# Postdoctoral Fellowship – CSOF4

Role summary for potential applicants

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| Advertised Job Title**:** | CSIRO Postdoctoral Fellowship in Building Trusted Artificial Intelligence (AI) to Solve Environmental Decision Problems |
| Reference Number**:** | 58774 |
| Classification**:** | CSOF4 |
| Salary Range: | AU $82k to AU $93k plus up to 15.4% superannuation |
| Location**:** | Dutton Park, Brisbane |
| Tenure: | Specified Term of up to 3 years (or part time equivalent) |
| Relocation assistance**:** | Will be provided to the successful candidate if required. |
| Applications are open to: | Australian Citizens Only  Australian/New Zealand Citizens and Australian Permanent Residents Only   * All Candidates |
| Functional Area**:** | Research Scientist / Engineer - Postdoc |
| % Client Focus - Internal: | 100% |
| % Client Focus - External: | 0% |
| Reports to the: | Team leader, Dr Iadine Chades |
| Number of Direct Reports: | 1 |

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| **Role Overview:** |
| **Postdoctoral Fellowships** at CSIRO provide opportunities to scientists and engineers who have completed their doctorate and have less than three years relevant postdoctoral work experience. These fellowships will help launch their careers, provide experience that will enhance their career prospects, and facilitate the recruitment and development of potential leaders for CSIRO.  Postdoctoral Fellows **are appointed for up to three years or part time equivalent** and will work closely with a leading Research Scientist or Engineer in their respective field. They carry out innovative, impactful research of strategic importance to CSIRO with the possibility of novel and important scientific outcomes. They present the findings in appropriate publications and at conferences.  We are seeking a highly motivated and dynamic postdoctoral research fellow to work on **developing AI specifically designed to deliver interpretable and explainable solutions to environmental decision problems**. The Postdoctoral Fellow will join the Conservation Decisions team led by Dr Iadine Chades (primary supervisor) and will be co-supervised by Dr Andy Reeson (CSIRO, Data 61) and Prof Tom Dietterich (Oregon State University).  Environmental managers seldom have the luxury of full information to guide their decision-making. In conservation and fisheries management, species are often too difficult to detect to provide accurate population abundance estimates needed to inform decision-making. Managers must make decisions despite the uncertain outcomes of their actions, or risk failing to achieve their goals through inaction. Making decisions under uncertainty is a complex mathematical problem that can be efficiently solved using Artificial Intelligence. For example, where the future is uncertain, managers must adapt their decisions as they act, using feedback from their observations to predict optimal future actions while reducing uncertainty over time. This adaptive management, or ‘learning by doing’ can be optimised using powerful AI decision models such as Markov Decision Processes (MDP) and Partially Observable Markov Decision Processes (POMDP). However, optimisation alone is not sufficient for good management.  AI decision models will only be useful if they are used by decision-makers. To date, most attention has been placed on the technical aspects of AI, with little emphasis on their adoption by human managers. This is a widespread problem, but is particularly acute in the environmental domain, in which decision-makers are typically trained in biology or environmental sciences, and experienced in practical fieldwork rather than technology. This has resulted in environmental managers not taking advantage of the opportunities these decision tools could offer to tackle complex environmental decision-making.  Over the last ten years, our research has pioneered the use of Artificial Intelligence decision tools to manage our environment and our science has been recognised by prestigious publications in both ecology and AI conferences (AAAI, IJCAI). Greater impact will come when more and more environmental managers effectively exploit the benefits of AI. We have identified that our greatest need is to develop trusted easy-to-use Artificial Intelligence for environmental managers rather than Artificial Intelligence that focuses on optimal solutions. Such solutions must be easy to interpret and provide explainable mechanistic insights. They should also help users to learn and explore the impact of alternative management actions and scenarios in order to add value to their judgement.  This requires an understanding of human decision-making, including biases and heuristics that could result in AI outputs being misinterpreted (or ignored) by environmental managers. The field of behavioural economics has identified characteristics of human judgement and decision-making, as well as elicitation techniques to minimise bias, which are currently poorly accounted for in AI decision tools. Building on behavioural economics, the PDF will address a key question in environmental management: How should AI be designed and implemented in order to be considered a trusted advisor by managers? What information should AI elicit, and how should it present and explain its outputs? Developing AI algorithms that can provide such solutions in human-operated systems is a substantial task that will be the focus of the PDF over the next three years. |

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| **Duties and Key Result Areas:** |
| * Under the direction of senior research scientists, carry out innovative, impactful research of strategic importance to CSIRO that will, where possible, lead to novel and important scientific outcomes. * Undertake regular reviews of relevant literature and patents. * Produce high quality scientific and/or engineering papers suitable for publication in quality journals, for client reports and granting of patents. * Prepare appropriate conference papers and present those at conferences as agreed with your supervisor. * Develop AI algorithms that provide explainable, interpretable and trusted solutions to solve environmental decision problems in human-operated systems. * Test performance of algorithms in human-operated systems. * Contribute to the development of innovative concepts and ideas for further research. * Make a contribution to the effective functioning of the research team and help deliver CSIRO’s organisational objectives and plans. * Work collaboratively with colleagues within your team, the business unit and across CSIRO. * Communicate effectively and respectfully with all staff, clients and suppliers in the interests of good business practice, collaboration and enhancement of CSIRO’s reputation. * Adhere to the spirit and practice of CSIRO’s Values, Health, Safety and Environment plans and policies, Diversity initiatives and Zero Harm goals. * Undertake an appropriate training and development program developed by CSIRO. * Other duties as directed.   **CSIRO’s postdoctoral training program**is developed between the Postdoctoral Fellow and a CSIRO scientist or engineer. The program will focus on enhancing the Fellows’ capabilities to the level expected of an independent researcher and will include on-the-job and course-based development encompassing:   * Discipline-specific techniques and protocols * Professional growth * Project management * Communication and influencing skills * Working and collaborating with others   <http://www.csiro.au/en/Careers/Student-and-graduate-programs/Postdoctoral-fellowships> |

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| **Selection Criteria:** |
| *Under CSIRO policy only those who meet all essential criteria can be appointed*  ***Pre-Requisites:***   1. **Education/Qualifications:** A doctorate (or will shortly satisfy the requirements of a PhD) in a relevant discipline area, such as Ecological modelling, Computer Science (Artificial Intelligence), Applied Mathematics, Operation Research and Economics.   ***Please note:*** *To be eligible for this role you must have* ***no more than 3 years (or part time equivalent)*** *of relevant postdoctoral experience.*   1. **Communication: High level written and oral communication skills with the ability to represent the research team effectively internally and externally, including at national and international conferences.** 2. **Publications: A record of publications in quality, peer reviewed journals and/or conference proceedings.** 3. **Behaviours:** A history of professional and respectful behaviours and attitudes in a collaborative environment.   ***Essential Criteria:***   1. Demonstrated research achievement in one of the following: decision theory, optimisation, artificial intelligence or ecological modelling. 2. Enthusiasm for applying advanced computational and decision theoretic tools to environmental problems. 3. Demonstrated ability to initiate research characterised by originality, creativity and innovation. Publish the findings from research in international peer reviewed journals and/or selective conference proceedings. 4. **The ability to work effectively as part of a multi-disciplinary, regionally dispersed research team, plus the motivation and discipline to carry out autonomous research.** 5. A record of science innovation and creativity, plus the ability & willingness to incorporate novel ideas and approaches into scientific investigations.   **Desirable Criteria:**   1. Demonstrated research achievement in one or more of Markov decision processes (MDP), partially observable Markov decision processes (POMDP), stochastic dynamic programming, reinforcement learning or mathematical programming. 2. Excellent programming skills in a language (Matlab, R, C or other language) 3. Strong track record of cross-disciplinary collaborative research.   **As Australia’s Innovation Catalyst, CSIRO has strategic actions underpinned by behaviours aligned to**:   * Excellent science * Inclusion, trust & respect * Health, safety & environment * Delivery on commitments.   **In your application and at interview you will need to demonstrate alignment with these behaviours.**  To be appointed as a Postdoctoral Fellow within CSIRO, candidates are required to have **submitted** their PhD at the time of commencement, as a minimum requirement, if PhD conferment has not been obtained. If a candidate has submitted, but their PhD has not yet been formally attained, the starting salary will be CSOF4-1 (AU$82,450).Upon CSIRO receiving written confirmation that the PhD has been awarded (within a six month period from commencement date), the salary will be increased to the negotiated level and the difference will be back-paid to the Officer’s start date.  ***Special requirements:***  Appointment to this role may be subject to conditions including security/medical/character clearance requirements. Applicants who are not Australian Citizens or Permanent Residents may be required to undergo additional security clearance processes; which may include medical examinations and an international standardised test of English language proficiency (i.e. IELTS test).- <http://www.ielts.org/default.aspx> |

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| **Other Information:** |
| **How to Apply**  Please apply for this position online at <https://jobs.csiro.au/> and enter requisition number **58774**. Internal applicants please apply via ‘Jobs Central’ in SAP (click ‘Recruitment’)  Please load your CV (Maximum 2MB). You may also be required to respond to some screening questions.  If you experience difficulties applying online call 1300 984 220 for assistance. Outside Australian business hours please email: [csiro-careers@csiro.au](mailto:csiro-careers@csiro.au).  **Referees**: Please provide contact details of two previous supervisor or academic/professional referees in your resume/CV. We will ask your permission before making contact.  **Contact:** If after reading the position details above you require more information please contact:  **Dr Iadine Chades**via email: iadine.chades@csiro.au or phone: **+61 7 3833 5683**  Please do not email your application directly to **Dr Iadine Chades**. Applications received via this method may not be considered by the selection panel.  **About CSIRO**  Australia is founding its future on science and innovation. Its national science agency, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) is a powerhouse of ideas, technologies and skills for building prosperity, growth, health and sustainability. It serves governments, industries, business and communities across the nation.  Find out more! [www.csiro.au](http://www.csiro.au).  We work flexibly at CSIRO, offering a range of options for how, when and where you work. Talk to us about how this role could be flexible for you.  Find out more! [CSIRO Balance](https://www.csiro.au/en/careers/the-csiro-experience/balance)  **CSIRO Land and Water**  With our partners we aim to deliver innovative solutions to the complex challenges that arise from the demands and impacts of human activities on the environment.  **Find out more at** <https://www.csiro.au/en/Research/LWF> |