

Hearing Research Center Projects

The Macquarie University Hearing Research Centre brings together more than 70 researchers from across all four faculties, combining expertise in hearing, language and linguistics, communication, engineering, psychological sciences, AI, engineering, and more. The Centre's mission is to innovate and transform hearing health for all, and this can only be achieved by combining wide interests, skills and talents, and by adopting a collaborative and inclusive approach.

Research themes

To employ a public health and co-design approach to transform hearing health and inform healthcare practice and policies for healthy listening and communication in Australia and globally.

Explore the fundamental bases of human hearing and its critical role in healthy communication, individual wellbeing and social connectedness.

Translate research and transform the design and development of assessments, environments, interventions and technologies supporting communication needs.

Improve current solutions and generate an entirely new class of hearing therapies and platforms informed by, and suited to the improvement of, human hearing abilities.

Current projects include

Hearing Impairment Data Infrastructure (HEIDI)

Project lead: Professor Gopinath

The HEIDI project aims to establish a national data resource to slow the course of adult-onset hearing loss. This big data project will transform our understanding of how adults with hearing loss navigate the care pathway, from general practice to the audiology clinic. The project aims to: (i) generate a centralised repository of large, heterogeneous datasets providing a comprehensive view of the patient journey; (ii) create data-driven decision support tools that can be integrated into general practice workflows, to motivate and empower GPs and their patients to better address hearing health. The impact of this project is set to significantly improve access to care and the patient experience.

Forming and following auditory objects

Project lead: Professor McAlpine

Problems understanding speech in background noise are an early sign of hearing loss. This project will determine brain mechanisms that support 'cocktail party listening', and how this is affected by hearing impairment. Employing functional near-infrared spectroscopy (fNIRS)—neuroimaging technology that uses light to infer changes in cortical neural activity—it will explore how accurately representing the statistical structure of background sounds improves listening abilities in challenging acoustic environments. Unlike other brain-imaging technologies, fNIRS is compatible with hearing aids and cochlear implants and can be used to explore ways in which technological solutions to hearing loss can be enhanced to connect users to their listening environments. This project is funded by the William Demant Foundation.

Developing realistic hearing assessments

Project lead: Associate Professor Jorg Buchholz

Communication in the real world requires attending to one or more people while filtering out distractions like background noise, other people talking and reverberation. Successful listening in such dynamic, complex environments is strongly impacted by hearing loss, cognitive decline and other age-related factors. Despite the complexity of these environments, current clinical hearing assessments largely rely on pure tone audiometry and other tests that use artificial sounds. The aim of the EColoical Hearing Outcomes (ECHO) Laboratory is to bring the real world into the laboratory so that listening can be assessed in controlled environments while providing outcomes that are representative of an individual's real-world listening experience and disability. In pursuit of this, the Centre has engineered 3D audio and video technologies that allow the recording and reproduction of authentic real-world scenes in the laboratory. This project has also developed and validated listening tasks that go beyond the detection of tones and simple word recall, assessing speech comprehension, interactive communication and spatial awareness. Using these realistic assessments, the Centre can provide a

research and development platform that allows evaluation of the benefit of hearing aids, cochlear implants and other hearing technologies.

LEAP-HEAR

Project lead: Professor McMahon

Middle ear disease (known as otitis media or OM) in Aboriginal children is highly prevalent (occurring at three times the rate of non-Indigenous children), occurs earlier, lasts longer than non-Indigenous children, and disrupts critical periods of literacy and language development. This program is delivered in partnership with Macquarie University's Djurali Centre and aims to mitigate the effects of ear disease and hearing loss in Aboriginal and Torres Strait Islander children by: (i) strengthening and robustly evaluating three long-standing pre-school and school hearing screening programs in three Aboriginal communities in NSW; (ii) establishing an effective and scalable model for national roll out.

The Australian Eye and Ear Health Survey

Project lead: Professor Gopinath

The Australian Eye and Ear Health Survey was launched in 2022 with the goal of recruiting 5000 adults from 30 sites across urban, regional and remote regions in Australia. This is the first national survey to assess both vision and hearing loss and provides contemporary data on risk factors as well as information on the health and social impacts of sensory impairments in Australian adults. It is funded by the Australian Government Department of Health and Aged Care and the Martin Lee Centre for Innovations in Hearing Health.

NFACR Acknowledgement

The Australian Newborn Hearing Screening Showcase is sponsored and supported by the National Foundation of Australia- China Relations

麦考瑞大学听力研究中心：致力于听力健康的变革与合作

麦考瑞大学听力研究中心汇集了来自四个学院的70多名研究人员，涵盖了听力、语言和语言学、沟通、工程、心理科学、人工智能等领域的专业知识。该中心采用协作和包容的方法，创新和改变所有人的听力健康。

其科研主题在于探究人类听觉的基本基础，以及在健康沟通、个体福祉和社会联系中的关键作用。转化研究成果，改变评估、环境、干预和技术的设计与开发，以满足沟通需求。不断改进现有解决方案，通过提升人类听觉能力的改进，生成全新的听力疗法和平台。

当前主要研究项目包括以下几个

听力损伤数据基础设施 (HEIDI) 项目负责人: Bamini Gopinath教授

HEIDI项目旨在建立一个国家级数据资源，减缓成年人听力损失的进程。这个大数据项目将改变我们对成年听力障碍患者如何从普通诊所到听力诊所护理过程的理解。该项目旨在：(i) 生成大型、异质数据集的集中存储库，全面了解患者旅程；(ii) 创建数据驱动的决策支持工具，可集成到普通诊所工作流程中，以激励和赋予医生和患者更好地关注听力健康的能力。该项目的影​​响将显著提高护理服务的可及性和患者体验。

构建和跟踪听觉对象 项目负责人: David McAlpine教授

在背景噪音中难以理解语音是听力损失的早期迹象。这个项目将确定支持“鸡尾酒会听力”的大脑机制，以及听力损伤如何影响这一机制。采用功能近红外光谱 (fNIRS) ——一种使用光来推断皮层神经活动变化的神经成像技术，该项目将探索如何准确地呈现背景声音的统计结构，从而提高在具有挑战性声学环境中的听力能力。与其他脑成像技术不同，fNIRS与助听器和人工耳蜗兼容，可用于探索如何增强技术解决方案以改善用户与听力环境的联系。此项目由William Demant基金会资助。

开发现实听力评估

项目负责人: Jorg Buchholz副教授

在真实世界中进行交流需要注意一个或多个个人，同时过滤掉背景噪音、其他人的谈话和回响等干扰。在这样动态、复杂的环境中，听力很大程度上受到听力损失、认知衰退和其他与年龄相关的因素的影响。尽管这些环境的复杂性，目前的临床听力评估主要依赖纯音测听和使用人工声音的其他测试。生态学听力成果 (ECHO) 实验室的目标是将真实世界引入实验室，以便在受控环境中评估听力，同时提供代表个体真实世界听力体验和障碍的结果。为实现这一目标，中心开发了3D音频和视频技术，允许在实验室中记录和再现真实世界场景。该项目还开发并验证了超越音调检测和简单单词回忆的听力任务，评估了语音理解、交互沟通和空间意识。利用这些真实评估，中心可以提供一个研发平台，评估助听器、人工耳蜗和其他听力技术的益处。

LEAP-HEAR

项目负责人: Catherine McMahon教授

原住民儿童中的中耳疾病（称为中耳炎或OM）高度流行（发生率是非土著儿童的三倍），发生早于非土著儿童，持续时间比非土著儿童长，破坏了语言发展的关键时期。这个项目与麦考瑞大学Djurali中心合作，旨在通过：(i) 加强和严格评估新南威尔士三个土著社区的三个幼儿园和学校听力筛查计划；(ii) 建立一种有效且可扩展的国家推广模式，减轻土著和托雷斯海峡岛民儿童的耳疾和听力损失的影响。

澳大利亚眼耳健康调查

项目负责人: Bamini Gopinath教授

澳大利亚眼耳健康调查于2022年启动，旨在从澳大利亚城市、区域和偏远地区的30个地点招募5000名成年人。这是第一个评估视力和听力损失的全国性调查，提供了有关风险因素以及澳大利亚成年人

感官损害的社会影响数据。由澳大利亚政府卫生部以及马丁·李听力健康创新中心资助。

特别鸣谢

澳大利亚新生儿听力筛查展示由澳中基金会赞助支持

关键词：澳大利亚听力研究，麦考瑞大学，新生儿听力筛查，听力科研

