2025-26 HIVE Summer Internship Project

Scaling 3D Meteorite Scanning: designing a photogrammetry workflow

Primary Academic Supervisor
Dr. Lucy Forman

Project Background
Creating detailed digital 3D models of meteorites is scientifically valuable for morphological analysis, fragmentation studies, and atmospheric entry modelling. Traditional photogrammetry methods are extremely time-intensive.

The Tower's collection of 78 meteorites recently donated to the WA Museum presents a unique opportunity to develop and test automated 3D modelling workflows. The HIVE facility has recently acquired a Cognisys Stackshot 3X Deluxe automated photography system specifically to address this workflow bottleneck.

This project will focus on developing and optimising an automated pipeline for rapid, high-quality 3D digitisation of meteorite samples, with the goal of making large-scale meteorite collections digitally accessible for research.

Project Description, Expected Outputs, Possible Stretch Goals
The internship will establish a comprehensive workflow for meteorite 3D documentation, encompassing both hardware setup and potential processing pipelines. The student will test and optimise the Cognisys Stackshot system for meteorite photography, developing standardised protocols for specimen positioning, lighting configuration, and automated capture sequences.

The key deliverable would be establishing a workflow from image capture to data processing. This includes documented photography protocols, optimised photogrammetry processing workflows, quality assessment metrics for 3D model accuracy, and a user manual for future researchers. The project will produce high-quality 3D models of representative meteorite specimens as proof-of-concept demonstrations.

Stretch goals may include scanning of the Tower's collection, integrating focus stacking techniques for enhanced detail capture, and establishing database standards for long-term digital curation of the collection.

Links to background reading and any relevant recent work in the field
Cognisys Stackshot 3X System: https://cognisys-inc.com/motion-control/stackshot3x-pkgs/stackshot3x-dlx-pkg.html
Desert Fireball Network:https://dfn.gfo.rocks/
Meteorite recovery with 3D models: https://arxiv.org/abs/2006.07151

What type of visualisation will the student develop or produce?
3D models and photogrammetry

How will the visualisation contribute to your research outcomes?
Cognisys Stackshot 3X Deluxe automated photography system
HIVE photography lighting equipment
High-resolution cameras and lenses
Photogrammetry processing software
3D visualisation and analysis tools

If the project is successful, where would you consider publishing the results?
There is certainly scope for conference abstract/proceedings, and the results of a large database of scanned meteorites would produce a high quality journal article.

<u>Draft Project Timeline:</u>
Week 1
Nov 10 - Full day HIVE induction
Nov 11 - Area and Project Induction with Primary supervisor
Develop project plan with HIVE and academic team
Literature and relevant project review

Equipment familiarisation, literature review

Week 2
initial system setup

Week 3
photography protocol development

Week 4
lighting optimisation

Week 5
Automated capture sequence programming

Week 6
testing

Week 7
Photogrammetry processing pipeline optimisation

Week 8
Photogrammetry processing pipeline optimisation

Week 9
Focus on report writing and presentation preparation

Documentation creation, quality assessment

Week 10
Focus on report writing and presentation preparation
30th Jan Final Presentation Showcase Day and final report due

final reporting

Student Experience and Supervision:
How often will you meet with the student over the 10-week period?
once per week

Your work desk location and the location of student desk
314.155

<u>Student Attributes:</u>

Please indicate any preference for student's academic discipline or field of study

computer science

What competencies are required to start this project

Beginner - 2D image and/or video software (e.g. Adobe Suite, Sony Vegas)

Intermediate - 3D modelling software (e.g. Blender, 3ds Max)

Intermediate - Unity 2D/3D Artistry (assets, lighting, cameras, materials implementation)

Beginner - Unity Programming (C# coding, animation syntax, debugging, problem-solving)

Beginner - Unity Virtual Reality Development (rendering pipelines, scene content design, interaction)

Beginner - Data structures, analytics, statistical modelling

Do you have any other student attributes you think are important to the project?