Quantum-classical software for drug prescription simulation in aging people

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Purpose Aging often leads to the presence of comorbidities and chronic diseases. As a result, older people are often polymedicated, taking 5 or more drugs on a regular basis. This means that, when a new illness or physical problem appears, it is very difficult to prescribe the most appropriate medicine to treat them due to possible reactions, adverse effects, contraindications, etc. Personalized medicine tries to address this situation by analyzing the best possible combination of medication to treat each person's conditions. **Method** Pharmacogenetics is particularly relevant in the field of personalized medicine and medication. This field searches to prescribe drugs according to the effects of these drugs, the patient's history, and the genetic and physiological factors of the patient. Current software is useful to identify potential problems and facilitate the individualisation of the administration of certain drugs. However, providing safe and effective drug therapy with this software is a rather computationally complex problem for several reasons. Aging people take multiple medications and treatments throughout their lives. Therefore, there is a large amount of historical data to consider that is currently unmanageable with current tools, and linking this data to genetic information is computationally very complex (Dash, S. et al., 2019). The new discipline of quantum computing can be used to address this complexity. The arrival of quantum computing has brought a new paradigm in computing and software engineering, unlocking new horizons in the applications of computation to solve problems (Zhao, J., 2020). Quantum computing not only makes it possible to solve problems in much less time than classical computers but also to use its computational power to tackle problems beyond the scope of classical computing as we know it (MacQuarrie, E.R. et al., 2020). Like conventional software, quantum software will be a fundamental part of the evolutionary process of this technology. However, there is still a lot of research to be done in the development of this new emerging technology (J. Rojo et al., 2020). **Results and Discussion** Hybrid architectures allow the combination of classical and quantum systems. In this work we present a system that allows healthcare professionals to use a classical system to analyze a patient's situation. This is transferred to a quantum system in which the patient's genetic information, medication history, etc. is analyzed and represented by a data model (Figure 1a). Therefore, the obtained results can be interpreted by healthcare professionals, and simulations can be performed using quantum computing in a transparent way (Figure 1b).

References

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Keywords: aging, quantum computing, quantum services, pharmacogenetics, drug treatment

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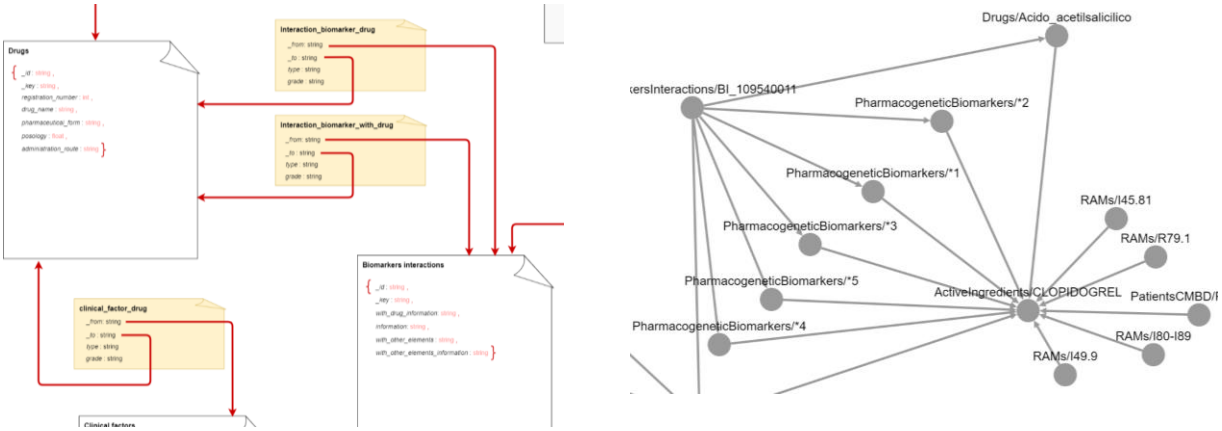
Acknowledgement This work was supported by the projects 0499_4IE_PLUS_4_E (Interreg V-A España-Portugal 2014-2020), PID2021-124054OB-C31; the QSalud Project; the Ministry of Economy, Science and Digital Agenda (GR21133, IB18030), and the European Regional Development Fund.



(a) Data model extraction *(b) Graph visualization*

Figure 1. Graph model with patient information for the quantum system