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| Ficha de Proposta de Dissertação/ Projeto/Estágio Mestrado | | | | |
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| Informação sobre o(s) Orientador(es) | | | | |
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| Exploring the potential of social agents and distributed ledger technologies for load balancing in community energy systems | | | | |
| Título do Projeto | | | | |
| Filipe Magno Gouveia Quintal | | |  | (967549595) |
| Nome do Professor Orientador | | |  | Contacto Telefónico |
|  | | |  | filipe.quintal@staff.uma.pt |
| URL do Projeto | | |  | E-Mail |

Preencher no caso de existir um Co-Orientador ou Orientador Externo:

|  |  |  |
| --- | --- | --- |
| Amâncio Lucas de Sousa Pereira |  | (967734005) |
| Nome |  | Contacto Telefónico |
| Técnico Lisboa, Universidade de Lisboa |  | lucas.pereira@iti.larsys.pt |
| Departamento ou Empresa |  | E-Mail |

Preencher no caso de ser uma dissertação proposta pelo aluno:

|  |  |  |
| --- | --- | --- |
| Nuno Alexandre Silva Velosa |  | 2043816 |
| Nome |  | Nº de Aluno |

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| Informação sobre a Dissertação/Projeto/Estágio |

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| Engenharia Informática |
| Área(s) Científica(s)  Motivation   |  | | --- | | Community energy systems (CES)**1**, where a community owns and manages its renewable energy assets are expected to play a crucial role in making the use of renewable energy sources more efficient. A fundamental requirement of CES is that the community is able to reduce its peak electricity consumption such that the demand can be covered as much as possible by RES.  Agent-based social simulation (ABSS)2 as been applied to CES as a mechanism to provide social behavior in load balancing across the community members with very promising results2. A key aspect of social-agents is their willingness to perform costly actions that benefits others, which greatly contrasts greedy agents that aim only at satisfying its own needs. Still, while the results in 3 show that social agents can increase the load balancing in CES, more research is needed to further assess these results using realistic profiles of load demand and production from RES.  In order to achieve load balancing in the CES, trade among the participants is required. For example, trading slots for operating particular loads (e.g., the washing machine), or excess production from RES. As such, recently the used of the distributed ledger paradigm as emerged to support the transactions among peers without the need to involve third-party entities to ensure trust among the peers4. However, despite the promise of DLTs, their application to manage transactions in CES is still underexplored especially with what concerns to the development of hardware-software prototypes. |   Objectives   |  | | --- | | Against this background the main objective of this thesis is to develop a platform that enables the simulation of social-agents operation in community energy systems using a distributed ledger to maintain the transaction among peers (i.e., agents).  The student is expected to:   * Conduct a literature review on the application of social-agent computation (e.g., the work in 3) and distributed ledger technologies (e.g., hyper-ledger fabric5) and their application to community energy systems. * Explore publicly available datasets or simulation systems that enable the creation of aggregated load consumption profiles from the combination of individual appliances consumption data. E.g., REFIT6 dataset, and AMBAL7 simulator. * Develop and test community energy systems simulator that enables social-agents to manage the scheduling of specific device operation times, e.g., washing machines, and used distributed ledger technologies to take care of the underlying transactions. * Evaluate the develop system from the perspectives of the social-agents (e.g., number of successful trades), and the community energy systems (e.g., reduction in peak-demand).   References   1. <https://www.rescoop.eu/blog/what-are-citizen-and-renewable-energy-communities> 2. <https://link.springer.com/chapter/10.1007/978-3-540-69304-8_41> 3. <https://www.mitpressjournals.org/doi/abs/10.1162/isal_a_00290> 4. <https://ec.europa.eu/jrc/en/publication/blockchain-energy-communities-proof-concept> 5. <https://www.hyperledger.org/> 6. <https://www.refitsmarthomes.org/datasets/> 7. <https://www.areinhardt.de/publications/buneeva-smartgridcomm-2017/> |   Resources   |  | | --- | | AT ITI/LARSyS the student will be given access to a computing and data storage infrastructure to help in the development of the thesis work.  The work in this thesis will also count with the collaboration of Prof. Simon Powers from the Napier University and Nathan Brooks from Keele University in the UK, who have considerable experience in social-agents for community energy systems. |   Preencher no caso de o projeto ser desenvolvido numa Entidade Exterior:   |  |  |  | | --- | --- | --- | |  |  | () | | Nome da Entidade |  | Contacto Telefónico | |  |  |  | | Morada |  | E-Mail |   Observações e/ou Pré-Requisitos   |  | | --- | |  | |