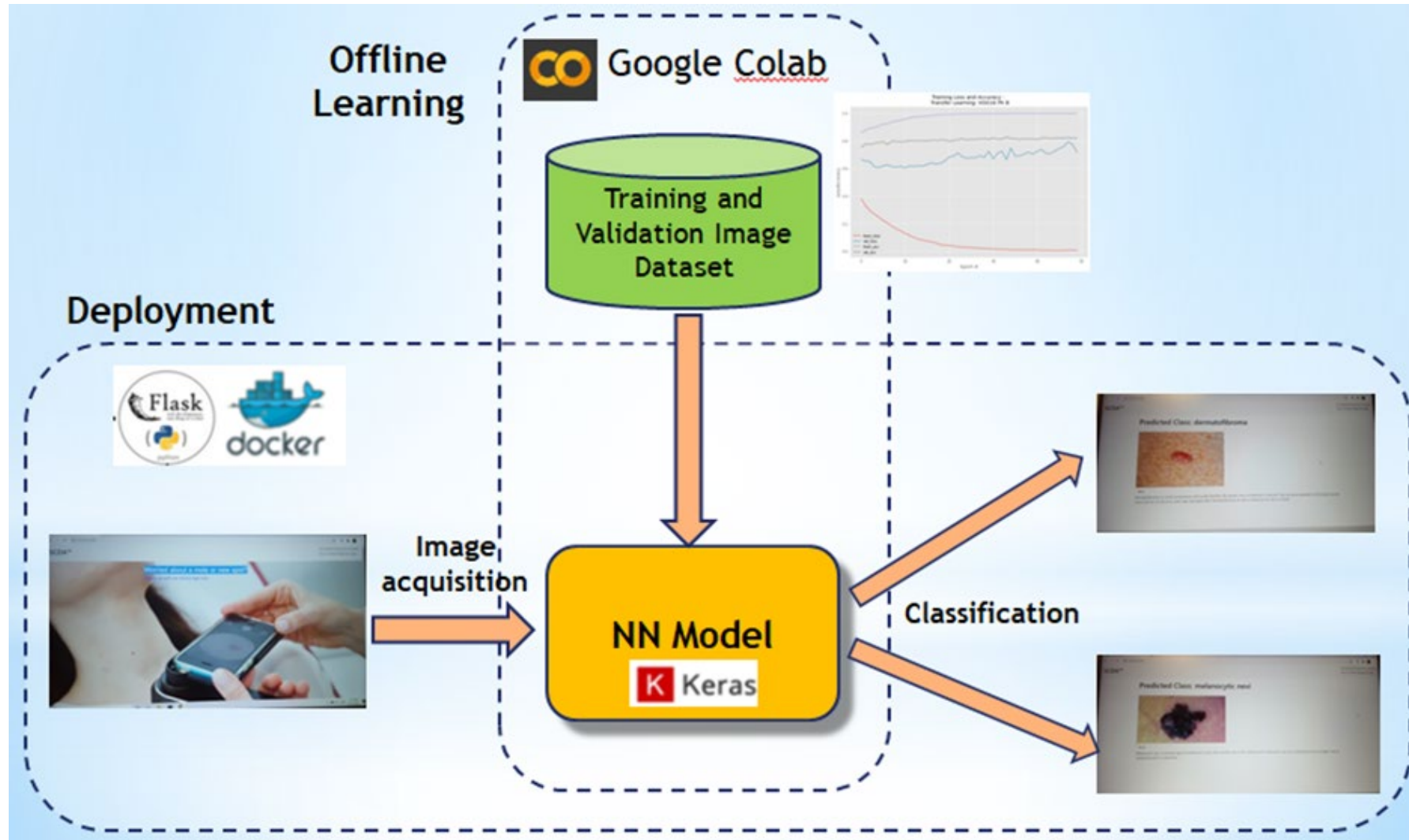
- Form a project team of max 4 members and enrol in LumiNUS project groups.
- The team may work on any practical application that demonstrates the advantage of pattern recognition and machine learning techniques.
- A suitable project uses AI/machine learning techniques to design and build a pattern recognition system to solve a real-world problem using the skills taught in the 3 course modules.
- The project must develop, integrate and demonstrate at least **three** out of following aspects:
 - ❖ Supervised learning / unsupervised learning scenarios
 - ❖ Machine learning/ Deep learning techniques
 - ❖ Hybrid machine learning /Ensemble approach
 - ❖ Intelligent sensing / sense making techniques

Practice Module : Project Work

Project Examples:

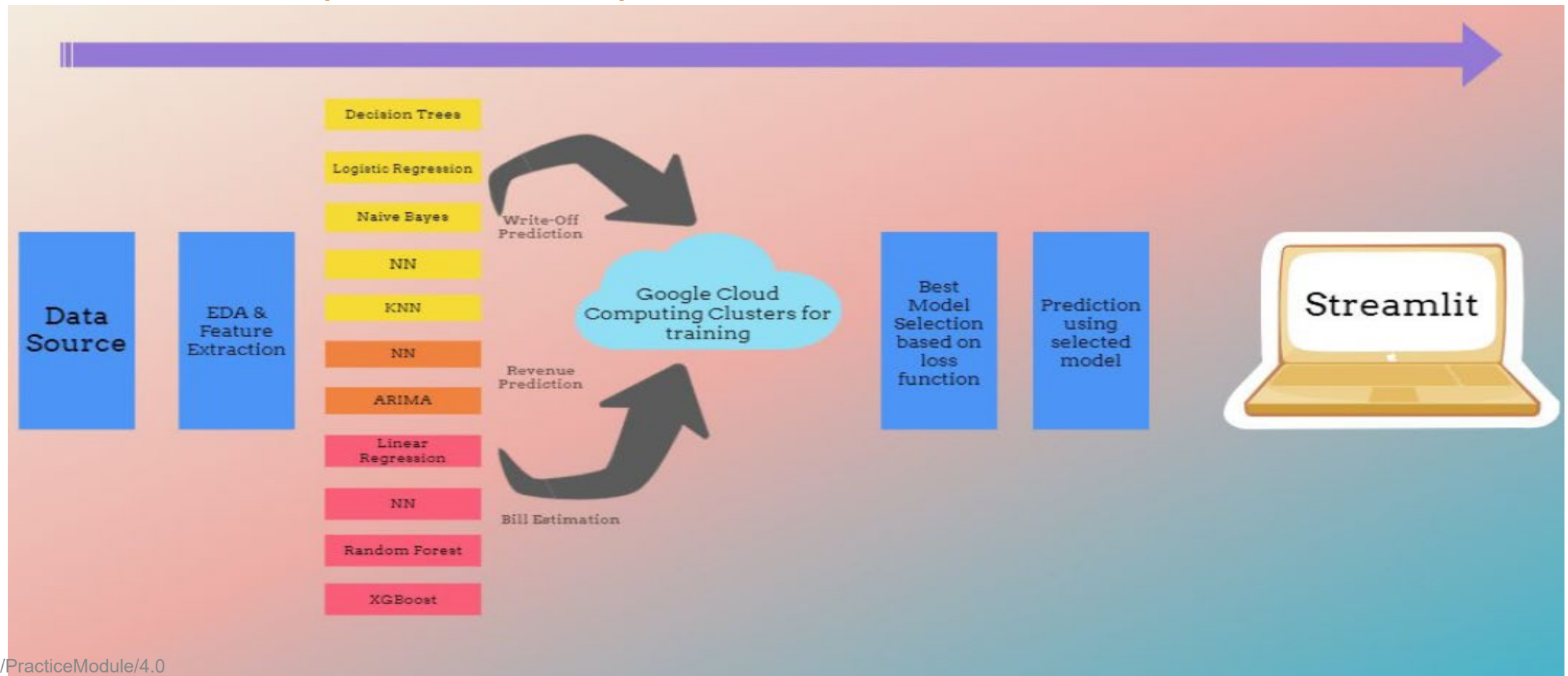
- Stock market forecasting
- Speech to text transcriber
- Facial emotion recognition
- Automatic image caption generation
- Hand gesture recognition
- Mini social robots
- Skin cancer detection
- Defect detection system

Project Example: Skin Cancer Detection



Project Example: Private Healthcare Administration Use Cases

- Use Case #1: Prediction of Write-Off Cases
- Use Case #2: Prediction of Inpatient Revenue
- Use Case #3: Hospital Bill Estimation Upon Admission



Practice Module: Project Work

Project Deliverables:

- A runnable pattern recognition system
- Datasets
- Final report to describe:
 - Tools/techniques you have used
 - System design / Models
 - System performance
 - Findings and discussions
- Python/R/Java/... codes, model files, other supporting documents (if any)
- A video presentation file, .mp4/.mov/.wmv etc., containing a 10 -15 mins presentation,
- Slides of two presentations

Practice Module: Project Work

Additional Submissions:

- 1-2 pages individual project report per project member, including:
 - Individual reflection of project journey: (1) personal **contribution** to group project (2) what learnt is most **useful for you** (3) how you can apply the knowledge and skills in **other situations or your workplaces**
- Peer evaluation form

Submission deadline: 14/11/2021

Please submit to LumiNUS folders

Please submit only one ZIP file from each team.

Questions & Answers



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