

THE UNIVERSITY OF MANCHESTER

FACULTY OF HUMANITIES

ALLIANCE MANCHESTER BUSINESS SCHOOL (AMBS)

ESRC IAA RESEARCH ASSOCIATE

VACANCY REF: HUM-032511

Job title: Research Associate for developing eXplainable AI-powered Decision Models (XAI-DMs) for Insurance Underwriting

Salary: £37,694.00 (Grade 6.1)

Hours: 35 hours / 1.0 FTE

Start/duration: as soon as possible until 31st December 2027

Based at: AMBS and Protector Insurance

Responsible to: Academic Supervision Team:

Prof Jian-Bo Yang, Professor of Decision and Systems Sciences

Prof Dong-Ling Xu, Professor of Decision Science and Systems

Informal enquiries: Prof Jian-Bo Yang; Email: jian-bo.yang@manchester.ac.uk; Tel: 0161 3063427

Prof Dong-Ling Xu; Email: ling.xu@manchester.ac.uk; Tel: 0161 2750941

JOB DESCRIPTION

This is an exciting opportunity for an ambitious graduate with the ability and confidence to work on a research project for developing eXplainable AI-powered Decision Models (XAI-DMs) for Insurance Underwriting, which is funded by ESRC IAA to The University of Manchester (UoM) together with Protector Insurance as industrial partner.

The University of Manchester is looking to recruit a decision scientist, artificial intelligence (AI) modeller, system scientist to undertake this project, which is based on the research conducted by UoM experts over many years in areas of decision science, systems science, AI and Data Science to develop the Evidential Reasoning (ER) theory, including the Maximum Likelihood Evidential Reasoning (MAKER) framework for probabilistic reasoning with imperfect data, the ER rule for combination of uncertain evidence acquired from imperfect data and human judgment, the ER approach for multiple criteria decision making under uncertainty, and the Belief Rule Base (BRB) methodology for probabilistic system modelling and intrinsically explainable machine learning funded by many EPSRC grants.

The RA position will provide the successful candidate with a unique opportunity to take the lead on a strategic project, aimed at translating the ER theory and industrial domain knowledge to develop new XAI-DMs for Insurance Underwriting and to integrate them into existing working practices for Protector Insurance.



ance, which will be supported by the specialists of the company. The RA will therefore be faced with the challenge of understanding both the theory and the practical applications of decision modelling, data analytics, probabilistic inference, XAI decision modelling and evidence-based decision making to support the development of the XAI-DMs; and translating the technical know-how into a form that can be easily understood and used by users within Protector Insurance.

Candidates will require a recently obtained minimum 2:1 with doctoral research experience in Systems Science, Decision Science, Operational Research, Data Analytics, Artificial Intelligence, or Applied Statistics with Decision, or a PhD degree in the afore mentioned or related subject areas, with evidence of a strong grounding in probabilistic data analysis and reasoning, XAI decision modelling, decision analysis, multiple criteria assessment, and software development in Python or equivalent.

This post is funded through an ESRC IAA award together with Protector Insurance, a UK Government scheme intended to promote sustained and mutually beneficial relationships between universities and industry.

Based at Alliance Manchester Business School and Protector Insurance, the successful candidate will work directly with the supervisors from the University and with other researchers and practitioners from Protector Insurance.

BACKGROUND

Alliance Manchester Business School (AMBS):

Established in 1965 as one of the UK's first two business schools, we are proud to be part of the prestigious University of Manchester and the UK's largest campus-based business and management school. Ranked 2nd in the UK for research power, our influential research impacts all areas of business and management – from accounting and health management to big data, AI for business and human rights. The academic team supporting the project are based within Research Centre for AI and Decision Sciences, a world leading centre of research excellence in the areas of Data-driven and Knowledge-based Modelling and Simulation, Probabilistic Machine Learning, Multiple Criteria Decision Analysis and Decision Support Systems. <https://www.alliancembs.manchester.ac.uk/research/centre-for-ai-and-decision-sciences/>

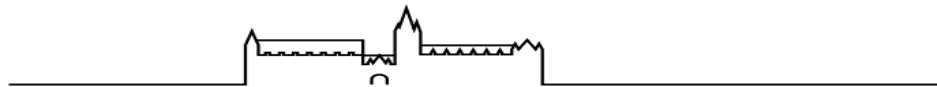
Protector Insurance:

Protector Insurance is an insurance firm with expertise in underwriting, risk management and claims handling. The company is the challenger in the insurance sector and demonstrates this through unique relationships, best in class decision making and cost effective solutions. The company has specialist underwriters with knowledge over a wide range of trade sectors and programme structures including non-conventional. Their experienced underwriting team has a wide range of expertise in managing and growing profitable underwriting portfolios. As part of underwriting process data and analytical analysis is considered as part of both pricing and Risk Management propositions. <https://protectorinsurance.co.uk/>

The Evidential Reasoning (ER) theory and the Belief Rule Base (BRB) methodology

The Evidential Reasoning (ER) theory provides a rigorous, strictly probabilistic foundation for modelling and reasoning with multiple sources of uncertain evidence acquired from incomplete data, ambiguous information or professional judgement that is inherently unreliable.

The Belief Rule Base (BRB) methodology operationalises the ER theory by representing expert knowledge as transparent belief rules, which can be trained and updated using data while retaining a clear reasoning



structure. This makes BRB particularly suitable for intrinsically explainable machine learning, where each input, rule activation, inference step and output can be inspected, challenged and audited. In professional services such as insurance underwriting, ER and BRB can be used to codify specialist judgements, reduce inconsistency and bias in decision making, and support knowledge-based and data-informed assessments that are transparent, traceable and accountable. This provides an important methodological basis for responsible AI systems that assist professionals rather than replace them, enabling organisations to combine human expertise, imperfect data and machine learning in a way that is interpretable, auditable and practically useful.

OVERALL PURPOSE OF THE ROLE

Overview of the main purpose of the role:

The project aims to apply cutting edge research to transform insurance underwriting through explainable AI decision models. Unlike traditional actuarial models or opaque machine learning systems, our approach combines data-driven techniques with expert knowledge to create transparent, auditable decision models, with high model accuracy / interpretability and trustworthiness.

The project is expected to deliver a prototype that improves underwriting speed/consistency/fairness, while meeting regulatory requirements for interpretability. This aligns with the UK research council's themes on Digital Society and Artificial Intelligence in the Economy and Society and supports the goal of accelerating impact from research into industry.

Via follow-on activity, this innovation could evolve into an online platform with dedicated user interfaces, databases, generative AI agents to determine risk status and support faster/accurate/auditable underwriting decisions.

Beyond technical innovation, the project will establish a scalable framework for applying XAI in other financial services, creating a foundation for future collaborations.

Key Responsibilities, Accountabilities or Duties

The key duties will include:

- Review - Following familiarisation and review of business requirements, the Associate will undertake a review of the current thinking, latest technology and work undertaken in insurance underwriting.
- Current analysis - Analyse current insurance underwriting practices together with the company.
- Critical evaluation - Understand and critically evaluate current underwriting decision-making, working with the company team to identify inconsistencies, gaps, and opportunities for improvement through systematic modeling.
- Critical thinking - Critically assess domain practice and challenge assumptions while maintaining collaborative relationships.
- Decision modelling and assessment review - Analyse state of the art in multipole criteria assessment and decision modelling techniques.
- Construct a factual BRB model to support insurance underwriting.
- Establish and validate a heuristic BRB model to support evidence-based insurance underwriting powered by the ER approach.
- Develop a heuristic BRB model-based process for insurance underwriting.



- Develop a hierarchical BRB model by integrating the built models to automate insurance underwriting and assessment based on the ER approach.
- Model validation - Create evaluation framework responsibility, including establishing an evaluation framework to test whether BRB models improve underwriting consistency and decision quality, with feedback loops to validate recommendations against actual outcomes.
- Establish prototyping environment - Integrate the developed models into the insurance underwriting processes of the company to establish a prototyping environment.
- Creation of solution - With assistance from the development team of the company, to test and evaluate the prototype.
- Final Embedding & Dissemination

Other duties:

- Assist in the supervision of students who may be assisting with the research.
- Undertake research (preparing, setting up, conducting and recording the outcome of experiments and field work, the development of questionnaires and conducting surveys).
- Conduct literature and database searches.
- Contribute to the production of research reports and publications.
- Prepare papers and present information on research progress and outcomes.
- Make internal and external contacts to develop knowledge and understanding and form relationships for future collaboration.
- Actively participate as a member of a research team and contribute to decisions affecting the work of the team.
- Attend and contribute to relevant meetings.
- Make use of standard research techniques and methods.
- Deal with problems which may affect the achievement of research objectives and deadlines.
- Analyse and interpret the results of own research and generate original ideas based on outcomes.
- Plan own day-to-day research activity within the framework of the agreed programme.
- Continue to update knowledge and develop skills

PERSON SPECIFICATION

Qualifications:

Essential:

- Minimum 2:1 BSc/MSc in System Science, Decision Science, Operational Research, Computer Science, Applied Statistics with Computation, Computer Science with Business, or equivalent.
- Doctoral research experience or PhD degree in a related subject area in Systems Science, Decision Science, Operational Research, Data Analytics, Applied Statistics, Artificial Intelligence or Machine Learning, **with** evidence of a strong grounding in e-business, software engineering or equivalent.

Skills & attributes:

Essential:

- Specialist knowledge in systems science, decision science, operational research, data analytics, applied mathematics and statistics, including devising/adapting algorithms and the use of statistical and optimisation packages.
- Knowledge, ideally with evidence of application, gained through project work, placement and/or work experience, of the following:



- Probabilistic inference and decision modelling with data.
- Multiple criteria assessment, analysis and decision making
- Computational intelligence for decision support.
- Knowledge of computer language such as Python, C++ or C.
- Optimisation and machine learning approaches and tools.
- Database knowledge and data integration.
- Strong journal publication interest or record.
- Commercial aptitude and the ability to understand the needs of internal and external customers are essential.
- Ability to elicit, interpret and respond to user requirements.
- Strong analytical skills are essential to the post.
- Ability to visualise, articulate, conceptualise or solve both complex and uncomplicated problems for making decisions and/or exploring new technical opportunities/ideas.
- The ability to work independently and as part of a team, collaborating with colleagues and sharing expertise.
- Excellent communication and interpersonal skills with the ability to produce high level written reports are crucial, as is enthusiasm in presenting verbally project achievements.
- Proactive with a willingness and aptitude to take ownership of all aspects of the project management including administration, communication, etc.
- Excellent time management and organisational skills.
- Ability to meet deadlines.

Desirable:

- Interest and ability to co-supervise student dissertation projects related to this project.
- Experience of working in a professional services business environment.

Reporting Structure for the Role

Prof Jian-Bo Yang (PI) University of Manchester – Line manager

WORKING FOR THE UNIVERSITY OF MANCHESTER

The University of Manchester strives to make our community a welcoming, caring and enthusiastic one, fuelling ambition with opportunities and support to help us all achieve our personal and professional goals.

Our diverse job opportunities include an attractive [benefits package](#) with family-friendly policies that provide for flexible working. We care deeply about career and personal development, offering a structured induction programme for new staff, an annual performance and development review, staff training for all career stages and mentoring opportunities to support your career development.

We have a genuine commitment to [equality of opportunity](#) for our staff and students, and are proud to employ a workforce that reflects the diverse community we serve.

As a global institution, situated at the heart of a lively, [culturally diverse city](#), we welcome applicants of all nationalities. To help international job applicants plan for life in the UK, we have put together some useful [information on passports and visas](#), travel to the UK, accommodation and a number of other practical considerations.