

H8IOTRTA: IoT Real Time Analytics

Module Code:	H8IOTRTA
Long Title	IoT Real Time Analytics APPROVED
Title	IoT Real Time Analytics
Module Level:	LEVEL 8
EQF Level:	6
EHEA Level:	First Cycle
Credits:	10
Module Coordinator:	Dominic Carr
Module Author:	Dominic Carr
Departments:	School of Computing
Specifications of the qualifications and experience required of staff	Master's degree or PhD in a computing or cognate discipline. May have industry experience also.
Learning Outcomes	
<i>On successful completion of this module the learner will be able to:</i>	
#	Learning Outcome Description
LO1	Design and implement an IoT system which produces streams of real-time data
LO2	Select and implement appropriate algorithms for context sensitive real-time analytical processing
LO3	Utilize industry standard analytics engines
LO4	Demonstrate proficiency in IoT device level, and server side, programming
Dependencies	
Module Recommendations	
No recommendations listed	
Co-requisite Modules	
No Co-requisite modules listed	
Entry requirements	Learners should have attained the knowledge, skills and competence gained from stage 3 of the BSc (Hons) in Data Science

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Module Content & Assessment			
Indicative Content			
Introduction to IoT What is it? What is it useful for? Why does it present an analytics challenge? What are the ethical implications?			
Data Stream algorithms and their applications 1 Sampling, filtering, correlation, frequency analysis, anomaly / tampering testing,			
Data Stream algorithms and their applications 2 Prediction, clustering, event triggering, merging streams, stream correlation e.g. necessity to view temperature, humidity, and status of windows as conjoined			
IoT Development working with IoT development boards, attaching sensors, writing programs using sensors, pre-processing the data at the node level, inter-node communication			
IoT Development 2 working with IoT development boards, attaching sensors, writing programs using sensors, pre-processing the data at the node level, inter-node communication			
Publishing Sensor Data How to publish to WWW e.g. NodeRED, IFTTT, Google Cloud, Dweet, AWS IoT or other platforms such as ThingWorx			
Publishing Sensor Data 2 Detailed work through of sensor to cloud with an industry standard platform			
Utilizing Analytics Dashboards Such as AWS IoT conditional triggers to actuate a response to identified events, thingworx, IFTTT, Dweet triggers			
Building your own Analytics suite Create a REST web service to receive and store data, program triggers to handle events, allow for the customization and creation of other triggers, link to actuation e.g. reprogram IoT device, send message to user (Twilio perhaps)			
Implementation of Data Stream algorithms in our system Implementation of Data Stream algorithms in our system			
Utilization Utilization of existing systems such as Apache Spark, Flink, Pulsar, Heron, Akka, Samza or Apache Storm.			
Assessment Breakdown			%
Coursework			100.00%
Assessments			
Full Time			
Coursework			
Assessment Type:	Formative Assessment	% of total:	Non-Marked
Assessment Date:	n/a	Outcome addressed:	1,2,3,4
Non-Marked:	Yes		
Assessment Description: There will be formative assessment throughout the module which will guide the students for other assessments. They will receive feedback on in class labs and online submissions.			
Assessment Type:	Assignment	% of total:	50
Assessment Date:	n/a	Outcome addressed:	1,2,3,4
Non-Marked:	No		
Assessment Description: The assignment will assess students ability to implement an IoT system which produces a stream of real-time sensory observations. This will be done with physical hardware such as a Raspberry PI and a sensor kit publishing to a service such as Dweet or AWS IoT. The learner will have to select and implement appropriate algorithms for context sensitive real-time analytical processing, additionally they must utilize industry standard analytics engines to analyse the data produced from real sensory streams (may also use repositories of sensor data through 'playback')			
Assessment Type:	Project	% of total:	50
Assessment Date:	n/a	Outcome addressed:	1,2,3,4
Non-Marked:	No		
Assessment Description: Develop a project which builds upon the functionality described in the assignments using a selection of student developed and industry standard hardware and software			
No End of Module Assessment			
No Workplace Assessment			
Reassessment Requirement			
Repeat examination <i>Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.</i>			
Reassessment Description The repeat strategy for this module is a project. Learners will be afforded an opportunity to repeat the project at specified times throughout the year and all learning outcomes will be assessed in the repeat project.			

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Module Workload				
Module Target Workload Hours 0 Hours				
Workload: Full Time				
Workload Type	Workload Description	Hours	Frequency	Average Weekly Learner Workload
Lecture	Classroom & Demonstrations (hours)	24	Per Semester	2.00
Tutorial	Other hours (Practical/Tutorial)	24	Per Semester	2.00
Independent Learning	Independent learning (hours)	202	Per Semester	16.83
Total Weekly Contact Hours				4.00

Module Resources	
<i>Recommended Book Resources</i>	
<p>Ellis, Byron.. (2014), Real-Time Analytics: Techniques to Analyze and Visualize Streaming Data, Wiley.</p> <p>DeLoach, Don.. (2017), The Future of IoT: Leveraging the Shift to a Data Centric World, Wiley.</p> <p>Kolozali, Sefki, et al.. (2014), A knowledge-based approach for real-time iot data stream annotation and processing, Internet of Things (iThings),.</p> <p>Tönjes, Ralf, et al.. (2014), Real time iot stream processing and large-scale data analytics for smart city applications, poster session, European Conference on Networks and Communications.</p> <p>Gubbi, Jayavardhana, et al.. (2013), Internet of Things (IoT): A vision, architectural elements, and future directions, 7 (, " Future generation computer systems 29.</p>	
<i>Supplementary Book Resources</i>	
<p>Hwang, H.. (2017), Big-Data Analytics for Cloud, IoT and Cognitive Computing.</p> <p>Slama, D,. (2017), Enterprise IoT: Strategies and Best Practices for Connected Products and Services.</p>	
<i>This module does not have any article/paper resources</i>	
<i>This module does not have any other resources</i>	
Discussion Note:	