

## Arch\_Man\_u ITTC Press Release

October 31, 2025

### *Arch\_Man\_u's Fifth Hackathon Explores AI and Sustainability in Global Design Innovation*

From 21–28 October 2025, the ARC Centre for Next-Gen Architectural Manufacturing (Arch\_Man\_u) hosted its fifth hackathon, bringing together 24 participants and four expert consultants from Sydney, Melbourne, Adelaide, Frankfurt, Vienna, London, and New York. Themed *AI and Sustainability*, the event united industry representatives and academic researchers in an international collaboration exploring how artificial intelligence can accelerate digital and circular transformation in the built environment.

Participants included representatives from Arch\_Man\_u's academic nodes (UNSW, Swinburne University of Technology, the University of Adelaide) and partnering architecture and engineering firms (Architectus, Bollinger + Grohmann, Cox Architecture, Grimshaw, Tzannes). Conducted over two intensive days within the week-long event, the hackathon fostered hands-on experimentation across computational design, environmental performance, and AI-assisted regulation. Working in cross-disciplinary teams, participants developed four prototypes that illustrate how data-driven intelligence can meaningfully contribute to more sustainable and efficient design processes.

#### **1. AI-Driven NCC Compliance Checker for Revit**

Expanding on Arch\_Man\_u's previous research in AI-guided building regulation, this project delivered an on-premises prototype that automates compliance checking of BIM models against the Australian National Construction Code (NCC). Integrating architectural, computational, and AI expertise, the team developed a modular system connecting Revit to a local AI stack via a custom pyRevit interface and FastAPI microservice. Using Qdrant for vector search and locally hosted Large Language Models, the system provides clause-level analysis with cited evidence, confidence scores, and actionable feedback—while ensuring data sovereignty and alignment with Australian IT security standards. This work lays the foundation for scalable, privacy-preserving regulatory intelligence in architectural design.

*Project team:* Farrukh Memon (Swinburne University of Technology), Gavin Crump (Architectus), Guanlin He (UNSW), Harris Paneras (Cox Architecture), Houssame Eddine H'sain (UNSW), Joshua Stellini (Grimshaw), Kate Morris (Cox Architecture), Sharon Zhang (Cox Architecture), Wimarsi Rathugamage Dona (Adelaide University), Zhengnan Liu (UNSW)

*Expert advice:* Steve Fox (Architectus)

#### **2. Agentic Graph Intelligence for Decarbonising Structural Design**

This project introduces a new framework for decarbonising structural design by transforming how design intelligence is represented, read, and reasoned by AI. Instead of treating optimisation as a linear process of reducing material quantities, the team redefined structural understanding as a graph-based relational system where geometry, connectivity, and semantics are equally critical to decision-making. Through agentic AI orchestration, specialised agents interpret these graphs under a Planner Agent's coordination to propose context-aware design adjustments that maintain structural performance while reducing embodied carbon. The work reframes the future of computational engineering, envisioning structures as AI-readable systems where design, fabrication, and sustainability are intelligently negotiated through data.

*Project team:* Alina Schuster (Bollinger + Grohmann), Alireza Abdolmaleki (Swinburne University of Technology), Andrew Butler (Cox Architecture), Hirusheekesan Selvanesan (Adelaide University), Mahdi S. Fard (UNSW), Matthew Tam (Bollinger + Grohmann)

*Expert advice:* Alexander Hofbeck (Bollinger + Grohmann), Ljuba Tascheva (Bollinger + Grohmann)

### 3. Environmental Performance Companion

This team addressed the challenge of embedding sustainability at the earliest stages of design through an AI-powered environmental “companion” chatbot. Designed to operate within everyday workflows, the system introduces three intelligent personalities: Compliance, Understand, and Enhance, each supporting a different phase of environmental decision-making. During the hackathon, the Compliance module was prototyped, featuring a layered information architecture encompassing infrastructure, processing, training, monitoring, integration, and user interface design. The result is a conceptual foundation for an adaptive, conversational tool that can interpret environmental certification, define data requirements, suggest tools, analyse results, and guide design iteration, making environmental literacy more accessible, engaging, and actionable for architects.

*Project team:* Jeffrey Moser (Grimshaw), Jorge Castillo (Swinburne University of Technology), Marc Micuta (Tzannes), Pantea Alambeigi (Swinburne University of Technology)

*Expert advice:* Andy Watts (Grimshaw)

### 4. XR for Environmental Performance and Accreditation

Bridging the gap between simulation and human experience, this project explored how extended reality (XR) technologies, virtual and augmented reality, can reimagine environmental analysis in architectural design. Focusing on daylight as a tangible sustainability criterion, we developed complementary workflows linking Honeybee (Radiance) daylight simulations with immersive Unreal Engine environments and AR overlays in Fologram. This combined approach enabled dynamic visualization and comparison of quantitative daylight metrics (sDA, ASE) with spatial comfort cues at multiple scales. Together, these explorations demonstrate how XR can transform static analyses into interactive, data-driven design processes aligned with sustainability certifications and occupant wellbeing.

*Project team:* Lisa Lu (UNSW), Mehrnoush Latifi (Swinburne University of Technology), Shahrzad Fereidouni (Grimshaw), Shiva Ghaznavi (Swinburne University of Technology)

*Expert advice:* Andy Watts (Grimshaw)

The hackathon once again demonstrated Arch\_Manu’s leadership in bridging academic and industry innovation through agile, collaborative experimentation. The event highlighted how AI can become an active partner in sustainable architectural production, advancing Arch\_Manu’s mission to enable a digitally empowered and circular design future for Australia’s built environment.

For more information about Arch\_Manu’s research and upcoming events, visit [archmanu.com](http://archmanu.com) or contact [archmanu@unsw.edu.au](mailto:archmanu@unsw.edu.au).

**About Arch\_Manu:** Arch\_Manu is an interdisciplinary, industry-focused research and training initiative funded by the Australian Research Council’s Industrial Transformation Training Centre scheme. It brings together academic and industry leaders to drive digital transformation in the architecture and engineering industries, fostering cutting-edge innovation and professional development.