## 2022/2023 Summer Research Project Description

Please use this template to create a description of each research project, eligibility requirements and expected deliverables. Project details can then be uploaded to each faculty, school, institute, and centre webpage prior to the launch of the program.

<table>
<thead>
<tr>
<th>Project title:</th>
<th>Trustworthiness and Digital Twins: designing for trustworthiness in data-run buildings and cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project duration, hours of engagement &amp; delivery mode</td>
<td>Duration of the project, 6-10 weeks during Summer Vacation. Hours of engagement must be between 20-36hrs per week. Applicant will be required on-site for the project.</td>
</tr>
<tr>
<td>Description:</td>
<td>Digital twins are virtual models of buildings and cities that are updated in real-time using sensors embedded in the real world. They provide a common data environment that models and shares data from across different stakeholders, services and disciplines. There has been significant interest in utilising Digital Twin technology as part of the infrastructure delivery program for the 2032 Olympic Games. However, as these data-focused technologies are embedded in our cities, we need to be certain that their design, development and deployment are done in a way that is trustworthy. This project will begin with analysing the literature on the importance of trustworthiness and the city, examine how these trust relations are under pressure as the city is automated and then digitised. And how trustworthiness can be preserved and enhanced through the design process both of the physical and digital spaces of our cities, including examining any proposed blockchain model for trustworthiness in the internet of things.</td>
</tr>
<tr>
<td>Expected outcomes and deliverables:</td>
<td>Students may gain skills in doctrinal research, work with lawyers and coders with expertise in blockchain and digital twins. Students may also have an opportunity to generate publication(s) from their research. Students may</td>
</tr>
</tbody>
</table>
also be asked to produce a report or oral presentation at the end of their project.

**Suitable for:**
This project is open to applications from architecture or urban design students (4th year onwards).

**Primary Supervisor:**
Dr Brydon Wang  
Brydon.wang@uq.edu.au

**Further info:**
N/A
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<th>Project title:</th>
<th>Updating the Queenslander typology with amphibious foundations for flood-resilience</th>
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<td><strong>Project duration, hours of engagement &amp; delivery mode</strong></td>
<td>Duration of the project, 6-10 weeks during Summer Vacation. Hours of engagement must be between 20-36hrs per week. Applicant will be required on-site for the project.</td>
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<tr>
<td><strong>Description:</strong></td>
<td>Following the devastating floods in New Orleans, there was a concerted effort to develop amphibious foundations to create buoyant structures that food float above flood waters. In light of the 2022 Brisbane floods, this project seeks to translate the research on amphibious foundations in North America to the South East Queensland context to articulate the benefits of retrofitting amphibious foundations to heritage structures, including the Queenslander housing typology.</td>
</tr>
</tbody>
</table>

![Static position](image1)

![During a flood event](image2)
Over the course of the project, students will undertake research into amphibious housing across North America and Europe, and undertake research into built heritage preservation (particularly studying the Queenslander typology). Students will then compare this with efforts undertaken to imbue housing stock in South East Queensland with flood resilience.

**Expected outcomes and deliverables:** Students may gain skills in doctrinal research, data collection from site visits, and work with civil engineers with expertise in floating structures technology. Students may also have an opportunity to generate publication(s) from their research. Students may also be asked to produce a report or oral presentation at the end of their project.

**Suitable for:** This project is open to applications from architecture or urban design students (3rd year onwards).

**Primary Supervisor:** Dr Brydon Wang
Brydon.wang@uq.edu.au

**Further info:** N/A
### Project Title:
Robotic winding of spatial FRP structure

**Project duration, hours of engagement & delivery mode**

- **Duration of the project:** 10 weeks during Summer Vacation.
- **Hours of engagement:** must be between 20-36hrs per week
- **COVID-19 considerations:** Please outline if the project can be completed under a remote working arrangement or if on-site attendance is required.
  
  *For example, applicant will be required on-site for the project.*

**Description:**
This project will work on robotically fabricated prototypes that explore the potential of architectural form, structure, ornament, and tectonics through topological optimised design methods. The project validates the feasibility of the proposed system via the design, fabrication, and testing of several full-scale prototypes. The reusability of the robotic assembled temporary support system in the fabrication process further raises its competitiveness among all the manufacturing methods. This technology eventually provides a novel method to build adaptive, lightweight, sustainable, low-cost, and reliable structures.

![Outcome for robotic winding summer research 2021](image)

**Expected outcomes and deliverables:**
The outcome of the new design and fabrication system for large-scale spatial structure is based on a combined workflow of robotic assembly and robotic winding. The outcome will potentially be exhibit in Melbourne design week 2023.
<table>
<thead>
<tr>
<th>Suitable for:</th>
<th>Year 3-4 undergraduate students / master students in Design, Architecture and Civil Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Supervisor:</td>
<td>Dan Luo : <a href="mailto:d.luo@uq.edu.au">d.luo@uq.edu.au</a></td>
</tr>
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<td>Further info:</td>
<td></td>
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