

| | |
|---|--|
| Department | School of Computing |
| Supervisors | Prof. Ahmed Al-Dubai, Prof Amir Hussain and Prof Berl Canberk |
| | |
| Project Title | Intelligent Resource Allocation in Industrial IoT |
| <p>PROJECT DESCRIPTION</p> <p>While cloud computing offers virtually infinite processing resources, it also, however, leads to intolerable processing delays for timely critical Industrial Internet of Things (IIoT) applications. In addition, while the amount of generated data increases dramatically, such data are in need for different resources at different levels. With implications in the IIoT and virtual reality, mobile networks operate and provide a multi-aspect strategy for multiple resource allocation paradigms and service-oriented possibilities in the computing sectors. Hence, the evolution of the current cloud-centric architecture to new paradigms (e.g. fog, edge & distributed clouds) presents a suitable path to facilitate solutions that are more efficient in terms of capacity and latency. The Mobile Edge Computing (MEC) model combines a virtual source with edge communication among execution. Thus, this study will develop and implement a revolutionary resource allocation technique in the IIoT by using appropriate machine learning algorithms that will enable MEC share and utilise the resources efficiently. The study will employ a latency-aware scheduling and resource provisioning algorithms to enable tasks to complete and meet their latency requirements. Simulation experiments and analytical modelling will be deployed to validate the proposed solutions.</p> <p>Academic qualifications</p> <p>A first degree (at least a 2.1) ideally in Electronic Engineering or Computer Science with a good fundamental knowledge of Cybersecurity.</p> <p>English language requirement</p> <p>IELTS score must be at least 6.5 (with not less than 6.0 in each of the four components). Other, equivalent qualifications will be accepted. Full details of the University's policy are available online.</p> <p>Essential attributes:</p> <ul style="list-style-type: none"> • Experience of fundamental IoT systems • Competent in handling cloud and edge computing • Knowledge of Resource allocation and machine learning • Good written and oral communication skills • Strong motivation, with evidence of independent research skills relevant to the project • Good time management <p>Desirable attributes:</p> <ul style="list-style-type: none"> • Experience in cloud computing • Good knowledge of communications • Preliminary experience in machine learning | |
| Indicative Bibliography | <ul style="list-style-type: none"> - Alsarhan, A. Itradat, A. Y. Al-Dubai, A. Y. Zomaya and G. Min, "Adaptive Resource Allocation and Provisioning in Multi-Service Cloud Environments," in <i>IEEE Transactions on Parallel and Distributed Systems</i>, vol. 29, no. 1, pp. 31-42, 1 Jan. 2018, doi: 10.1109/TPDS.2017.2748578. - H. Djigal, J. Xu, L. Liu and Y. Zhang, "Machine and Deep Learning for Resource Allocation in Multi-Access Edge Computing: A Survey," in <i>IEEE Communications Surveys & Tutorials</i>, 2022, doi: 10.1109/COMST.2022.3199544. |

| | |
|------------------|---|
| | <ul style="list-style-type: none"> - J. Xu, B. Palanisamy, H. Ludwig and Q. Wang, "Zenith: Utility-Aware Resource Allocation for Edge Computing," <i>2017 IEEE International Conference on Edge Computing (EDGE)</i>, 2017, pp. 47-54, doi: 10.1109/IEEE.EDGE.2017.15. - H. Liao <i>et al.</i>, "Learning-Based Context-Aware Resource Allocation for Edge-Computing-Empowered Industrial IoT," in <i>IEEE Internet of Things Journal</i>, vol. 7, no. 5, pp. 4260-4277, May 2020, doi: 10.1109/JIOT.2019.2963371. - Z. Sharif, L. T. Jung and M. Ayaz, "Priority-based Resource Allocation Scheme for Mobile Edge Computing," <i>2022 2nd International Conference on Computing and Information Technology (ICCIIT)</i>, 2022, pp. 138-143, doi: 10.1109/ICCIIT52419.2022.9711641. - Sartzetakis, P. Soumplis, P. Pantazopoulos, K. V. Katsaros, V. Sourlas and E. M. Varvarigos, "Resource Allocation for Distributed Machine Learning at the Edge-Cloud Continuum," <i>ICC 2022 - IEEE International Conference on Communications</i>, 2022, pp. 5017-5022, doi: 10.1109/ICC45855.2022.9838647. - M. S. Allahham, A. Mohamed and H. Hassanein, "Incentive-based Resource Allocation for Mobile Edge Learning," <i>2022 IEEE 47th Conference on Local Computer Networks (LCN)</i>, 2022, pp. 157-164, doi: 10.1109/LCN53696.2022.9843405. - X. Liu, "Resource Allocation in Multi-access Edge Computing: Optimization and Machine Learning," <i>2021 IEEE 12th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON)</i>, 2021, pp. 0365-0370, doi: 10.1109/IEMCON53756.2021.9623076. |
| | |
| Enquiries | For informal enquiries about this PhD project, please contact Prof Ahmed Al-Dubai, Email: a.al-dubai@napier.ac.uk |
| Web page | https://www.napier.ac.uk/research-and-innovation/research-degrees/application-process |