

## **PhD Project**

### **AI-Assisted Tax Assessment**

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The project is aimed to develop an AI-assisted system to automatically generate tax assessment reports from various documents of contracts, costings and accounting. It involves a rule-based expert system in the first stage and further learning ability from text contents to tax treatments in the second stage. You will have the opportunity to gain experience in modern artificial intelligence techniques, in particular on expert systems and natural language processing.

### **Project Description**

Identifying potential capital allowances involves large volumes of construction and fixed asset cost data to be analysed to assign the correct tax treatment, requires an understanding of tax legislation, complex case law and construction terminology. This process is time-consuming and complex, and as a result, often available tax relief is overlooked. In this project, we will develop an automated solution to this problem by using advanced techniques of Artificial Intelligence and Natural Language Processing.

In the proposed approach, the raw data originates from the clients internal accounting systems or from external consultants, and is fed into the capital allowances template. This is then fed into the automated system that predicts the tax treatment based on what it's learned from its training data. This should be completed in a matter of seconds compared to hours or even days by human experts. Each output in the list of tax treatment will also be associated with a probability score of how confident it is to be correct, allowing a focused review by a human operator for final confirmation. If a manual override occurs, the system will track the corrections, and turn them into part of the training data, ensuring increased accuracy next time.

The project will involve two stages of development. First, a rule-based system will be constructed to encode the experts' knowledge into a prototype system, while data is collected and processed in parallel. In the next stage, a learning-based method is further developed to learn the relationship between the text descriptions and the corresponding tax treatment from the data collected in the previous stage.

### **Project Impacts**

The new tax legislation introduced in October 2018 extended the previous tax reliefs, providing incentives for businesses of all sizes to invest in buildings, structures, plant and equipment. It applies to the majority of all property expenditure on developing, refurbishing, converting and extending a commercial property. Currently, expenditure on buildings has been largely ignored, because it is seen as building and not qualifying tax relief, mainly due to clients and their advisors not understanding what benefit they are entitled to claim.

The automated solution will enable businesses with property portfolios claiming back their capital allowances quicker and with ease, and more importantly, making the most of their tax relief. Also, it will enable the HMRC to promote tax compliance and simplification the tax claim process. The system can also overlay additional rules when processing data which allows it to deal with legislation changes and what-if scenarios. This level of flexibility ensures it remains future proof.

We will be working closely with Veritas Advisory, a specialist on capital allowance and tax relief, through the whole process of the project, from the data collection, pre-processing and exploitation, to the development of rule-based system, and eventually the automated system.

## **Environment and Support**

The Department of Computer Science enjoys a strong international standing for its research in both data science and artificial intelligence, as evidenced by numerous research performance metrics, e.g., 3rd in UK overall and 1st in UK for H-index from 2018-2020 (the NTU Performance Ranking of Scientific Papers, Subject: Computer Science, 2020). Data Science and artificial Intelligence has been a strategic focus of the Department for both research and teaching. The proposed research sits right in the centre of the above focus area, and covers promising topics of intelligent data analysis, cloud computing, expert systems and natural language processing.

## **Eligibility**

Applicants will be required to demonstrate that they have the following qualification, knowledge and skills:

- An Undergraduate First Class or Upper-Second Honours degree in computing, engineering, or other STEM subjects.
- A Postgraduate degree is not required but may be an advantage.
- Strong programming skills, ideally in Python, but other languages also acceptable.
- Good knowledge in expert systems, natural language processing and artificial intelligence.
- Highly motivated to learn.
- Able to work independently as well as collaborating with others in a team.